



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

**NPPR-PCEP**  
**2020**





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## FOREWORD

Peste des petits ruminants (PPR), a contagious livestock affecting wild and domestic small ruminants, has been associated with devastating socio-economic losses and serious damage to the livelihoods, food security and nutrition of especially small-scale farmers and pastoralists. The annual global impacts of PPR have been estimated at between US\$1.4 billion and US\$2.1 billion. Global consensus has been reached on the need to control and eradicate PPR. The PPR Global Control and Eradication Strategy (PPR GCES) was endorsed at the International Conference for the Control and Eradication of PPR, in 2015, and Eradication of the disease by 2030 was its goal.

PPR is a notifiable disease as per the Livestock Rules and Regulations of Bhutan 2017. Outbreak of the disease has been sporadically reported in the country and most of the outbreaks were found to be associated with incursion due to import of live animals. As part of the global effort to eradicate the disease by 2030, Bhutan has been actively implementing various strategies to prevent, control and eradicate the disease. This document clearly outlines strategies and activities to eradicate PPR from Bhutan by 2028 through adoption of Global Strategy for Control and Eradication of PPR.

I am happy to note that the National Centre for Animal Health and Animal Health Division, Department of Livestock, have taken the lead in developing the National PPR Prevention, Control and Eradication Plan. I would like to extend my appreciation to all individuals who have contributed towards producing this important national plan document.

I hope this plan document will be useful as ready reference to all those involved in the prevention, control, and eradication of PPR in the country. I am confident that this plan document will directly contribute in decreasing the incidence of PPR in the country and eventually reaching the eradication milestone.

(Dr Karma Rinzin)

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## ABBREVIATIONS AND ACRONYMS

AHD	Animal Health Division
BAFRA	Bhutan Agriculture and Food Regulatory Authority
CVO	Chief Veterinary Officer
DoFPS	Department of Forests and Park Service
DoL	Department of Livestock
DVH	Dzongkhag Veterinary Hospitals
Dzongkhag	District, an administrative division composing of a group of Gewogs in Bhutan
ELISA	Enzyme-linked immunosorbent assay
FAO	Food and Agriculture Organization
Gewog	Sub-district, an administrative division composing of a group of villages in Bhutan
GF-TADs	Progressive Control of Transboundary Animal Diseases
LEC	Livestock Extension Centres
MoAF	Ministry of Agriculture and Forests
NCAH	National Centre for Animal Health
NC-PCE	National Committee for PPR Control and eradication
NPPR-PCEP	National PPR Prevention, Control, and Eradication plan
OIE	World Organization for Animal Health
PMAT	PPR Monitoring and Assessment Tool
PPR-GCES	PPR Global Control and Eradication Strategy
PPRV	<i>Peste des Petits Ruminants virus</i>
RLDC	Regional Livestock Development Centre
RRT	Rapid Response Team
SAARC	South Asian Association for Regional Cooperation
SOP	Standard Operating Procedure
SVL	Satellite Veterinary Laboratories
Tshethar	Practice of freeing animals from imminent slaughter and death
TWG-PCE	Technical Working Group on PPR

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## 1. INTRODUCTION

### 1.1. Country and geography

Nestled in the Himalayas and sandwiched between China to the north and India to east, west, and south (See figure 1), the Kingdom of Bhutan is a small landlocked country with an area of 38 394 km<sup>2</sup> stretching approximately 160 km north-south and 240 km east-west. The geolocation of the country is defined by 26° 40'– 28° 20' northing and 88° 45' – 92° 70' easting. The current human population of Bhutan is 727,145 (NSB, 2018). As a result of the remarkable variations in altitude in a small area, the country experiences diverse climatic conditions from wet sub-tropical in the south and temperate to alpine in the north. About 71% of the land is under natural forest cover (NSB, 2019). Bhutan is administratively divided into 20 districts, 205 sub-districts, and 4,340 villages (ECB, 2008) and is essentially an agrarian country with about 57% of the population engaged in agriculture for their livelihood (DoE, 2014). Livestock farming forms an integral part of the agricultural system with about 62% of the households rearing livestock (NSB, 2013). The traditional farming system involves the integration of crop production and livestock rearing. The majority of livestock farming practices involve grazing in agricultural fields and forests. Only a small proportion of livestock are reared under a stall-feeding system. Livestock farmers in the high-altitude areas practice a traditional transhumance migration system (downward in winter and upward in summer) to make feed and fodder available for their animals all year.

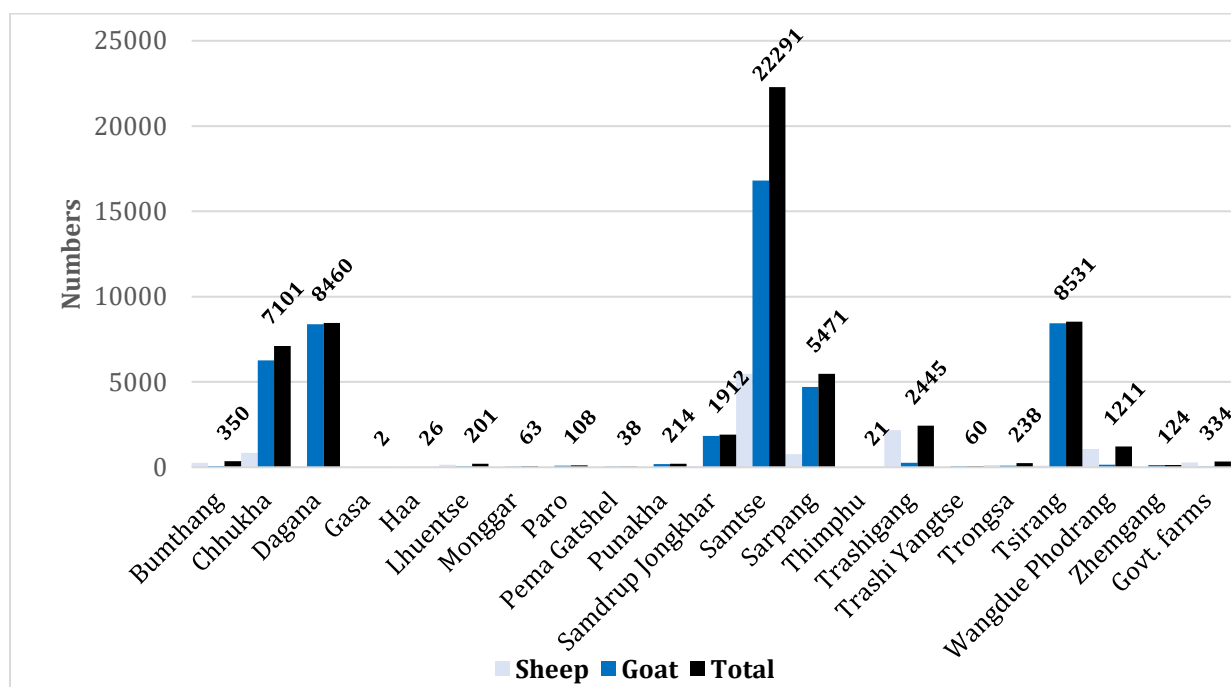


*Figure 1: Bhutan and its neighbours*

## 1.2. Sheep and goat population

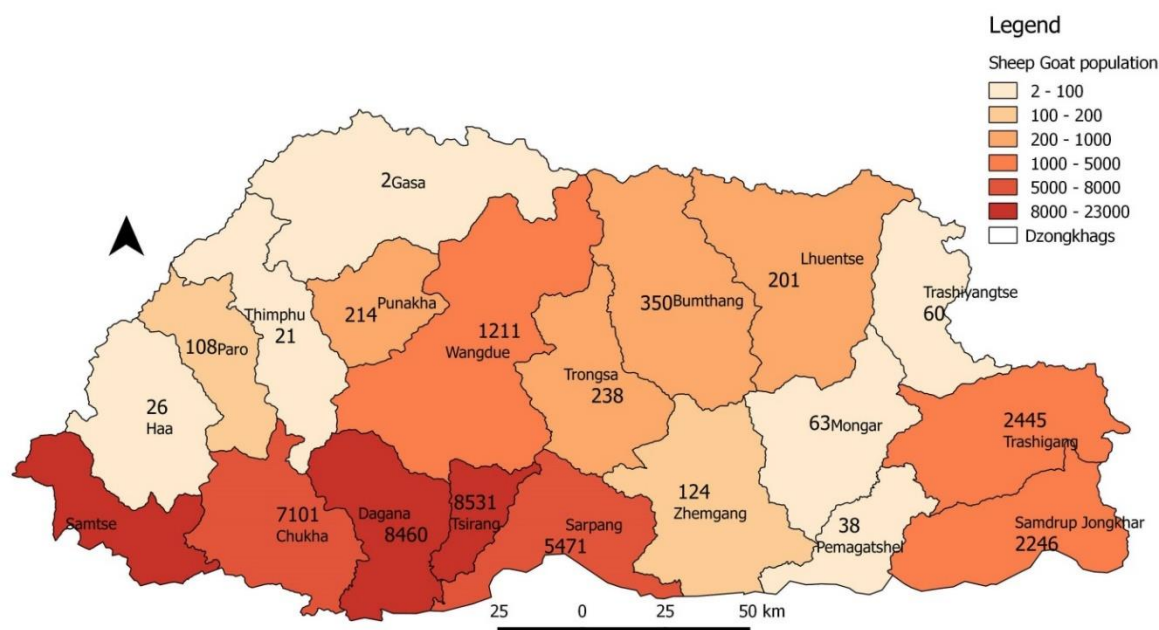
Goats are predominantly found in the six southern districts bordering with India. Five border districts share a long porous border with India where transboundary animal diseases are of concern not limited to PPR but also with rabies, FMD, and HPAI. In contrast, the northern border with China is inaccessible due to harsh climatic and difficult terrain conditions. With the government policy on the economic stimulus plan to boost livestock production, there has been a considerable number of livestock being imported. Goat is one of the species imported for chevon production. In the recent past, all the PPR outbreaks were traced back to imported goats.

As per the annual livestock statistics of Bhutan (Department of Livestock) for the calendar year 2019, Bhutan has 59,201 small ruminants: 47,735 goats and 11,466 sheep (See Figure 2), susceptible to PPR infection.



*Figure 2: Population distribution of small ruminants by Dzongkhags, 2019*

The Population of small ruminants is highest in Samtse Dzongkhag, followed by Tsirang, Dagana, Chhukha, Sarpang, etc., majority of which are located in the southern belt sharing a porous border with India (See Figure 3).



*Figure 3: Small ruminants' population density, 2019*

### 1.3. Small ruminant production system

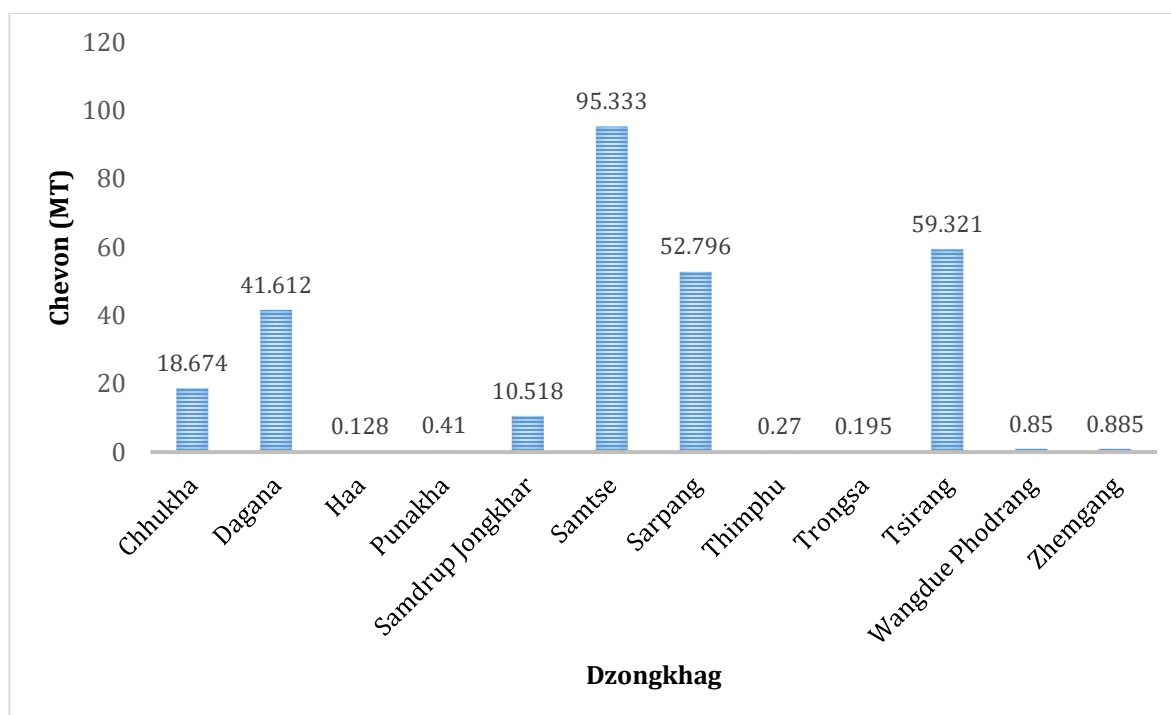
Livestock farming forms an integral and indispensable part of the agricultural farming system in the country with about 78% of the agrarian population owning livestock. Sheep and goats are a source of milk, meat and meat products, skins, and wool throughout the year. They reproduce rapidly and are easier to manage. In agro-pastoral and crop production systems, they are an important source of manure for soil fertility. Sheep and goats are also well-adapted and easy to rear as compared to large ruminants.

Goat rearing is a subsistence farming in the rural community mainly supporting day-to-day expenditure. As such, goat farming does not have any producer organisations instituted nor follow the organised marketing system that involves live animal transport, slaughter, packaging, and marketing.

### 1.4. Meat production and import of Chevron in Bhutan

Sheep and goat production is at the subsistence level in Bhutan. Meat and other products from them are harvested and sold to supplement household expenses and mitigate financial crises at the household level. The slaughter is undertaken at the farm gate. There is no designated slaughterhouse in the country.

As per the annual livestock statistics of Bhutan 2019, a total of 280.992 MT of chevon production was recorded from 12 Dzongkhags of Bhutan (See Figure 4), and as per Bhutan trade statistics 2019, published by Department of Revenue and Customs, 29.891 MT of goat and sheep meat and meat-products were imported costing a total of 12.8 Million Bhutanese Ngultrum.



*Figure 4: Chevon production (domestic), 2019*

### 1.5. PPR susceptible wild ruminants

Bhutan is known for its rich biodiversity including both fauna and flora. Among various faunal species found in Bhutan, small wild ruminants consist of musk deer, takin, spotted deer, Himalayan Serow, goral, and Himalayan blue sheep (Bharal). Most of these species are preserved in protected areas and biological corridors across the country. Himalayan blue sheep are predominantly found in high altitude mountain ranges. Although Forests and Nature Conservation Rules and Regulations of Bhutan 2017 prescribes the grazing of goats in the confined area and prohibits grazing in State Reserve Forest, instances of non-compliance are reported. Therefore, there is a possibility of spill-over of PPR from goats to wild small ruminants.

## 2. THE DISEASE

Peste des Petits Ruminants (PPR) also known as ‘goat plague’ is a viral disease of goats and sheep characterized by fever, necrotic stomatitis, diarrhoea, pneumonia, and death. It is considered a highly contagious transboundary disease that has a serious socio-economic impact on the smallholder farmers and the government.

### 2.1. Causative agent

*Peste des Petits Ruminants* (PPR) is caused by a single-stranded enveloped RNA virus belonging to the genus *Morbillivirus* of the family *Paramyxoviridae*. PPRV can be differentiated into four lineages: 1 to 4. It is antigenically similar to the Rinderpest virus, Measles, and Canine distemper virus and often referred to as viral triad.

### 2.2. Virus survival

PPR virus cannot survive for a long time outside the host but it can survive for long periods in chilled and frozen tissues. Its half-life has been estimated to be 2 hours at 37°C and the virus can be destroyed at 50°C for 60 minutes. It is stable at pH between 5.8 and 10 and can be inactivated easily below pH 4 and beyond 11. The virus is susceptible to phenol and 2% sodium hydroxide for 24 hours.

### 2.3. Source and excretion of virus

The PPRV is excreted in tears, nasal discharge, and secretions from coughing and in the faeces of infected animals. The infected animals usually start excreting the virus at least 24-48 hours before the development of clinical signs. This has important epidemiological implications as animals are infectious before the onset of clinical signs and disease can be spread by the movement of infected animals.

### 2.4. Host range and susceptibility

Sheep and goats are the main reservoir host for the virus. Wildlife (small ruminants) may also be affected by the virus. Cattle and pigs develop in-apparent infections and do not transmit disease. PPR is not a zoonotic disease.

### 2.5. Pathogenesis

PPRV is lymphotropic and epithelia-tropic. After the entry of the virus through the respiratory tract, it localizes first replicating in the pharyngeal and mandibular lymph nodes as well as tonsil. Viremia may develop 2-3 days after infection and 1-2 days before the onset of the first clinical sign. Subsequently, viremia results in the dissemination of the virus to spleen, bone marrow, and mucosa of the gastrointestinal tract and respiratory system. The PPRV is excreted in tears, nasal discharge, secretions from coughing, and in the faeces of infected animals. The infected animals usually start excreting the virus at least 24-48 hours before the development of clinical signs.



## 2.6. Transmission

### 2.6.1. Direct and indirect contact

PPRV is most commonly spread by direct contact between an infected and a susceptible animal. The disease can also be spread indirectly by contaminated fomites including water, milk, feed trough, bedding materials, and movement of people and equipment. Activities such as wool shearing, blood sampling, and milking can also lead to indirect contact with the virus from infected animals if proper hygiene and aseptic precautions are not taken.

### 2.6.2. Transmission by ingestion

Animals can be infected through the ingestion of contaminated feed and water.

### 2.6.3. Air-borne transmission

Infected animals produce a large amount of virus in their exhaled air and secretion. Sheep and goat are particularly susceptible to infection by the aerosol route.

### 2.6.4. Iatrogenic transmission

Use of PPRV contaminated instruments, such as hypodermic needles during parenteral administration of drugs or vaccines, could lead to transmission of infection.

## 2.7. Clinical signs

The incubation period of disease is 4-6 days but may range from 3-10 days. However, the maximum incubation period is 21 days for regulatory and trade purposes. Disease severity depends on PPRV lineage, species, breed, immune status of animals. The animal that recovers from PPR develops an active immunity and immunity is probably lifelong.

### 2.7.1. Acute form

- Sudden rise in body temperature (40-41<sup>0</sup>C) with severe depression, loss of appetite and clear nasal discharge
- The nasal discharge becomes thicker and yellow and forms a crust that blocks the nostril causing respiratory distress
- The eyes may also be infected, causing eyelids to mat together with discharge
- Tissues in the mouth can swell and ulcers form on the lower gums, dental pad, hard palate, cheeks and tongue
- Pregnant animals may abort
- Severe diarrhoea develops in small animals resulting in dehydration and death (3D)
- Survivors undergo long convalescence

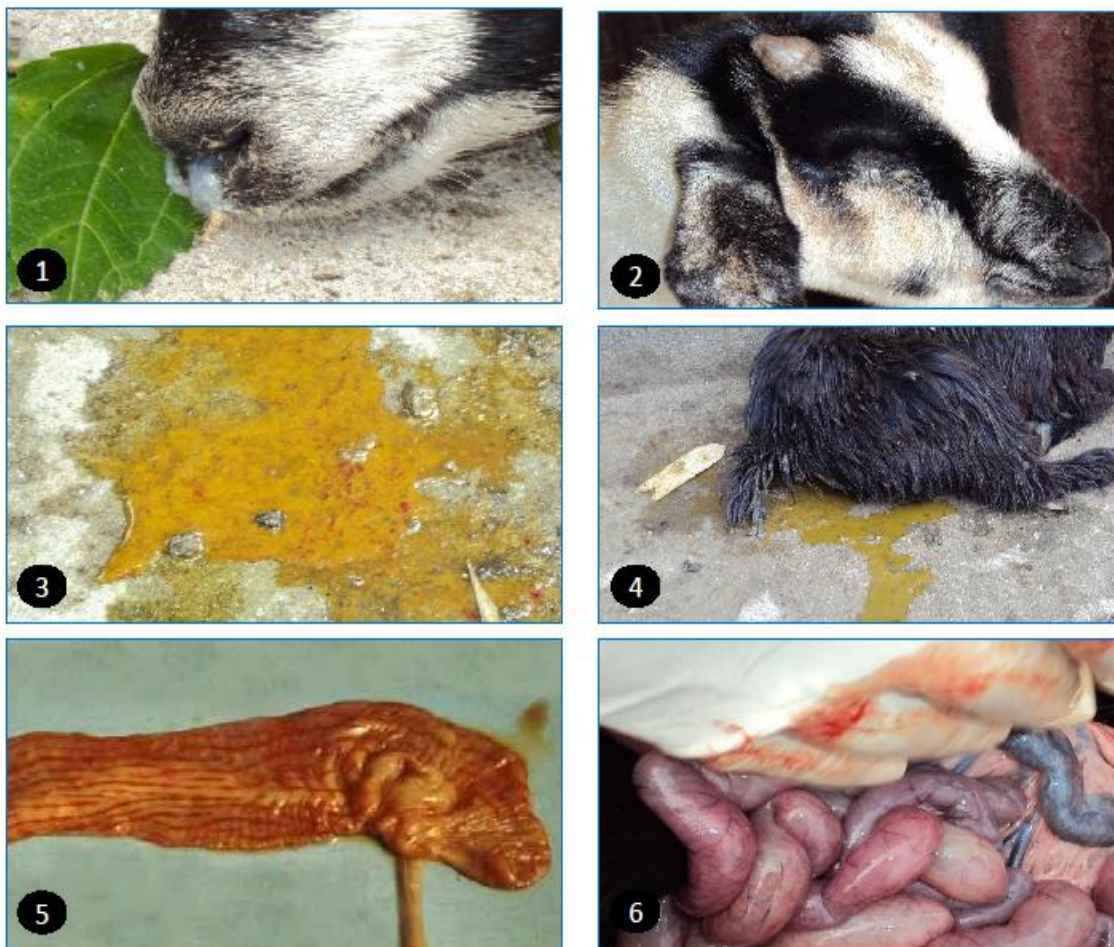
### 2.7.2. Per-acute form

- Per acute form is common in goats especially in a naive population
- There will be high fever, depression, and death



### 2.7.3. Sub-acute form

- Frequent in local breed. It is commonly seen in experimentally infected animals
- Diarrhoea, dehydration and prostration



**Figure 5: Clinical signs and lesions of PPR**

- 1 – Mucopurulent nasal discharge
- 2 – Ocular discharge and eyelids matting
- 3 – Diarrhoea with blood specks
- 4 – Watery diarrhoea
- 5 – "zebra striping" in the large intestine. Note the lines of haemorrhage along with the tips of the folds of the lining of the caecum and colon. Later, the individual haemorrhages join up and, after death, turn black (FAO 1999).
- 6 – Haemorrhagic enteritis (gross picture)

## 2.8. Diagnosis

### 2.8.1. Clinical diagnosis

Clinical diagnosis is based on the history of exposure and clinical signs. A tentative diagnosis of PPR is made based on clinical signs, but this diagnosis is considered provisional until laboratory confirmation and post-mortem diagnosis is made for differential diagnosis with other diseases with similar signs. Detail clinical signs are shown in figure 5.

### 2.8.2. Post-mortem diagnosis

The post-mortem examination of lesions observed are conjunctivitis, stomatitis, and zebra stripes of congestion in the intestine, pneumonia, and splenomegaly, congestion of the liver, and edema of lymph nodes. However, post-mortem examination only supports the provisional clinical diagnosis. It will only be definitive following the laboratory examination of the samples.

### 2.8.3. Differential diagnosis

The disease should be differentiated from other diseases of small ruminants which are enlisted and described briefly in the following table.

**Table 1: Diseases to be differentiated from PPR**

Disease	Differential clinical signs
<b>Contagious caprine pleuropneumonia</b>	High fever, anorexia, productive cough, wide stance, extended neck, nasal discharge, debilitation. PM lesion: Granular lung appearance, fibrinous pneumonia
<b>Blue tongue</b>	Drooling, High fever, swelling in the mouth, head and neck, lameness and wasting of muscles in hind legs, inflammation of the coronary band PM lesions: haemorrhages under the skin
<b>Pasteurellosis</b>	Listlessness, lethargy, panting, cyanosis of the udder PM lesion: congestion of nasal cartilage, heart, hepatomegaly, pulmonary adhesion
<b>Contagious ecthyma/ Orf</b>	Blister like lesion in mouth, muzzle, face, ear, teats, coronary band, vulva, and scrotum. PM lesion: Lymphadenopathy & fibrinous pneumonia
<b>Foot &amp; Mouth Disease</b>	Pyrexia, lameness and oral lesions, foot lesions along with the coronary band, agalactia. PM lesion: blisters inside the mouth and on foot
<b>Sheep and goat pox</b>	High fever, small circumscribed skin hyperaemia, papules of 0.5-1 cm diameter all over the body, especially on groin, axilla, and perineum. PM lesions: pox lesion in the mucous membrane of eyes, respiratory and GI tracts.
<b>Mineral poisoning</b>	Brown urine, anorexia, weakness & recumbency. PM lesion: Icterus and gunmetal blue kidney
<b>Coccidiosis</b>	Blackish diarrhoea which contains blood, emaciation

	PM lesion: whitish pedunculated nodules on the mucosa of the small intestine.
<b>Heart water</b>	High fever, listlessness, dyspnoea, tremors of superficial muscles, nystagmus & hyperaesthesia. PM lesion: Pulmonary oedema

#### 2.8.4. Laboratory diagnosis

Detection of antigens by;

- Agar gel immunodiffusion test (AGIDT)
- Immuno-capture enzyme-linked immunosorbent assay ELISA (ICE)
- Reverse transcriptase polymerase chain reaction (RT PCR)

Detection of antibody;

- Competitive ELISA

### 2.9. Treatment

PPR is a viral infection and there is no specific treatment. However, antibiotics can be administered to prevent secondary infections. Analgesics and antipyretics may be given to treat fever. Fluid therapy may be given to treat diarrhoea for the restoration of the body fluid and to maintain ionic balance.

## 3. GOAL AND OBJECTIVE

### 3.1. Overall Objective

The overall objective of this document is to control PPR in Bhutan and ultimately eliminate it by 2028. Achieving this objective will contribute to poverty alleviation through the improved rural livelihood of smallholder farmers. Achieving this goal is monitored through verification of the absence of PPR outbreak in the country and OIE recognizing freedom status.

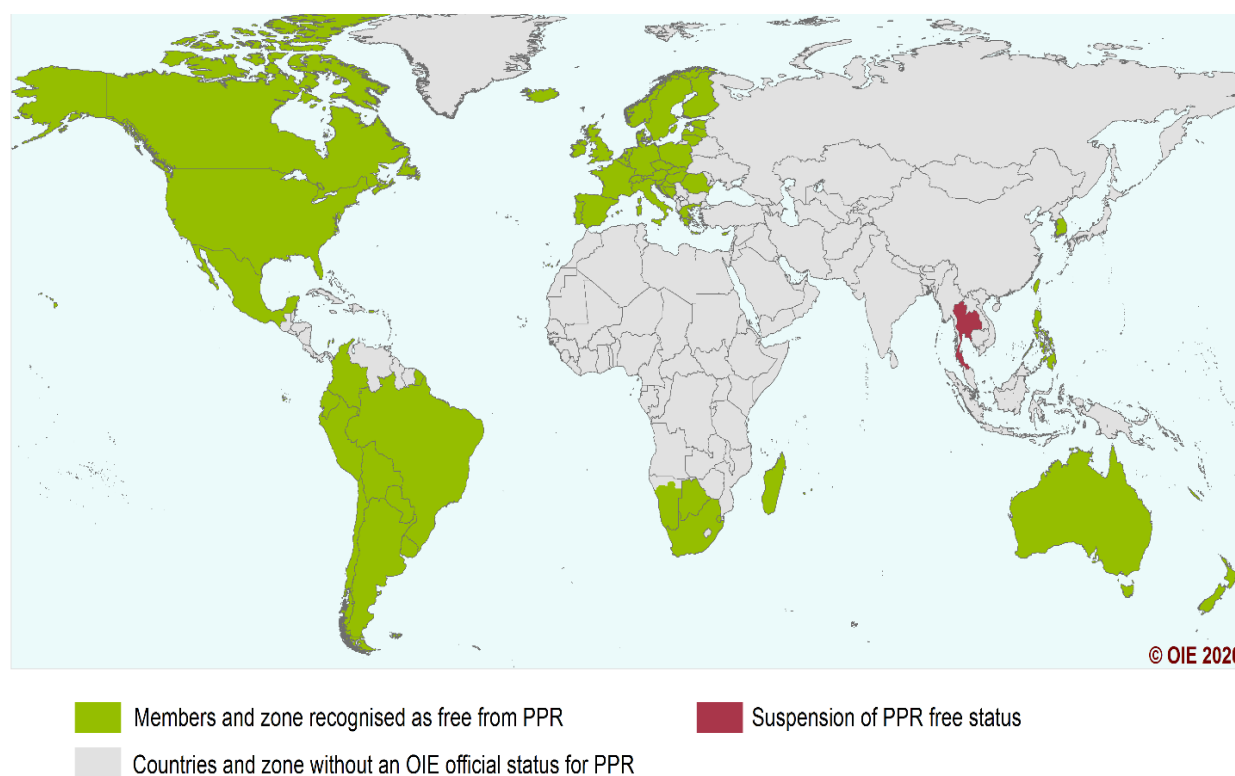
The purpose of this plan document is to guide the implementation of PPR control and eradication programme by strengthening laboratory diagnostic capacity, epidemiological capacity, prevention strategy, biosecurity measures, and legal framework. Progress on implementation phases shall be assessed using PPR monitoring assessment tool (PMAT) on an annual basis.

### 3.2 Situational Analysis

#### 3.1.1. PPR situation in the world

PPR is a fast-spreading viral disease that affects and kills small ruminants. PPR was first identified in Côte d'Ivoire in 1942 and spread to around 70 countries in Africa, the Middle East, and Asia, regions that are home to over 80 percent of the world's sheep and goats and to more than 330 million of the world's poorest people who depend on them for their livelihoods. Economic losses caused by PPR are estimated to be USD 1.45 to 2.1 billion each year.

As per Resolution No. 21 (87th General Session of World Assembly, May 2019, 57 member countries were recognized as PPR free according to the provisions of Chapter 14.7. of the Terrestrial Animal Health Code (See Figure 6).



**Figure 6: OIE members' official PPR status, updated in March 2020**

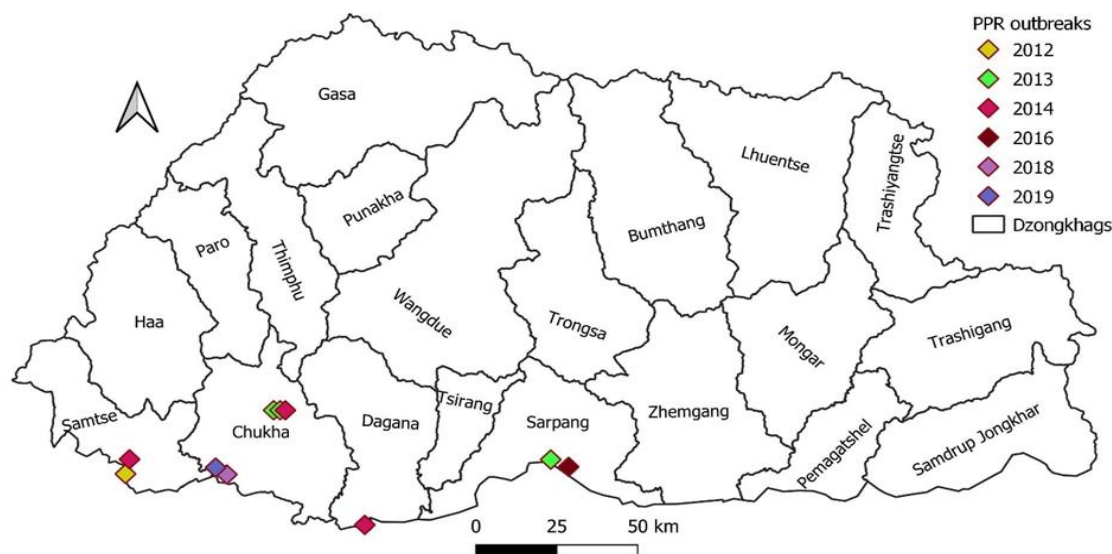
### 3.1.2. PPR outbreaks in Bhutan

PPR was first reported in Bhutan in June 2010 from Chhukha district from an animal holding facility for *Tshethar*. Thereafter, sporadic outbreaks were recorded in 2012, 2013, 2014, 2016, 2018, and 2019 from Samtse, Chhukha, Dagana, and Sarpang Dzongkhags (See table 2 and figure 7). The outbreak in Dagana and Sarpang in 2014 and 2016, respectively, were observed soon after the legal import of animals from India by the department. Other parts of the country had not reported PPR to date. In the past, most of the outbreaks occurred in the illegally imported “*Tshethar*” goat.

**Table 2: PPR outbreak history in Bhutan – 2010 to June 2020.**

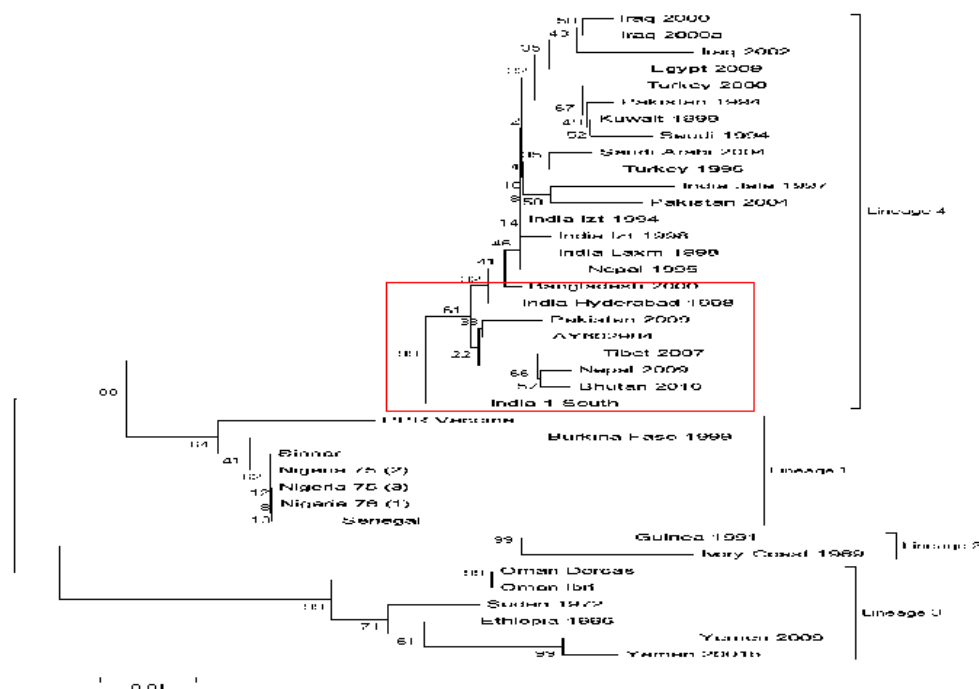
Sl. No.	Date	Place of outbreak	Species	No of cases	No of death	Susceptible Population	Probable source	Test type and where
1.	June, 2010	Bjachho, Chhukha	Caprine	80	40	100	<i>Tshethar</i> goat from India and released inside the CHPCA Dog pound	Phylogenetic analysis at Pirbright, UK
2.	Dec, 2012	Samtse, Samtse	Caprine	1	0	1	Unknown	Antigen/antibody ELISA at Pirbright, UK
3	May, 2013	Bjachho, Chhukha	Caprine	41	25	47	Illegal import from India into CHPCA dog pound	Antigen/antibody ELISA at Pirbright, UK
4	Nov, 2013	Bhur, Sarpang	Caprine	14	10	20	Imported by Govt for research/ breeding	Antibody ELISA at BLRI Bangladesh
5	Mar, 2014	Lhamoid zingka, Dagana	Caprine	120	36	140	Imported goat from India	Antigen/antibody ELISA at NCAH, Bhutan
6	Nov, 2014	Bjachho, Chhukha	Caprine	20	7	27	CHPCA dog pound (Tshethar)	Antibody ELISA at NCAH, Bhutan
7	Aug, 2014	Uttarey, Samtse, Samtse	Caprine	42	4	60	Breeding bucks introduced	Antibody ELISA at NCAH, Bhutan
8	May, 2016	Gelephu, Sarpang	Caprine	10	3	125	Imported breeding goat from India	Antigen/antibody ELISA at NCAH, Bhutan
9	Mar, 2018	Phuentshogling, Chhukha	Caprine	26	4	58	Illegal goat from India	Antigen ELISA at NCAH, Bhutan
10	Feb, 2019	Sampheling, Chhukha	Caprine	27	7	235	Tshethar goat from Jaigaon, India	Antigen ELISA at NCAH, Bhutan





**Figure 7: PPR outbreak points, 2010 - 2019**

The first PPR virus involved in the 2010 outbreak was found to be lineage 4 which is antigenically related to Nepal and Tibet Autonomous Region of China (See figure 8).



**Figure 8: Phylogeny tree of PPR virus from Bhutan – 2010 outbreak (Source: Dr. Carrie Batten and group, Institute for Animal Health, Pirbright, UK)**

### 3.1.3. Diagnostic Capacity

Simple, rapid, and reliable laboratory methods are routinely used to confirm the field diagnosis. A rapid test to detect antigen is being used in the field for immediate preliminary diagnosis. An enzyme-linked immunosorbent assay (ELISA) tests to detect antibodies and antigens in biological samples (swabs and serum) are used at the National Veterinary Laboratory, National Centre for Animal Health. Appropriate samples are referred to the laboratories outside the country for real-time RT-PCR and virus characterization.

Samples are collected and transported to designated laboratories as per the official standard operating procedures (SOPs): SOP for sample collection; SOP for sample packaging/preparation; SOP for sample transportation. Samples are collected and referred to the National Veterinary Laboratory for confirmatory diagnosis. A sample submission form with details of sample accompanies the referred samples to national Laboratory

The sample collection form mainly aims at collecting information on sample and field information where the outbreak has occurred. Sample submission form consists of five main areas where details of samples are recorded: a) Details of the owner; b) Details of animals; c) Details of specimens; d) Case history and e) Pathways for different test requested. Copies of forms are available as Form 2 (Sample collection form) and Form 3 (Sample submission form) under Annexure 6.

The National laboratory has the capacity for rapid as well as serological tests. Regional and district level laboratories have only rapid test capacity. The table below shows the diagnostic capacities at different levels.

*Table 3: PPR diagnostic capacity at different levels of laboratory*

Method	National Laboratory	Regional Laboratory	Satellite laboratory	District Laboratory
		Agent identification		
Immuno-capture ELISA	Yes	No	No	No
Pen side test (LFD)	Yes	Yes	Yes	Yes*
		Detection of immune response		
Competitive ELISA	Yes	No	No	No

Note: RT-PCR = reverse-transcription polymerase chain reaction; ELISA = enzyme-linked immunosorbent assay; LFD = lateral flow device; \* Not in all District lab

The above section explains the current status of the diagnostic capacity of PPR at national, regional, and district level laboratories. As the country progresses with control and eradication of PPR, more advanced level diagnostic techniques need to be established. To establish this, the following activities shall be attended:

- Introduce molecular test technique at the national laboratory
- Training of laboratory staffs on molecular techniques
- Participate in proficiency testing scheme with laboratories in the region
- Strengthen/establish linkages with regional and world reference laboratories



- Continue implementing a laboratory quality control and assurance system in the national laboratory and its network
- Strengthening of regional and district laboratories

### ***Laboratory information management system (LIMS)***

Information on veterinary laboratory activities is efficiently managed through the Laboratory Information Management System (LIMS). It is an online database system designed for all the laboratory facilities under the Department of Livestock.

### **3.3. Feasibility for elimination**

PPR is a transboundary animal disease (TADs) with significant economic value. It harms the economy, food security, and livelihood of the poor farmers. PPR Global Eradication is technically achievable and eradication of PPR will have major development impacts, especially for the world's poorest populations.

PPRV eradication is feasible because of the favourable epidemiological features: the absence of the long term-carrier state in animals, no known reservoirs in wildlife or the domestic animals other than small ruminants, and life-long immunity after single-dose vaccination, including growing political support following global eradication of rinderpest. The control and eventual eradication of the disease will contribute significantly to achieving the sustainable development goals by 2030. Bhutan aims to free from PPR by 2030.

Lessons learned from the Global Rinderpest Eradication Programme demonstrate that the use of a highly efficacious rinderpest vaccine capable of immunising animals against all rinderpest virus strains was a vital contributor to the campaign's success. Similarly, efficient PPR vaccines are available and can induce life-long protective immunity in vaccinated animals. However, the eradication programme of the neighbouring countries also needs to be adequately implemented to provide synchrony in the programme as a joint venture for the region. The effort taken by Bhutan without similar support from the neighbouring states/countries may retard the eradication programme for Bhutan.

### **3.4. Challenges for control and elimination**

Although PPR eradication is feasible, there are some challenges towards control and eradication of PPR in Bhutan, few of which are as follows:

- Difficulty in control and monitoring of cross-border movement of small ruminants
- 'Tshethar' practice challenges the implementation of preventive and control measures
- Difficulty in implementing stamping out measures in PPR eradication strategies.

## 4. VETERINARY SERVICE STRUCTURE

The animal health services in the country are delivered to farming communities through a network of Livestock Extension Centres (Veterinary hospitals, RNR-ECs & LECs). Technical and laboratory supports are provided by National Centre for Animal Health (NCAH), Regional Livestock Development Centres (RLDCs), Satellite Veterinary Laboratories (SVLs), and Dzongkhag Veterinary Hospitals (DVHs) at their respective levels.

### 4.1 Legislation

The following documents are in force concerning notifiable disease reporting, prevention, control, transport of animals, quarantine, import of animal, welfare, and biosecurity.

#### ❖ *Livestock Act of Bhutan, 2001*

Chapter IV of Livestock Act of Bhutan, 2001 under the heading Quarantine, Notifiable diseases, and Controlled diseases provides legal provision for designation of notifiable diseases, quarantine, movement control of animals/products and other control measures to be implemented. Further Chapter XI under Enforcement and Penalties authorizes designated authorities to check, search, and penalize offenders under the act.

#### ❖ *Livestock Rules and Regulations of Bhutan, 2017*

Livestock Rules and Regulations of Bhutan, 2017 designates Bhutan Agriculture and Food Regulatory Authority (BAFRA) as Regulatory Authority of Bhutan. Further, its Annexure-II of the rules and regulations designates PPR as a notifiable disease.

#### ❖ *Forests and Nature Conservation Rules and Regulations of Bhutan, 2017*

Forests and Nature Conservation Rules and Regulations, 2017 designates some small ruminants (Takin, Musk Deer, Wild buffalo, Gaur, Serow) as totally protected wild animals under Schedule I. Further, its chapter II require goats to be reared in confinement and restricts from grazing freely in state reserved forests.

#### ❖ *Bhutan Health Code for Import of Animals, 2018*

Bhutan Health Code for Import of Animals, 2018 under its section 4.1 describes import conditions, procedures to be followed in quarantine station and surveillance for PPR after release into the country.

#### ❖ *In-Country Livestock Biosecurity Guidelines, 2015*

Section 4.6 of In-Country Livestock Biosecurity Guidelines, 2015 lays out detailed outbreak response procedures in instances of the outbreak of notifiable diseases.

Other legislation and documents related to PPR control and prevention include Animal Quarantine Station Operation Manual, Guidelines on animal tshethar practices 2018, Bhutan Biosafety Act 2015, Bio-safety Rules and Regulations, 2018, and Bhutan Biodiversity Act of Bhutan, 2003.

#### 4.2. Department of Livestock

The Animal Health Division (AHD) with the Department of Livestock shall oversee policy formulation related to the National PPR control and eradication plan in the country. The specific roles include the following:

- Mobilize resources including the fund for PPR control and eradication programme in the country
- Liaise with different international organizations/agencies/stakeholders (e.g. FAO, OIE, SAARC) for facilitating better implementation and ensuring the success of the PPR control and eradication programme
- Collaborate with BAFRA to enable better enforcement of the Livestock Act and Livestock Rules and Regulations.
- Collaborate with relevant national agencies for ensuring and mobilization of support required for PPR control and eradication activities
- Coordinate border harmonization meetings with the Indian counterparts at the state and central levels.

#### ❖ *National Level*

The NCAH shall function as the national focal agency for the overall planning, coordination, and implementation of the National PPR control and eradication programme in the country. The responsibilities of the national focal agency are to:

- Coordinate the overall implementation of the PPR control and eradication programme in the country
- Mobilize resources at the national level in terms of supply of vaccine and equipment
- Support activation of the rapid response team (RRT) in the event of PPR outbreak
- Liaise with different stakeholders/agencies for facilitating better implementation and ensuring the success of the control and eradication programme
- Coordinate conduct of epidemiological research on PPR in collaboration with national, international diagnostic and research institutions
- Production of educational materials and make available for wider circulation for the advocacy campaign
- Ensure maintenance of the database on PPR control programme (e.g. vaccination coverage), analysis and dissemination of information/progress report to the Department/ Ministry/ other stakeholders regarding the progress of the control programme
- Conduct PPR coordination workshops at the national level to review and realign the control programme
- Capacity building of RRT members
- Monitor and evaluate the control programmes implemented by the field units
- Ensure vaccination coverage as per the risk zones
- Declaration of risk zones/compartments for PPR
- Maintenance of the status of these zones/ compartments by regular surveillance and monitoring

- Standardization of protocol for diagnosis of PPR and ensuring uniformity across diagnostic laboratories in the country

#### ❖ *Regional Level*

The Regional Livestock Development Centres (RLDCs) and TVHs shall function as regional focal agency for PPR control and eradication programme at respective regions and bordering areas. The main roles of the regional focal agency are to:

- Coordinate the overall implementation of the PPR control and eradication programme at the regional level
- Coordinate the activation of the rapid response team (RRT) in the event of PPR outbreak
- Provide support and coordinate logistics arrangement at the regional level and bordering towns.
- Coordinate the cross-border surveillance of PPR in their respective areas
- Liaise with BAFRA at the regional level for facilitating better enforcement of the Livestock Acts and Livestock Rules and Regulations
- Monitoring and evaluation of the PPR control and eradication programmes in their respective regions
- Ensure prompt reporting of the outbreak and updating/validation of disease status in the disease database system.
- Ensure maintenance of the database on PPR control programme (e.g. vaccination coverage), and submit the progress report to the NCAH

#### ❖ *Dzongkhag Level*

At the Dzongkhag level, the Dzongkhag Veterinary Hospital (DVH) shall function as the focal agency for the implementation of the PPR control and eradication programme. The Dzongkhag focal agency should carry out the following tasks:

- Implement the PPR control and eradication programme at the Dzongkhag level.
- Arrange logistics at the Dzongkhag level and assist the Gewog staff with their logistics
- Liaise with the BAFRA at the Dzongkhag level for facilitating better enforcement of the Livestock Act and Livestock Rules and Regulations
- Support the activation of RRT in the event of PPR outbreak
- Mobilize manpower in the Dzongkhag for routine and ring vaccination programme
- Ensure prompt reporting of the outbreak and updating the disease status in animal disease information system
- Ensure maintenance of database on PPR control programme at Dzongkhag Level (e.g. vaccination coverage)
- Submit monthly reports to the RLDC regarding the status of the disease in the Dzongkhags

### ❖ *Gewog Level*

The Livestock Extension Centre/RNR Extension Centres/Veterinary hospitals at Gewogs should be the focal agency for that geog. They shall play a very crucial role in the implementation of the PPR control and eradication programme in their respective Gewogs.

The main roles of the Gewog focal agency are as follows.

- Implement the PPR control programme in the field as per the NPPR-PCP.
- Ensure prompt reporting of the outbreak through the flash report and updating the disease status every week
- Conduct regular disease awareness campaign for the farmers and other clients
- Implement provisional emergency control measures in the locality in the event of an outbreak
- Ensure maintenance of proper recording of vaccinated herds and other records
- Liaise with the BAFRA for facilitating better enforcement of the Livestock Act and Livestock Rules and Regulations
- Liaise with the Gewogs administration, gups, other local leaders and farmers for facilitating the proper implementation of the programme in the field
- Carry out the vaccination of the susceptible goat population
- Support RRT for the rapid containment of PPR outbreaks in the Gewogs

### 4.3. Bhutan Agriculture & Food Regulatory Authority

Bhutan Agriculture and Food Regulatory Authority (BAFRA) as a Regulatory Authority under MoAF is mandated to enforce and implement the Livestock Act of Bhutan and Livestock Rules and Regulations.

- Enforcement of Livestock Act of Bhutan (2001) and Livestock Rules and Regulations (2017)
- Enforcement of movement ban of livestock and livestock products in and out of the PPR outbreak areas
- Strict quarantining of imported animals at the quarantine station
- Quarantining of infected animals in the affected areas.
- Monitor the livestock movements from one Dzongkhag to others.
- Inspection and certification of suspected livestock products
- Carry out bio-security measures during the outbreaks (segregation, disposal, cleaning, and disinfection)
- Support activation of the rapid response team (RRT) in the event of PPR outbreak
- Border vigilance for the illegal movement of livestock and livestock products

#### 4.4. Other stakeholders

##### ❖ *Department of Forests and Park Services*

Livestock grazes freely in the forest with possibilities of interactions with wild ruminants. There may also be disease transmission (PPR) at the domestic-wild life interface since most of the villages in the country are in the vicinity of forests. Therefore, the collaboration between livestock and forestry sectors is important for disease surveillance, sharing of disease outbreak information, and prevention and control programme.

##### ❖ *Dzongkhag Administration*

The Dzongkhag, Dungkhag, and Gewog administration support are important for coordinating PPR prevention and control activities including rapid containment of PPR outbreak in their areas. Local government support is crucial for the strict implementation of NPPR-PCEP at the village and community level.

##### ❖ *Royal Bhutan Police*

The Royal Bhutan Police support shall be sought if necessary, during the implementation of control measures during PPR outbreak in the field.

##### ❖ *Ministry of Finance*

The Ministry of Finance (MoF) should provide adequate funds for the implementation of NPPR-PCEP in the country. The additional fund support should be sought from MoF if the existing budget is not sufficient at the different levels during implementation and in an emergency response situation.

##### ❖ *International collaboration*

It is important to build linkages with international organizations such as the Food and Agriculture Organization (FAO), World Organization for Animal Health (OIE), and Global PPR Secretariat for seeking fund and technical support, human resource development, and referring of samples for laboratory diagnostic services. SAARC PPR reference laboratory, BLRI, Bangladesh shall be the regional centre for sample referral and testing. The national laboratory will also seek support from the OIE PPR reference laboratories.

The OIE mission conducted PVS evaluation in 2008, Gap Analysis in 2009 followed by PVS Pathway follow-up in 2015 for Bhutan. Accordingly, the series of corrective measures were recommended for improving veterinary services. The OIE laboratory mission, based on the national priorities of the Veterinary Services as defined in the 2009 PVS Gap Analysis Report and the 2015 PVS Follow-up report, was also conducted by OIE PVS Laboratory Experts. Among different notifiable diseases of concern reported to OIE such as Anthrax, Classical Swine Fever (CSF), Foot and Mouth Disease (FMD), Brucellosis, Haemorrhagic Septicaemia (HS), Black Quarter, Peste des Petits Ruminants (PPR), Highly Pathogenic Avian Influenza (HPAI), Newcastle

Disease (ND), Infectious Bursal Disease (IBD), and rabies, PPR is also an important disease of concern in terms of economic impact for the country. The OIE mission in 2015 recommended the planning of active surveillance for major diseases.

## **5. COMMITTEE FOR PPR CONTROL AND ERADICATION**

A National Committee for PPR Control and Eradication (NC-PCE) with representation from the relevant agencies and Dzongkhag level task force shall oversee the implementation of PPR control. This multi-sectoral task force will provide stewardship and be responsible for the implementation of the different components of the national PPR eradication strategy.

### **5.1. National Committee for PPR Control and Eradication**

The National Committee for PPR Control and Eradication (NC-PCE) with representation from the various stakeholders will guide the national PPR control and eradication plan. The members of NC-PCE will constitute of:

- Secretary, Ministry of Agriculture and Forests (MoAF)
- Head, Department of Livestock, MoAF
- Head, Bhutan Agriculture and Food Regulatory Authority, MoAF
- Head, Department of Forests and Park Services, MoAF
- Head, Animal Health Division, DoL
- Head, National Centre for Animal Health, DoL
- Head, Plant and Animal Biosecurity Division, BAFRA

#### ***Roles of NC-PCE***

- To oversee and guide the implementation of PPR Control and eradication programme
- To enhance coordination among the different stakeholders
- To facilitate resource mobilization
- To make policy decisions related to the implementation of National PPR Control and Eradication Programme
- To endorse recommendations of the technical working group for PPR

#### ***Meeting and Procedures***

- The NC-PCE will be chaired by Secretary of MoAF
- The CVO, AHD, DoL shall serve as the member secretary
- The committee shall meet at least once a year or as and when required

### **5.1. Technical Working group on PPR Control and Eradication**

A Technical Working Group on PPR (TWG-PCE) comprising of experts from different sectors will advise and provide technical recommendations to the concerned agencies and the NPC and field offices for implementation of national PPR prevention, control and eradication plan.



***TWG Members:***

- Head, Animal Health Division, DoL
- Head, Plant and Animal Biosecurity Division, BAFRA
- Head, National Centre for Animal Health, DoL
- Head, Laboratory Service Unit, NCAH
- Head, Disease Prevention and Control Unit, NCAH
- Head, Biological Production Unit, NCAH
- Regional Director, Regional Livestock Development Centre, DoL (1 representative)
- Animal Health Expert from RLDC/ SVL (1 representative)
- Veterinary Officer from PPR endemic Dzongkhag (1 representative)
- Veterinary Epidemiologist

***Roles & Responsibilities***

- To oversee and evaluate the activities of National PPR Prevention, Control and Eradication Plan using PMAT tool
- To recommend solutions for technical issues/challenges in the implementation of NPPR-PCP
- To provide technical guidance/ advice to the NC-PCE and concerned agencies
- To review and develop guidelines, SOPs, IEC related to PPR control and eradication
- To develop training materials and provide training to DoL and BAFRA officials
- To manage the database on PPR, conduct analysis, prepare and submit the report to NCPCE and other relevant key stakeholders
- To identify research needs, review research proposal, coordinate and supervise operational research related to PPR
- To review and propose amendments on regulations related to PPR control and eradication
- To prepare a dossier for validation and for acquiring freedom from PPR infection following the stepwise approach for PPR control and eradication

***Meeting and Procedures***

- The Head of AHD will be the Chair of the committee and Head, DPCU will be the member secretary to coordinate the TWG activities
- The Technical Working Group will meet bi-annually, or as and when called upon to convene the meeting by the NC-PCE.



## 6. PPR PREVENTION STRATEGY

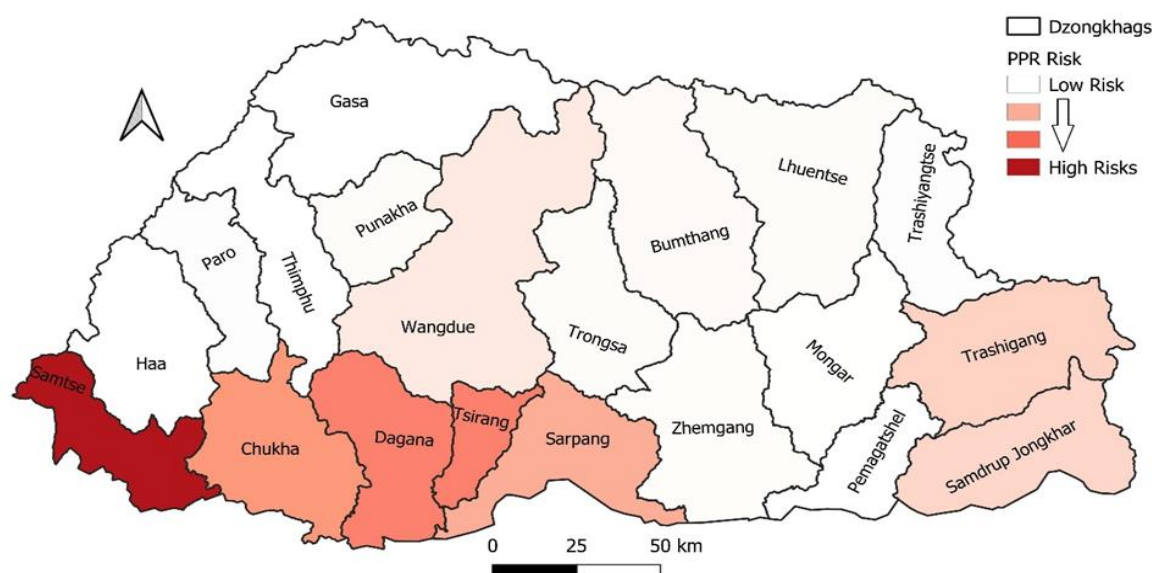
### 6.1. Legislative framework

At its broad end, the control strategy will be in line with Chapter IV of Livestock Act of Bhutan, 2001. The strategy will further be supported by the following documents:

- ❖ Livestock Rules and Regulations of Bhutan, 2017
- ❖ Forests and Nature Conservation Rules and Regulations of Bhutan, 2017
- ❖ Animal Health Code for Import of Livestock Commodities, 2018
- ❖ In-Country Livestock Biosecurity Guidelines, 2015
- ❖ Animal Quarantine Station Operation Manual

### 6.2. Risk-based approach

For effective control and prevention of PPR, a risk based approach shall be adopted.



*Figure 9: PPR risk map of Bhutan (Weighted by population and past outbreaks)*

Risk assessment exercise shall be conducted to identify PPR incursion threats from across the international border and then internal transmission from one locality to another.

The country will be compartmentalized into different risk zones based on:

- Distribution and density of susceptible animal populations (mainly small ruminants)
- Animal movements
- Number of known/ established and unknown stock routes
- Production systems
- Cultural practices

- The number, activity, and distribution of animal markets
- People's knowledge of the disease
- Quality and reach of veterinary services
- PPR status, susceptible animal density, and movement along the international border(s)
- Road/highway connectivity
- Prevalence rate based on pilot studies / previous outbreaks
- Vicinity to international borders

### 6.3. Cross border harmonization and control

Bhutan shares a long porous border in the south with India which is endemic for PPR. PPR is an important transboundary disease of the small ruminant, and therefore, border harmonization of animal health programmes between neighbour countries is one of the critical components of control programmes. BAFRA shall play an important role in monitoring/regulating cross border activities. The entry of any small ruminants and their products from across the border will be strictly monitored. The three-tier system for the cross-border meeting between Bhutan and neighbouring countries takes place at the Secretary level, Director level, and Dzongkhag/Dungkhag level involving the respective levels of both countries depending upon the agenda and the objectives of the meeting. In the past, a third-tier system which is coordinated through the Dzongkhag/Dungkhag of the border areas involving the district magistrate and the Block Livestock Development Centre of the neighbouring states had been conducted with success without long administrative process. There is a need for at least an annual cross border meeting which will be coordinated through the Dzongkhag/Dungkhag. This will ensure a better exchange of information with regards to the disease status across the border, creating understanding between the two states in undertaking the joint disease prevention and control programme to avoid the disease spread across the border.

These cross-border meetings will be done through the Dzongkhag/Dungkhag and coordinated by RLDC of the respective region with fund support from the Department of Livestock.

### 6.4. Animal identification system

For effective monitoring of animals, identification of individual animals using a systematic identification system shall be implemented only for the imported and breeding animals. However, Herd registration will be implemented for all the farms. This will ensure effective follow-up for surveillance, vaccination, post-vaccine monitoring and evaluation, movement of small ruminants along the value chain.

### 6.5. Farm biosecurity and management

The bio-security measure is one of the important activities in the eradication phase. To avoid the spread of PPR, a strict bio-security measure is critical. Illegal movement from endemic (high-risk zone) should follow strict bio-security guidelines.



### 6.6. Regulation on import of small ruminants

The import of animals should be done as per the requirement outlined in the Animal Health Code for Import of Animals 2018. The import permit should be obtained from BAFRA before the import of goat and sheep. The importer should produce health certificate issued by the competent veterinary authority attesting that the animals:

- Showed no clinical sign suggestive of PPRV infection within 48 hours before shipment.
- Were vaccinated against PPR with live attenuated PPRV vaccines.
- Originated from the organized farm and an area with no disease problems

Upon arriving at the quarantine station, animals should be managed as per the Manual for Animal Quarantine Station. An animal should be screened for PPR using an antigen detection laboratory test. The confirmed positive animals should be rejected for import. Once the animals are released from the quarantine station, they should be closely monitored under clinical surveillance by the livestock health officials in the field. BAFRA should also strictly monitor the illegal import of small ruminants at the international border. Any illegal import of goat/ sheep by any individual/ party should be confiscated and fined as per the provisions prescribed in Livestock Rules and Regulations.

### 6.7. Regulation on release and management of goats as *Tshethar*

If any individual/ party is interested to obtain goat/ sheep for *Tshethar* purpose, it should be done as per the Guidelines for the *Tshethar* Practice. The concerned individual should be responsible for the care and management of animals and to ensure vaccination. If the animals for the *Tshethar* purpose is transported to other places, the concerned party should obtain a movement permit from BAFRA. Animals should be transported and managed following Bhutan Animal Welfare Standards and Guidelines.

### 6.8. Regulation of animal movement within the country

The movement of susceptible animals within the country usually occurs for slaughtering, breeding, and *Tshethar* purposes. The movement of the animals will be regulated by BAFRA as per the Livestock Act of Bhutan (2001) and Livestock Rules and Regulations (2017). The concerned party who wishes to transport the animals needs to get a movement permit from BAFRA before transportation. Further, the movement of animals from high-risk zone to lower risk zones will be strictly regulated.

### 6.9. Responsive Vaccination programme

Routine mass vaccination will not be followed. Only strategized responsive vaccination will be carried out during the PPR outbreak. All the susceptible animals in the protection or the vaccination zone around the demarcated zone of infection will be vaccinated during the outbreak. Zonation shall be carried out by the RRT based on the epidemiological features and geographical settings. A responsive ring vaccination will be carried out as per the SOP (Refer SOP 5). Responsive vaccination programme shall be implemented during stage 3 of the eradication plan and will be discontinued during the 'Eradication Stage' based on surveillance findings.

### ***6.1.1. Target species and age for vaccination***

All the susceptible species in the protected or vaccination zone will be vaccinated during the outbreak. All targeted susceptible animals 4 months and above shall be vaccinated. Animals in advanced pregnancy and less than four months shall not be vaccinated.

### ***6.1.2. Reporting the progress of vaccination***

The vaccination during the outbreaks shall be monitored. Records of all vaccinated livestock must be properly kept by the agency and the details of animals vaccinated in the field should be reported using the animal health reporting systems.

### ***6.1.3. Post-vaccination evaluation***

Vaccination is the key to preventing and controlling PPR. To evaluate the effectiveness of the responsive vaccination during the outbreaks, several approaches can be used. The Dzongkhags and farms will ensure the detailed records of vaccination (number, species, age, location, date, identification number). Participatory techniques to assess livestock owners' perception of vaccination success and other parameters, as well as serological surveys at a defined time period after vaccination, will be used for this purpose. Post-vaccination sero-monitoring shall be carried out through a serological survey based on the standard protocol which will identify the immune response to vaccination, population immunity at a given point in time, changes in population immunity over a course of time.

### ***6.1.4. Vaccine procurement and supply***

The NCAH shall procure PPR vaccine, maintain vaccine buffer stock, and supply to Dzongkhags as and when required during the outbreaks.

### ***6.1.5. Vaccine strain and quality***

Vaccination was initiated in 2016. Until 2019, Sungri 96 was used to vaccinate the goat population in the high-risk zone. From 2020 Vero cell culture-based live attenuated Vaccine-Nigerian 75/1 strain shall be used for the vaccination programme. For the responsive vaccination, live attenuated vaccine strain will be used. The vaccine will be evaluated for its effectiveness by conducting post-vaccination sero-monitoring studies.

### ***6.1.6. Cold chain maintenance***

The quality of the vaccine will be maintained throughout the storage, transportation, and handling of vaccines at all levels. The maintenance of optimal temperature during the supply of vaccines by the supplier to NCAH should be monitored by the Biological Production Unit (BPU) including the storage at BPU. The distribution of vaccines from the BPU to the field offices shall be done in refrigerated vans to the RLDCs and the Dzongkhags. During the distribution of the vaccine, it should be ensured that the optimal temperature is maintained in the refrigerated van by use of temperature data logger, which will be monitored by BPU. At the RLDCs and Dzongkhags, the concerned staff shall record the temperature of the refrigerators daily and maintain the data at all



levels using a standard form (refer form in annex) which should be checked and monitored by the RLDC. It is the responsibility of the concerned Gewog in-charges to ensure that vaccine is kept under proper cold storage during the entire phase of the vaccination programme. The vaccine should be carried to the field in cool-boxes using ice-packs. To maintain the cold chain, the vaccination programme should start early morning and end by afternoon. Normally the ice packs may last only up to 24 hours and should be replaced with new ice packs.

The currently commercially available vaccines are in freeze-dried form and they are stable for at least two years at 2°C to 8°C and for several years at –20°C. Once the vaccine is reconstituted, it needs to be utilized as soon as possible, but no later than 30 minutes after dilution. The logistic arrangement should be in place for the vaccination programme.

## 7. PPR CONTROL STRATEGY

### 7.1. Outbreak investigation and reporting

PPR is a notifiable disease and the farmers should immediately report even the suspected disease to the Gewog livestock health official(s) or the Gewog administration. The Gewog livestock office should immediately investigate all suspected clinical cases of PPR and should be declared as **“suspected PPR outbreak”** if the affected animal meets the case definition of PPR (See Table 4). Following this, the concerned Gewog livestock staff should immediately report to the Dzongkhag Veterinary Hospital, Regional Livestock Development Centre, and the National Centre for Animal Health using the flash report form and other fastest means. The DVH/RLDC should conduct disease outbreak investigations and inform BAFRA. This team should undertake a comprehensive epidemiologic assessment in the field to confirm the case as well as collect appropriate samples. The clinical diagnosis should be further confirmed at NCAH including serotyping of the virus. Samples should be also referred to an OIE designated reference laboratories for the characterisation of the PPR virus. The disease outbreak investigation team should also update the detail of the outbreak through an online animal disease information system followed by a weekly update of the disease outbreak situation.

*Table 4: Case definitions for PPR*

Case	Definition
<b>Suspect case</b>	Small ruminants (Sheep and Goats) showing clinical signs suggestive of PPR: acute diarrhoea, cough, nasal and ocular discharge, necrotic lesions in mouth and nose, high morbidity, high mortality, and high fever.
<b>Probable case</b>	A suspected case with the history of the introduction of new animals into the flock or epidemiologically linked to PPR outbreaks and showing clinical signs suggestive of PPR and post-mortem lesions like engorgement and blackening of folds of the large intestine (zebra stripe).

<b>Confirmed case</b>	Antigen or ribonucleic acid specific to PPRV, excluding vaccine strains, or antibodies to PPRV antigens which are not the consequence of vaccination, has been identified from samples of suspected or probable cases.
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## 7.2. Declaration of the provisional infected zone

When PPR outbreak is suspected, the Gewog livestock staff/investigation team should immediately identify the area and declare as a Provisional Infected Zone. The geographical limits of the Provisional Infected Zone should be determined after due consideration of the epidemiologic risk and natural geographical settings.

The following control measures should be implemented in the Provisional Infected Zone to prevent the spread of the disease.

- Immediate segregation of affected animals including separate management (feeding, watering)
- Symptomatic treatment of the affected animals as per SOP
- Disinfection/ decontamination of the contaminated premises as per SOP
- Disposal of carcasses as per SOP
- Provisional ban on the movement of all small ruminant animals and their products from the infected premises
- Awareness and education of the livestock owners in the affected village on zoo sanitary measures

## 7.3. Declaration of the infected zone and PPR outbreak

If the case definition of PPR is met, the area where the disease has occurred within a radius as decided by the disease outbreak investigation team should be immediately declared as Infected Zone. The geographical limits of the infected zone should be determined after due consideration of the epidemiologic risk and natural geographical settings. The disease outbreak investigation team should also declare the vaccination zone/ protection zone within a certain radius of the infected zone where immediate ring vaccination in the surrounding villages should be carried out to prevent further spread of the outbreak. Based on the recommendation of the disease outbreak investigation team, the Dzongkhag administration should issue the disease outbreak declaration order with information to the Gewog administration, DoL, BAFRA, NCAH, RLDC, DoFPS, and DVH.

All the provisional control measures should be continued with reinforcement of the efforts in the required areas once the disease outbreak is officially declared. If the disease suspected is not PPR, all the provisional control measures that have been implemented should be immediately discontinued and the alternate measures specific to that disease should be undertaken.



The arrows indicate the direction in which the vaccination team should move

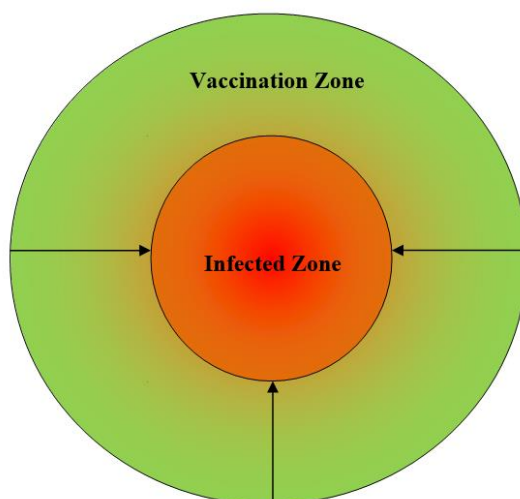


Figure 10: Declaration of infected and vaccination zone.

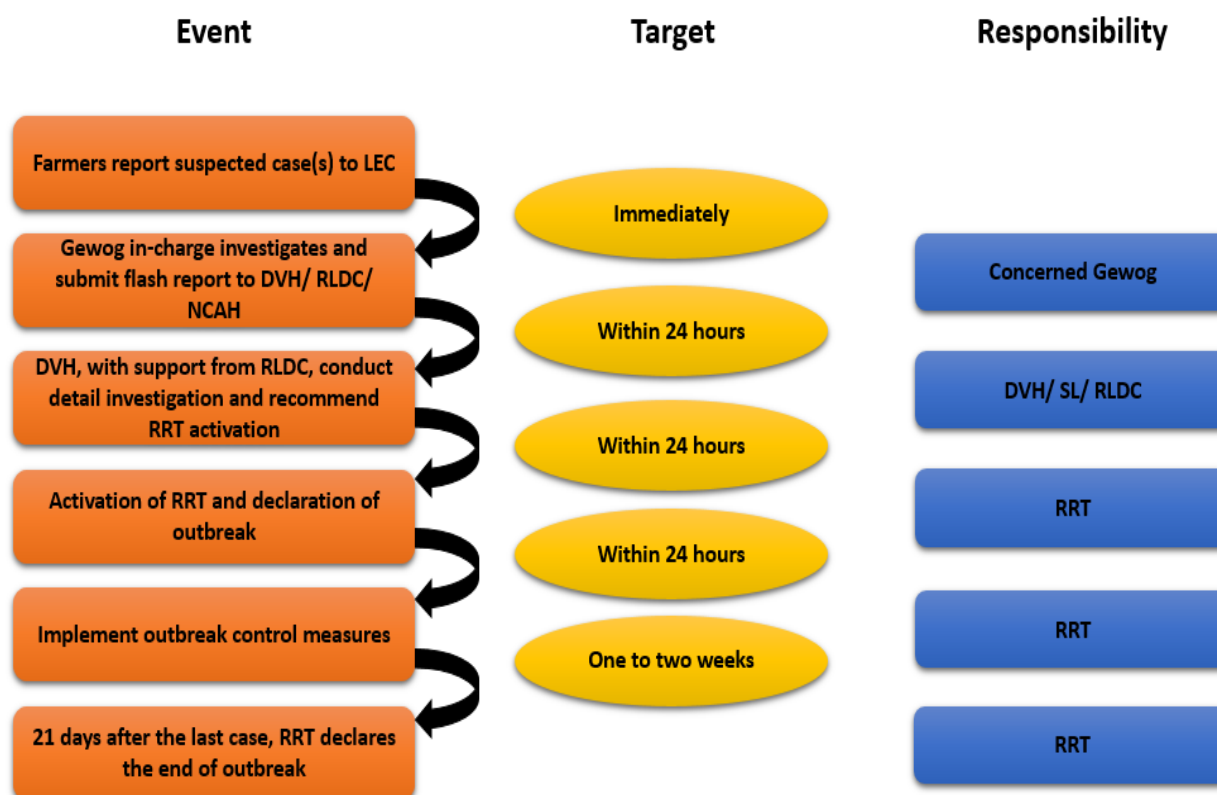
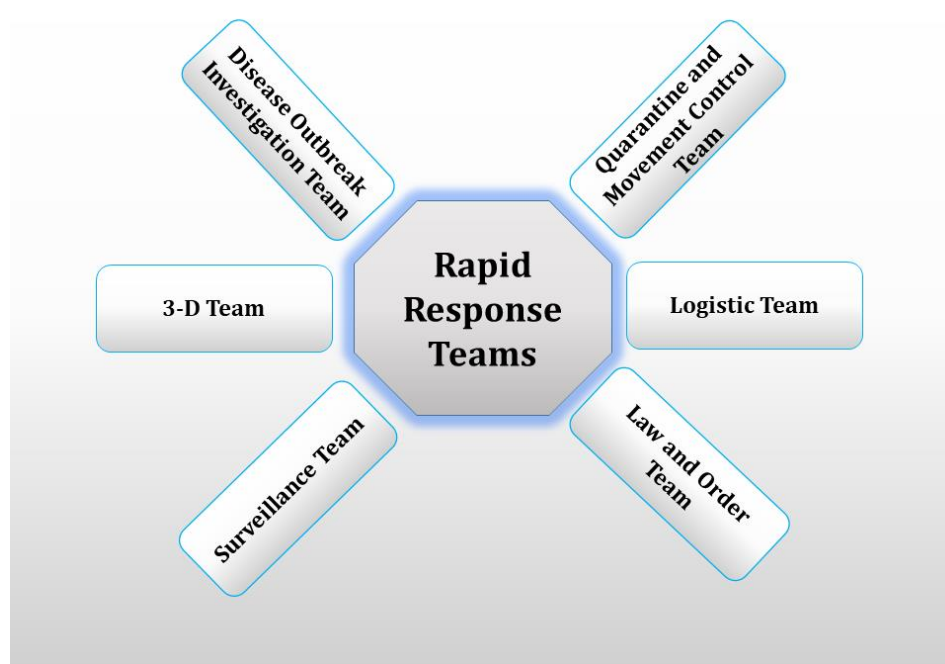


Figure 11: Timeline for PPR outbreak containment activities

#### 7.4. Activation of Rapid response and containment

Once the PPR outbreak is confirmed by the disease outbreak investigation team, Rapid Response Team (RRT) should be activated immediately to rapidly contain the disease without allowing it to spread to other places. RRT should mainly constitute main RRT groups, based on the severity and extent of the outbreak, to effectively implement disease control measures. The DoL should be responsible for disease outbreak investigation, ring vaccination, surveillance, and logistic supply. BAFRA should be responsible for the culling of infected animals, quarantine, movement control of susceptible livestock and livestock products from the infected zone. The roles of various teams under the RRT are described in Annexure 3.



*Figure 12: RRTs for PPR outbreak control*

The following activities should be implemented by the RRT to effectively control the PPR outbreak.

##### ➤ *Stamping-out of the infected animal*

Stamping-out of the animals which are affected and those suspected of being affected in the infected flock will be done once the evidence of active PPR virus infection is confirmed. The RRT team shall be responsible for carrying out the culling, disposal, and decontamination of animals. Humane slaughtering of the animals addressing animal welfare and safety of the handlers will be done as per the SOP 2 provided in the annexure 4. Animals will be slaughter using penetrating captive bolt followed by pithing or bleeding.



➤ ***Disposal of the infected carcass***

The carcass of animals died due to PPR and the carcass of infected animals culled should be properly disposed to avoid the spread of the virus through contamination (Refer SOP 3).

➤ ***Disinfection and decontamination of contaminated premises and materials***

The decontamination team shall be responsible for carrying out cleaning and disinfection of infected premises and all other infected or potentially infected materials and equipment as per the SOP 4 provided in the Annexure 5. All the staff exiting the infected areas should strictly disinfect themselves while leaving the affected areas following the procedures described in SOP 4.

➤ ***Ring vaccination***

Ring vaccination should be done by a separate team (Vaccination Team) who has not been in contact with the infected animals. Ring vaccination in the protection/vaccination zone should be carried out considering the geographical barriers, common grazing areas, water source, and proximity to the affected area. The vaccination should start from the periphery to the inside (the focus of infection) until the infected area is reached and should be completed as soon as possible - within one week (Refer SOP 5).

➤ ***Ban on the movement of livestock and livestock products***

Ban on the movement of live sheep and goats including their products (such as meat and milk) both into and out of the affected areas should be strictly implemented to prevent the spread of the infection to other places. BAFRA should mobilize their staff to attend the check posts and entry points and to strictly control the movement of livestock and livestock products in and out of the outbreak area.

➤ ***Surveillance and weekly follow-up***

The RRT should also carry out the clinical surveillance in the infected zone and vaccination zone on the occurrence of any new cases as well as to monitor any mortality of the PPR infected animals. An update on the disease outbreak situation should be done as a follow-up report every week using the online animal disease information system.

➤ ***Logistic support***

To implement the activities for successful containment of PPR outbreak by RRT, adequate logistic support should be mobilized. There is a need to mobilize additional manpower, vaccines, mobility, and fund to carry out the activities by RRT.

## 8. PPR SURVEILLANCE SYSTEM

Surveillance is a collection, collation, and analysis of data that enables the prompt dissemination of the information to take timely action. Surveillance is needed to understand the health status of the animals in the country so that problems can be identified and actions are taken. For an appropriate surveillance activity to be performed, we should have a clear objective and understanding of the need. There are large numbers of reasons why veterinary authorities undertake surveillance activities and can be summarized into four general purposes:

- Demonstrating freedom from disease
- Early detection of disease
- Measuring the level of disease
- Finding cases of the disease

Surveillance is a key element of the national PPR control and eradication plan and will become even more important as Bhutan works to move along the stepwise approach for Global Eradication of PPR by 2030.

### 8.1. Clinical surveillance

Continuous passive surveillance will be done along with other notifiable diseases. Any cases with pneumo-enteric signs in small ruminants will be reported and investigated by field para-veterinarians. Any clinical cases suspected will be followed up by a collection of appropriate samples such as ocular and nasal swabs, blood, or other tissues for virus isolation or virus detection by other means. Sampling units within which suspicious animals are detected will be classified as infected until fully investigated.

Active surveillance (structured non-random surveillance, including targeted or risk-based surveillance) shall be conducted in the southern districts. Syndromic surveillance, participatory disease search, a sentinel system, and abattoir surveillance, should also be conducted. Each livestock centres including central farms should collect information on PPR status in animals from their respective areas (village and farms). The reporting should be done from Gewog to the Dzongkhag office. The Dzongkhag livestock sector (DVH) should then submit the report to NCAH and RLDCs of PPR syndromic surveillance and reporting forms (See Annexure 5) or using the online system. In events of suspected PPR cases, Form 1 will be used to flash the cases from the field to RLDCs, NCAH, and District Livestock sector. Simultaneously, the case will be updated in VIS by the focal persons. NCAH shall maintain national data, perform analysis, and provide feedback to all the stakeholders in the country. The analysed report shall support validating FAO/OIE PCP for PPR in Bhutan and determine Bhutan's PPR stepwise approach stage.

### 8.2. Surveillance during the outbreak

Once the PPR outbreak is confirmed by the disease outbreak investigation team, continuous surveillance should be carried out in the infected and vaccination zone by RRT. The update on the disease status shall be submitted every week to RLDC and NCAH using Form 5 and/or online information systems. Any suspicious cases will be put through laboratory investigation. When the

outbreak is effectively contained, the effected ban period shall be lifted 21-day post reporting of the last case.

### **8.3. Laboratory surveillance**

#### **8.3.1. Sero surveillance**

A structured survey shall be conducted as and when required to determine the seroprevalence of PPR virus in animals using laboratory tests. The choice of test for sero-surveillance will take into account to differentiate antibodies elicited by vaccination and infection. Additionally, a post-vaccination evaluation survey shall be conducted to determine the immune profile developed in the vaccinated animals.

#### **8.3.2. Virological surveillance**

Virological surveillance will be conducted as a follow-up to clinically suspected cases. During the outbreak period, tissue samples and secretions of infected animals shall be collected and tested using RT-PCR test and competitive ELISA. Samples should be collected from affected animals around the time of infection or while exhibiting clinical signs. The molecular analysis will also be conducted to understand the cross-border incursions. PPRV isolates will be sent to an OIE Reference Laboratory for further characterisation.

### **8.4. Surveillance in wildlife**

Small ruminants of wildlife species may be susceptible to PPR virus. Although the role of wildlife in the epidemiological cycle of PPR and virus circulation is not yet entirely understood, wild ruminants may contribute to the geographic spread of the disease through their migratory movements, which can stretch over long distances. As part of the PPR surveillance programme, veterinary officials should closely liaise with the forestry officials to investigate the mortality of wild ruminants and rule out PPR infection. The forestry officials should also inform the veterinary officials as and when they come across the death of wild ruminants suspected of PPR so that appropriate samples are collected for laboratory examination.

## **9. OTHER SUPPORT PLAN**

### **9.1. Communication and advocacy**

Public awareness campaigns are needed to ensure that the farming communities and the relevant stakeholders are made aware of the National PPR Prevention, Control, and Eradication Plan, and its potential benefit and the activities of the programmes being implemented in the field.

Following are the awareness programmes to be implemented during the prevention phase:

- Awareness on PPR and its economic impact on affected animals and /or farms
- Awareness of vaccination and vaccination coverage

- Awareness through training of stakeholders (farmers, traders, meat vendors, livestock officials) on disease and control measures
- Awareness of timely reporting of disease outbreak
- Awareness on National PPR Prevention, Control and Eradication Plan

Following are the awareness programmes to be implemented during the outbreak phase:

- Awareness of the regulation of movement of livestock and livestock products
- Awareness of timely reporting of disease outbreak
- Awareness of ring vaccination
- Awareness on safe disposal of animals that died of PPR

### 9.2. Veterinary capacity development

National PPR prevention, control, and eradication plan require capacity development in diagnostic and surveillance systems. Strengthening the national epidemiological unit that is responsible for PPR surveillance and control programme at the national level is essential. Upgrading diagnostic facilities at the national, regional, and district levels with trained laboratory staff is necessary for the control programme. Veterinarians from DoL and BAFRA must be trained in the diagnosis of PPR including ante-mortem and/or post-mortem inspection and collection of appropriate samples.

### 9.3. PPR coordination meeting

It is necessary to conduct annual National PPR coordination workshops where all the stakeholders come together to review and revise the programme. Besides, the regular coordination meeting should be organised at the regional and Dzongkhag level to smoothly implement the PPR prevention and control activities in the field to assess its progress.

### 9.4. Research and extension

While very effective tools already exist for the control of PPR, investment in further research will be invaluable to facilitate the campaign and speed up the course of the programme. The following research should be conducted to support the PPR control and eradication plan:

- Epidemiology of PPR and other diseases of small ruminants
- Risk zone identification
- The socioeconomics of small ruminants and PPR
- Knowledge, attitude and practice of community on small ruminant diseases and PPR
- Risk analysis of PPR along the value chain of small ruminants and production system
- Post-vaccination evaluation

### 9.5. Programme financing

National PPR control and eradication plan will require the development of an annual business/operational plan which includes clear specification of the physical requirements and the estimated costs of the work for every subsequent year. The required budget should be proposed to the Ministry of Finance each year by AHD, NCAH, RLDCs, and Dzongkhags based on the roles



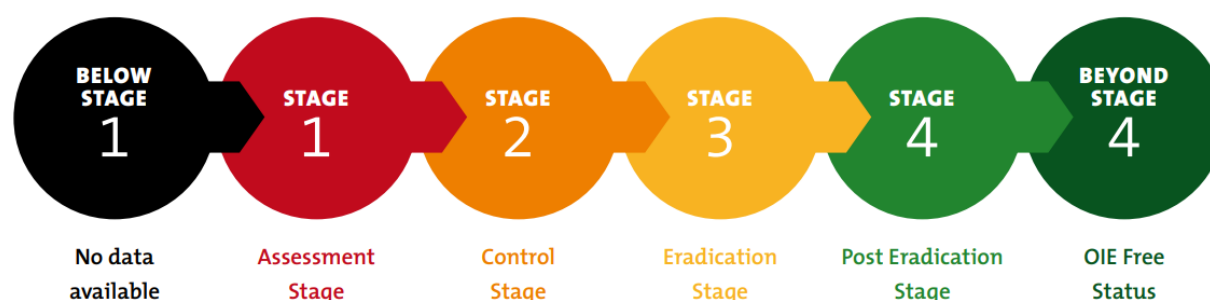
and activities required to be executed by respective agencies. It will also need a clear specification of the output, key performance indicator, responsibility, and timeline.

## 10. STEP-WISE APPROACH FOR PPR ERADICATION

The Strategic approach of the PPR eradication is based on four different stages, all of which correspond to a combination of decreasing levels of epidemiological risk and increasing levels of prevention and control.

The PPR Monitoring and Assessment Tool also is based on four different stages identified in the Global Strategy for the progressive control and eradication of PPR.

The different stages identified in the Global Strategy are as shown in the following figure.



*Figure 13: Stages of global strategy for the control and eradication of PPR*

### ***Below Stage 1***

A country where there are insufficient and unstructured data to understand the true risk for PPR and where no appropriate epidemiological investigations are undertaken and where no prevention and control programme is present.

### ***Stage 1 (Assessment stage)***

The epidemiological situation of PPR is being assessed and PPR diagnostic, surveillance, prevention and control, legislative, and stakeholder involvement is in place.

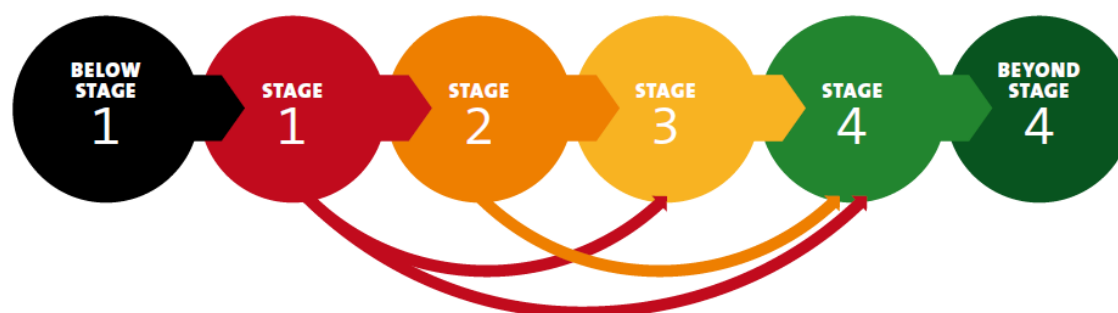
### ***Stage 2 (Control Stage)***

The control activities, particularly vaccination, are implemented or overseen by the Veterinary Service in the targeted geographical areas or production systems.

### ***Stage 3 and 4 (Eradication stage)***

All PPR activities are led by the Veterinary Services (except for biosecurity measures at farm level) and are considered to be public goods. Identification of flocks and gradually of individual animals will be implemented in Stages 3 and 4.

The usual progression of a **Step-wise approach** is to move from one Stage (n) to the Stage immediately after (n+1); this will be the case for most countries where PPR is endemic, notably in developing countries which may not have the resources to tackle the disease straightaway on a national scale. However, for countries willing to eradicate PPR more rapidly, there is a fast-track procedure allowing them to move from Stage 1 to Stage 3, Stage 2 to Stage 4 and Stage 1 to Stage 4. Whatever the path, Stage 1 is unavoidable to understand the situation and decide the relevant steps forward towards eradication.



**Stage durations are variable and depend on the context:** the speed of progression is according to each country's decision and possibilities, depending on the epidemiological situation, the capacity of the VS, and the political commitment with appropriate investments. However, the Global Strategy foresees the following duration for each Stage:

- Stage 1: Minimum 12 months and up to 3 years
- Stage 2: 3 years (from 2 to 5 years)
- Stage 3: 3 years (from 2 to 5 years)
- Stage 4: 24 months and up to 3 years

### 10.1 The risk-based strategic plan of the PPR progressive pathway for Bhutan

Bhutan is in Stage 3 of PPR-GCES Stages. This risk-based strategic plan is formulated to support the acceptance of the country into stage 4 and then to stage beyond 4 while a few typical items of stage 2 activities may still be continued. As such this plan contains elements (most of them) typical of stages 3 and 4.

The overall strategic approach of the plan is based on a preventive responsive vaccination campaign targeting the small ruminant population at high risk and in targeted areas as well as rapid containment of the outbreak. We will implement risk-based strategic activities to make Bhutan free from PPR by 2028.

### Objectives and expected results of PPR elimination

#### *Overall objective*

The small ruminant sector will continue to contribute towards food security and nutrition, enhance rural income generation, alleviate poverty, and improve the livelihoods of smallholder farmers and general human wellbeing.

### *Specific objective*

Bhutan achieves a rapid reduction of the incidence and spread of PPR in small ruminants, leading to achieving stage 3 by 2025 and final elimination by 2028 in line with SAARC regional goal.

### *Expected results*

- Effective specific surveillance systems are in place in the country
- Laboratory capacity for PPR diagnosis is strengthened
- Effective control through responsive vaccination
- Stage wise eradication of PPR and cessation of PPRV circulation is achieved
- The incidence of other priority small ruminant diseases is reduced significantly

#### *10.1.1. Structure for components, outcomes, outputs, and activities*

To achieve the strategic objectives, the Risk-based plan is structured into five main components, namely *Diagnostic System, Surveillance System, Prevention and Control System, Legal Framework, and Stakeholder's Involvement*, following the recommendations of the Global Control and Eradication Strategy (GCES). Each component has one main outcome that is coherent with the stage of the progressive pathway that the country is claiming to be or to reach.

**Table 5: Plan structure as per GCES recommendations**

Technical elements	Stage	Objective
Diagnostics system	1	To establish laboratory diagnostic capacity mainly based on ELISA methods
	2	To strengthen the laboratory capacity through the introduction of bio-molecular methods for a better characterization of field strains
	3	To further strengthen laboratory capacity to support eradication through the introduction of a laboratory quality assurance system
	4	To maintain laboratory capacity as in the previous Stage and strengthen the differential diagnostic pathways. To start implementing PPRV sequestration activities
Surveillance system	1	To implement monitoring activities and evaluate socio-economic impacts
	2	To implement surveillance incorporating a response mechanism and risk mitigation measures
	3	To strengthen surveillance incorporating an emergency response mechanism
	4	To shift the goal of surveillance to proving the absence of PPR
	1	To lay the ground for the implementation of prevention and control activities



Prevention and control system	2	To implement targeted vaccination campaigns – on an area or production system basis – and thereby, manage secondary prevention in the whole country
	3	To achieve eradication, either by extending vaccination to areas/production systems not yet vaccinated or by adopting a more aggressive policy to suppress virus replication in identified outbreaks
	4	To suspend vaccination. Eradication and prevention measures are based on stamping out, import movement control, biosecurity measures and risk analysis to understand the potential pathways of (re)introduction of PPR
Legal framework	1	To assess the animal health legal framework with a focus on PPR
	2	To improve the legal framework to support the implementation of control activities in targeted sectors
	3	To further improve the legal framework to support prevention and risk mitigation at the population level, including the risk of PPR introduction from abroad, and possibly accommodate a compensation mechanism
	4	To further improve the legal framework to accommodate more stringent border control policies; prepare additional legal provisions (such as containment) to implement in the context of an official PPR free status
Stakeholder involvement	1	To engage stakeholders for their agreement and concurrence on the PPR control and eradication objectives (notably in terms of transparency)
	2	To actively involve stakeholders in increased reporting and targeted sectors in the implementation of vaccination campaigns
	3	To fully involve stakeholders in establishing procedures for accessing compensation funds in the event of PPR outbreaks
	4	To keep stakeholders fully vigilant and committed concerning PPR

### ***Component 1 – Diagnostics System***

The effectiveness of PPR control activities relies (among others) on a well-established network of laboratories able to deliver reliable and consistent test results. Besides, the network should be functioning in such a way that a sample submitted in any node of the system should be processed in an equal manner as it was introduced at the central level.

In Bhutan, the laboratory diagnostic capacity is established at the National Centre for Animal Health (NCAH), Serbithang. The National Veterinary Laboratory is equipped with commercially available antigen and antibody detection ELISA. The centre has good quality equipment and instruments for performing serological assays. The technical officers are confident in performing



these assays. Internal controls are maintained for quality assurance and the assay performance is periodically reviewed. Also, rapid tests (pen side tests) are available to detect the virus in clinical samples. The national laboratory is supported by four Regional Laboratories that are strategically located in different parts of the country. A special group of laboratories called Satellite Laboratories (4 numbers) is again strategically placed in the southern frontiers from where usually the disease incursions take place. There are district laboratories in each district, but they operate with bare minimum capacity and cannot detect PPR. The important gaps in laboratory diagnostic systems are a regular supply of diagnostic assays, reagents, and kits due to the cost factor. Commercially available assays from reputed manufacturers are very expensive. The national laboratory has developed linkages with regional and international referral laboratories such as BLRI in Bangladesh (To achieve stage 3 by 2025 and final elimination by 2028, diagnostic capacity will be strengthened through the planned activities as mention in the risk-based action plan/ logical framework in Annexure 1.

### ***Component 2 – Surveillance System***

Surveillance is a key element of the national PPR control and eradication plan and will become even more important as Bhutan works to move along the stepwise approach for Global Eradication of PPR. The main purpose of this component is to generate a more meaningful report that can contribute to understanding if the current targeted approach of the control programme is providing the expected outcomes.

In Bhutan, a one-time national PPR sero-surveillance was completed that provided critical information on sero-prevalence due to infection or exposure to field virus. The future sero-surveillance will focus on post-vaccination evaluation and search for infection foci (*see the technical elements of the surveillance system and logical framework matrix*).

### ***Component 3 - Prevention and Control System***

The prevention and control system of PPR in Bhutan had been focused on regulating the import of live animals and animal products, outbreak investigation and containment, movement control during the outbreak. However, the cross-border transmission of PPR is a serious issue in Bhutan and we have implemented a targeted vaccination in 2017. As Bhutan gear towards PPR Control Stage (Stage 3), a targeted vaccination in high-risk areas and a robust surveillance system will be ensured. Once the country enters into stage 4 (Post-eradication stage) the vaccination programme will be suspended mandatory and all the surveillance activities will be shifted in proving freedom from PPR. Besides, the *early warning-early detection-early response* will be strengthened. Farm biosecurity measures will be strengthened to enhance disease prevention and control (*see the technical elements of prevention and control system and logical framework matrix*).

### ***Component 4 - Legal Framework***

PPR is a notifiable disease and Livestock Act of Bhutan 2001 and Livestock Rules and Regulation 2017 specifies control of the transboundary animal disease. There is an on-going process to revise



the Livestock Act of Bhutan which will incorporate the process of animal disease control and eradication such as PPR. Nevertheless, there is strong government support towards the prevention and control of animal disease and this document also specifies the clear mandates, roles, and responsibilities of various stakeholders for the prevention and control of PPR. Most importantly, the national committee for PPR control and eradication and the technical working group will play an important role to coordinate PPR control in the country (*see the technical elements of the legal framework system and logical framework matrix*).

### Component 5 – Stakeholders’ Involvement

Along with the implementation of preventive and surveillance activities the concurrence of stakeholders is an essential requisite for preventive and control measures to be successful. There is existing formal veterinary structure and mechanisms for the prevention and control of livestock diseases in Bhutan and this document also specifies the clear term of reference of various stakeholders for PPR control and eradication programme (*see the technical elements of stakeholder involvement system and logical framework matrix below*).

#### 10.1.2. Timeline for PPR Eradication

Bhutan shall implement various activities to achieve “**Free from PPR**” by 2028. The PPR freedom dossier shall be submitted to OIE accordingly for validation and verification.

Detail timeline for control and eradication of Peste des petits ruminants (PPR) in Bhutan is given in the following figure.

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Bhutan	1	2	2	2	3	3	3	3	3	4	4	4	free		

Sl. No.	Stage		When		Lead Agency	Collaborator
	From	To	From	To		
1.	2 (Control)	3 (Eradication)	2017	2020	NCAH	
2.	3 (Eradication)	4 (Post-Eradication)	2020	2025	NCAH	RLDCs, Dzongkhags, BAFRA and DoFPS
3.	4 (Post Eradication)	4 (Beyond Eradication)	2025	2026	NCAH	
4.	Eradication/ Freedom from PPR		2026	2028	OIE	DoL/NCAH

*Figure 14: PPR control and eradication timeline*

## 11. MONITORING AND EVALUATION

A robust monitoring and evaluation system are crucial for the smooth delivery of programmes, activities, and related services for the achievement of outputs and outcomes. The success of the National PPR Control and Eradication Plan shall be assessed on an annual basis using the PPR Monitoring and Assessment Tool (PMAT) tool. Besides NCAH shall closely monitor the PPR prevention and control activities in close collaboration with RLDCs and DVHs. The NC-PCE and TW-PCE shall evaluate the progress of the PPR control and eradication programme. The control programme may be amended periodically based on the M & E findings for further improvement. The M&E will be done using the logical framework at different levels as per the area of relevance by Dzongkhag, Regional, National, and International agencies. The country-level M&E will be done by Regional Advisor Group (SAARC) and external experts from OIE to evaluate the PPR free status in Bhutan (*Refer logical framework*).

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## ANNEXURE

## Annexure 1: Risk-based action plan: Logical framework

Goal and Purpose	Description	Performance Indicator	Means of verification	Assumption	Time frame	Lead Agency	Collaborators
Goal	PPR is controlled and eliminated in Bhutan by 2028 thereby improving food and nutrition security, enhancing rural income generation, alleviate poverty, and improve the livelihoods of smallholder farmers and general human wellbeing.	No new cases of PPR detected without vaccination and the OIE accepted PPR freedom status	Submission of PPR freedom dossier to OIE, Proceedings of the Regional, International Roadmap PPR conference when the country was accepted	Policy support for PPR eradication in place	2020-2028	NCAH	RLDC, Dzongkhag
Purpose	To strengthen diagnostic, surveillance, prevention and control, legal framework and stakeholder/partnership for effective management of PPR eradication plan in the country	Incidence of PPR reduced annually and no new cases of PPR detected by 2025	Assessment report using PPR monitoring and assessment tool (PMAT)	National and international partnership in place	2020-2025	NCAH	RLDC, Dzongkhag

### Diagnostic System

Diagnostic system	Description		Performance indicator	Means of verification	Assumption	Time frame	Lead Agency	Collaborators
	Outcome	1.The Laboratory system works with a higher level of efficiency than in Stage 2. 2.The laboratory system is further improved by the introduction of bio-molecular techniques. 3.The Laboratory starts to develop a quality assurance system (stage 3) 4.The laboratory strengthens the differential diagnostic pathways. 5.Start implementing PPRV sequestration activities	1.Molecular analysis of PPR samples is handled at the National Laboratory for an advanced level of diagnosis. 2.Test performed at National laboratory complies with OIE diagnostic standards	Laboratory progress report, Lab quality assurance assessment report	Continuous support from policy directives, FAO and OIE	2020-2025	NCAH	RLDC, Dzongkhags
		Activities	Introduce molecular test technique at the national laboratory	No. of samples processed and tested for PPR	Lab results and report	Resource support in place	2021-2025	NCAH
	Training of laboratory staffs on molecular techniques		No. of staff trained and competent to conduct the test	Training Report, Lab results		2021-2025	NCAH	RLDC, Dzongkhag

	Participate in proficiency testing scheme with laboratories in the region	No. of proficiency test	Proficiency test certificate. Production of concurrent results between the laboratories in the region	Availability of participating laboratories in the region	2022-2025	NCAH	
	Strengthen/establish linkages with regional and world reference laboratories	No. of institutional linkages established; No of samples referred and tested	MoU, correspondence, Lab result/report		2020-2025	DOL	NCAH
	Continue implementing a laboratory quality control and assurance system in the central laboratory and its laboratory network	Good Laboratory Practices (GLP) manual/SOP developed and implemented	Valid test results		2020-2025	NCAH	RLDC, Dzongkhags
	Strengthening of regional and district laboratories	No. of pen side test kits distributed; No of staff trained	Invoice, Training report		2020-2023	NCAH	RLDC, Dzongkhags

# Surveillance System

		Description	Performance Indicator	Means of verification	Assumption	Time frame	Lead Agency	Collaborators
Surveillance system	Outcome	1. Implement surveillance incorporating an emergency response mechanism 2. The surveillance system is further strengthened, mainly in its passive component 3. The surveillance system is further enhanced by conducting active surveillance with a focus on the population at higher risk to improve early warning-early detection-early response; 4. Enhance surveillance to proving the absence of PPR	No. of samples submitted No. of cases reported No. of surveillance sites covered No. of active surveillance/disease search conducted	Surveillance results/ report, maps of the risk zone	Continuous support from policy directives, FAO and OIE	2020-2028	NCAH	RLDC, Dzongkhag, DOFPS
	Activities	1. Develop PPR focused epi-networks	No. of agency/individual in the epi-network	Database/records and reports of the network		2020-2021	NCAH	RLDC
		2. Conduct training of regulatory and field	No. of staffs trained	Training Report		2020-2022	NCAH	RLDC, Dzongkhag



	livestock officials on detection of PPR						
	3. Conduct passive and active surveillance to monitor the prevalence, distribution, detection of new outbreaks and to prove the absence of PPR in the country	No. of surveillance conducted	Surveillance report		2020-2028	NCAH	RLDC, Dzongkhag
	4. Conduct PPR surveillance in wildlife in collaboration with the Department of Forests and Park Services	No. of surveillance conducted	Surveillance Report		2020-2027	DoFPS	NCAH, RLDC
	5. Conduct import risk analysis on PPR in collaboration with Bhutan Agriculture and Food Regulatory Authority	No. of import risk analysis conducted	Risk analysis Reports		2020-2023	BAFR A	NCAH
	6. Establish a regional and international epidemiological network	No. of the network established	Report		2020-2023	DOL	NCAH
	7. Develop a mobile application system for reporting and strengthen disease information system	Mobile apps developed and operationalized	Mobile apps in use for reporting disease outbreaks		2020-2023	NCAH	RLDC, Dzongkhag
	8. Data analysis and publication of the report	No. of report	Publication report		2020-2028	NCAH	RLDC, Dzongkhag

### Prevention and Control System

		Description	Performance Indicator	Means of verification	Assumption	Time frame	Lead Agency	Collaborators
Prevention and control system	Outcome	<p>1.Targeted vaccination (responsive) campaign during the outbreak is implemented and additional measures (stamping out) in place to ensure the success of the vaccination campaign.</p> <p>2.Stringent preventive measures are put in place to maintain the absence of PPR outbreaks and prevent any reintroduction</p>	<p>1. Vaccination protocol developed and implemented.</p> <p>2. No. of vaccination campaigns</p> <p>3. No. of animals vaccinated in the protection zone during outbreaks</p> <p>4. No. of PPR outbreak(s) contained successfully</p> <p>5. No. of outbreaks reduced drastically</p>	Vaccination reports or report from online information systems		2020-2025	RLDC	NCAH, Dzongkhag
	Activities	Formulate and design responsive vaccination programme during the outbreak	Document developed	Document		2020-2025	NCAH	RLDC, Dzongkhag,

	Procure and distribute PPR vaccines	No. of doses of vaccine procured and distributed	Invoice, Distribution orders		2020-2025	NCAH	RLDC, Dzongkhag
	Procure and distribute equipment for cold chain maintenance of PPR vaccine	No. of equipment (refrigerators, cool boxes) procured and distributed	Invoice, Distribution orders		2020-2023	NCAH	RLDC, Dzongkhag
	Vaccinate susceptible species in the protection zone during outbreaks	No. of animals vaccinated	Vaccination records		2020-2025	Dzongkhag	NCAH, RLDC
	Conduct post-vaccination evaluation	No. and quality of evaluation study conducted	Report		2020-2026	RLDC	Dzongkhags, RLDC, DoFPS
	Implement contingency plan including stamping out in the event of an outbreak	Number of PPR outbreak(s) contained successfully	RRT reports		2020-2025	NCAH	RLDC, Dzongkhag, DoFPS
	Conduct farmers awareness programme on PPR	No. of farmers made aware	Reports		2020-2025	Dzongkhag	RLDC, NCAH
	Conduct cross-border harmonization meetings	No. of the cross-border meeting conducted	Minutes of the meeting	policy approval	2020-2025	RLDC	NCAH, DOL

### Legal Framework

		Description	Performance Indicator	Means of verification	Assumption	Time frame	Lead Agency	Collaborators
Legal framework	Outcome	The legal framework is supportive of the prevention and control activities	Livestock legislation revised and amended	Revised Livestock Act and Livestock Rules and Regulation		2020-2025	DoL	BAFRA, NC AH, RLDC, DOFPS, Dzongkhag
	Activities	Revise and amend Livestock Act and Livestock Rules and Regulation to incorporate section(s) on prevention and control of TADs	Livestock legislation revised and amended	Revised Livestock Act and Livestock Rules and Regulation		2020-2025	DoL	BAFRA, NC AH, RLDC, DOFPS, Dzongkhag
		Prepare PPR control and eradication plan	Plan developed	Print copies of National PPR Control and Eradication Plan	Plan endorsed	2020-2025	NCAH	DoL, BAFRA, RLDC, DoFPS, Dzongkhag

### Stakeholders Involved

		Description	Performance Indicator	Means of verification	Assumption	Time frame	Lead Agency	Collaborators
Stakeholder	Outcome	Stakeholders contribute to the control and eradication programmes in Stage 2, 3 and 4 through formal mechanisms of consultations	National PPR Control and Eradication Committee is established and functional	Minutes/resolutions of the meeting(s)		2020-2021	NCAH	DoFPS, BAFRA, RLDC, Dzongkhag

Activities	Establish National PPR Control and Eradication Committee	National PPR Control and Eradication Committee is established and functional	Minutes/resolutions of the meeting(s)		2020-2021	DOL	
	Establish Technical working group on PPR Prevention, Control, and Eradication	Technical working group on PPR Prevention, Control, and Eradication is established and functional	Minutes/resolutions of the meeting(s)		2020-2021	NCAH	
	Establish organization set up of PPR prevention, control and eradication with appropriate TOR for various stakeholders	Number of stakeholders identified and involved in PPR prevention, control and eradication programme	Stakeholders identified in National PPR Prevention, Control, and Eradication Plan.		2020-2025	NCAH	BAFRA, DoFPS, RLDC, Dzongkhag

## Annexure 2: Budget estimate for Risk-based action plan: Logical framework

Items	Quantity	Unit cost (Nu)	Budget (Million Nu)					Total budget
			Y 1	Y 2	Y 3	Y 4	Y 5	
<b>1. Vaccination Programme</b>								
a) Vaccines (doses)	9000	15	0.045	0.045	0.045			0.135
b) Cool box	10	2000	0.02					0.02
d) Vaccine delivery	6	20000	0	0	0			0.12
e) Vaccination Programme	3	100000	0.1	0.1	0.1			0.3
<b>2. Laboratory diagnostic system</b>								
a) RDT (kit)	100	3500	0.1	0.1	0.1	0	0	0.35
b) Ag ELISA (kit)	2	80000	0.1	0.1	0	0	0	0.15
c) Ab ELISA (kit)	2	91000	0	0	0	0.1	0.1	0.2
d) PCR reagents	5	140000	0.1	0.1	0.1	0.1	0.1	0.7
<b>3. Extension communication</b>								
a) Extension materials development	1	200000	0.2					0.2
b) Awareness education	1	400000	0.4	0.4				0.8
<b>4. Training</b>								
a) Serology technique	1	200000	0.1	0.1				0.2
b) Molecular technique	1	100000	0.1					0.1
c) Virology technique	1	100000		0.1				0.1
d) Epidemiology and outbreak response (disease simulation)	1	500000	0.3		0.2			0.5
<b>5. Disease surveillance</b>								

a) PPR and other small ruminant disease active surveillance and researches	2	800000	0.8			0.8	0.8	2.4
<b>6. Other/coordination</b>								
a) National PPR coordination meeting and Technical working group meeting	5	100000	0.1	0.1	0.1	0.1	0.1	0.5
b) National PPR workshop	2	800000	0.8			0.8		1.6
<b>7. Contingency</b>	1	250000	0.1	0.1	0.1	0.1	0.1	0.25
<b>TOTAL</b>								<b>9.63</b>



### Annexure 3: Rapid Response Team (RRT) during PPR outbreak

PPR is a highly contagious viral disease which spreads rapidly if not controlled promptly. Such infectious disease needs to be controlled rapidly at the source without allowing for further spread. Therefore, the formation of Rapid Response Teams (RRT) to respond against the outbreak of PPR should be formed with the following objective.

- To conduct a thorough investigation of disease outbreaks for the assessment of the disease/agent as well as to identify the source(s) of the infection.
- Rapidly contain the disease without allowing it to spread to other places, which includes certain actions even before the disease/agent is confirmed
- Risk communication on the disease and its control measures to educate the general public and field staff.
- To coordinate with the different stakeholders in responding to the disease outbreak within a shortest possible time to reduce the cost of response

#### ***Team Members for RRT***

- Head of Animal Health section, RLDC-Team Leader
- Laboratory Technician of RLDC
- Livestock Health Supervisor, RLDC.
- Dzongkhag Livestock Officer, DLO
- Veterinary Officer, DVH.
- Concerned Regulatory Officials from BAFRA
- Concerned In-charge of LEC/RNR-EC of the affected Gewog.
- Mangmi/Tshogpa of the affected Gewog/ Chiwog
- Epidemiologist/ Expert from NCAH Serbithang.
- Laboratory Officer/ Sr. Lab. Technician, NCAH, Serbithang
- Livestock staff from nearby Gewogs or DVH as and when required

Note: the team composition shall vary depending on the magnitude of the outbreak which will be decided by RLDC.

#### ***Roles of RRT:***

- As soon as suspected cases are reported, conduct a thorough investigation of the reported outbreak.
- Recommend Dzongkhag Administration to issue an outbreak declaration order.
- Declare infected and vaccination zones.
- Implement a ban on the movement of livestock and their products.
- Isolation and treatment of affected animals.
- Disinfection of infected premises using appropriate disinfectants.
- Collect samples from sick animals, conduct rapid field tests and refer samples to NCAH for further confirmation.
- Carry out ring vaccination in the designated areas (vaccination zone).

- Conduct surveillance in infected and vaccination zones.
- Constantly monitor the outbreak situation in the affected area.
- Daily recording of the disease outbreak status and vaccination coverage
- Mobilize the different teams for actions as per their roles.
- Submit the weekly follow up report on the disease status to Dzongkhag/ RLDC/NCAH/DOL/ BAFRA.
- Create awareness for different stakeholders.
- Mobilization of manpower and resources if required
- Seek the support of the Department /NCAH on any additional fund/logistics

### **Roles of different teams under RRT**

The RRTs be divided into different groups as per the mandate of the respective technical sectors involved for the disease control measures. The livestock sector will be mainly responsible for surveillance, vaccination, treatment, outbreak investigation, and logistic support while BAFRA will be responsible for the quarantine and movement control of susceptible livestock and products. In case there is the requirement of RBP to maintain law and order, their support will be sought by the team leader of RRT as and when required. The outbreak of the disease in the tshethar animal will be dealt with as per the tshethar guidelines and through the involvement of the concerned authority.

#### ***Disease Outbreak Investigation Team (DOIT)***

The DOIT shall be responsible for conducting disease outbreak investigation which includes identifying the source of infection, risk assessment, and confirming the outbreak. They should be responsible for the identification and establishment of infected premises and declaration of Infected Zone and vaccination zones and make key recommendations to RRT to improve the control activities based on the disease situation in the area (Refer SOP for DOIT). The team is also responsible for the weekly reporting of the disease status to the NCAH/Department.

The DOIT will constitute the following members:

- Epidemiologist/ Veterinary Officer
- Laboratory Technician
- BAFRA official

#### ***Vaccination Team***

The vaccination team (“clean team”) is responsible for conducting ring vaccination of the susceptible livestock population against PPR in the vaccination zone (if the animals were not vaccinated or if vaccinated more than 3 years ago) as per the directives from the team leader of RRT and as per the details mentioned in SOP (refer ring vaccination SOP). Simultaneously, this team will also carry out surveillance activities.



The vaccination team shall be composed of the following members:

- Veterinary Officer (Team Leader)
- Para veterinarians (number will be decided by RRT Team leader)
- Laboratory Technician
- Mangmi/ Tshogpa

### ***3-D Team***

The 3-D team is responsible for culling infected animals, disposal of carcasses, and disinfection of contaminated premises and materials. Humane culling of infected animals is done as per the SOP (refer culling SOP). The carcass of animals died due to PPR and the carcass of infected animals culled should be properly disposed to avoid the spread of the virus through contamination (Refer carcass disposal SOP). The team is also responsible for carrying out cleaning and disinfection of infected premises and all other infected or potentially infected materials and equipment as per the SOP (refer decontamination SOP).

The 3-D Team will be composed of the following members:

- Livestock Regulatory and Quarantine Officials, BAFRA
- Hired labours

### ***Quarantine and Movement Control Team***

The Quarantine and Movement Control Team shall be responsible for enforcement of quarantine and movement control in and out of the infected zone to control and prevent the spread of disease. Detailed procedure on enforcement of quarantine and movement control measures shall be done as per the Livestock Rules and Regulations of Bhutan by BAFRA.

The Quarantine and movement control team will be composed of the following members:

- Livestock Regulatory and Quarantine Officer, BAFRA
- Police personals (optional)

### ***Logistic Team***

The main roles and responsibilities of the Logistics team are to ensure that all necessary logistic facilities like PPE, materials and equipment, food/ refreshment, and transport are made available to RRT and to reinforce all essential supplies.

The logistic team shall be composed of the following members:

- Team Leader of RRT
- Dzongkhag Livestock Officer
- Livestock Supervisor
- Mangmi/ Tshogpa

### Modalities/ Modus Operandi

- Following the report of the disease outbreak in the field, RLDC should decide on the activation of the RRT based on the disease situation.
- RRT should be activated in the field within 24 hours based on the advice of the disease outbreak investigation team.
- RRT should seek the support of NCAH and the Department of Livestock as and when required.
- Once the ring vaccination is completed, the RRT Team Leader should decrease the number of members involved in PPR control activities as the main activities of the remaining team will be on the surveillance in the vaccination zone and other nearby areas. The final deactivation of RRT will be after three weeks of the last case of PPR.

### Logistics required are:

#### *Manpower:*

- Mobilize additional staffs from nearby centres, RLDCs, NCAH, Department and other Dzongkhags

#### *Vehicle*

- Mobilized from Dzongkhags, RLDCs, NCAH, projects and other central programmes if required

#### *Diagnostics*

- RLDC/ NCAH should facilitate rapid diagnostic kits and other sampling equipment.

#### *Communication equipment*

- Recharge vouchers should be provided to the members as per the government rules under the force

#### *Vaccines*

- NCAH shall arrange the required quantity of vaccines during the emergency in consultation with RRTs

#### *Fund*

- The fund required for the purchase of vaccines and consumables should be made available by NCAH.
- The fund for payment of DSA to team members should be met from the respective unit/Dzongkhag/RLDC/ NCAH.
- Expenses for the working lunch/refreshment during the disease containment programme should be arranged by RLDC and Dzongkhag. If there are no fund provision or insufficient funds, NCAH and Department should provide required fund support to RRT.

## Annexure 4: Standard Operating Procedures

### *SOP 1: Disease outbreak investigation*

A disease outbreak has been defined as the occurrence of one or more cases of PPR (refer case definition) in a herd or village clustered in time and space. An outbreak can be considered as a separate outbreak if the case(s) occur in a herd or village separated from other herds or villages by physical barriers and/or occurs after one month apart in the same village.

An outbreak investigation is a systematic procedure to help identify causes and sources of the epidemic to control an existing outbreak and prevention of possible future ones.

#### Purpose:

- To identify the causes and sources of disease outbreak
- To identify measures to prevent further spread of disease
- To control and contain the existing disease outbreak

#### Scope:

- This SOP outline the general principles and steps for investigation of PPR in the field

#### Users/targets:

- Veterinary Officers and para-veterinarians
- Rapid Response Team

#### Team composition:

- Epidemiologist/ Veterinary Officer
- Laboratory Technician
- BAFRA official

#### Materials and equipment:

- |  |          |
|--|----------|
| • Disposable gloves  | 20 pairs |
| • Gumboot  | 5 pairs  |
| • Apron  | 5 nos.   |
| • Shoe covers  | 10 pairs |
| • Scissors   | 2 nos.   |
| • Forceps  | 2 nos.   |
| • VTM  | 10 nos.  |
| • Cotton   | 1 roll   |
| • Vacutainer with anticoagulant                              | 20 nos.  |
| • Vacutainer without anticoagulant                           | 20 nos.  |
| • Adapter for blood collection                               | 3 nos.   |
| • 16G needles  | 40       |
| • Marker pen   | 2 nos.   |
| • Cool box   | 2 nos.   |
| • Bio-hazard bags  | 5 nos.   |
| • Disinfectant (Virkon-S/bleaching powder/ Sodium hydroxide) | 1 kg     |

• Antiseptic hand wash	1 package
• Ice pack	As required
• GPS	1 no
• Disease outbreak investigation form	5 nos.
• Laboratory sample submission form	5 nos.
• Written Instructions/ Printed SOP	3 nos.
• Notebook and pens	2 nos.

## **Steps for Investigation**

### ➤ ***Pre-investigation preparation***

- Formation of an investigation team and planning the response among team members
- Discuss each person's roles and responsibilities
- Arrangement of materials and logistics
- Epidemiological materials: Investigation form, notebook, laptop, GPS device
- Laboratory: swabs, needles, cool box, viral transport medium
- Educational: SOPs, guidelines
- Decontamination
- Mobility - vehicle
- Extension gears

### ➤ ***Gather preliminary information:***

The following information needs to be collected by the team before their departure:

- Farmers name and phone number (if available),
- Name of village, Gewog, Dzongkhag
- Type of rearing and number of animals, (stall-fed, open grazing, tethering)
- Date and time of the report of an outbreak from farmer to LEC/ DVH.
- Date and time of report from LEC/ DVH to RLDC/NCAH.
- Date and time of the visit by veterinarian or field staff,
- Name of contact field staff, address, and phone number.
- Provide information about the team visit to the outbreak area.
- Date and time of visit

### ➤ ***Field investigation***

*Background information to collect*

- Farm and village background information,
- Different animal categories and numbers (herd size,)
- Farm type and husbandry practices
- Whether any inter-mixing of animals such as cattle, sheep, goat and any other small ruminants
- General information regarding the introduction of any new animals

- General information regarding buying and selling of any livestock and livestock product
- General information about the affected village/ farm (no. of households: household rearing cattle, sheep, goat and any other small ruminants and farming system)
- General information about any recent local festival or gathering in the village/ locality.
- Collect XY coordinates (using GPS), altitude, road network, Government offices, frequency of movement of people in and out of the outbreak area

#### *Baseline morbidity, mortality and clinical signs*

- Determine baseline mortality for a period (week or month) before the outbreak and in the previous year, both generally, and more specifically for the same seasonal period as the present outbreak in the previous year;
- General information of the present disease outbreak such as the number of households affected, the population at risk, livestock population in the surrounding villages, etc.
- Record of the daily morbidity and mortality figures in the herd/ village
- Record of the detailed clinical signs.

#### *Bio-security arrangements*

- Describe the bio-security arrangement of the herd e.g. disinfectant foot wash, perimeter wall/fence (applicable to only Government and commercial farms);
- Mixing of different groups' including possible contact with wild animals.

#### *Feeding and management*

- Describe the grazing system followed including whether the animals are grazed in their private pasture or shared community pastures and tsamdros.
- Describe feed sources/s including whether the animals are fed with swills.
- Describe the housing type and the bedding materials used in the shed.
- Describe water source/s and including whether the affected animals are deliberately made to dip their footing the river or stream.

#### *Wild animals*

- Determine the presence of any wild animals in the area
- Determine whether there are any suspected PPR cases in the wild animals in the vicinity.

#### *Vaccination history*

- Record vaccination programmes and verify whether the animals in the affected herd/ villages are vaccinated against PPR and other diseases.



➤ **Laboratory investigation**

Laboratory investigation in the field (refer specific SOP for sampling, packaging, and transportation to the laboratory and rapid field test)

- Put on proper PPE (apron, gloves, gumboots and shoe cover)
- Carry out a physical examination of the sick animals and check lesions on lips, lower gum, dental pad, hard palate, and examine for signs of pneumonia.
- Collect occulo-nasal swabs in VTM and blood samples and transport them to the laboratory (refer to SOP).
- Carry out a rapid diagnostic test for PPR.

*Laboratory diagnosis*

(refer specific SOPs for laboratory diagnosis). Following laboratory tests will be done at NCAH for further confirmation.

- Rapid tests
- Virus neutralisation
- Agar gel immunodiffusion
- Competitive ELISA.
- Polymerase Chain Reaction tests for detection of PPR virus.

➤ **Characterize the outbreak:**

- Establish or verify the outbreak
- Provisional diagnosis made on clinical signs, epidemiological patterns, and gross pathology.
- Provisional disease control measures should be in place before the confirmatory diagnosis is made.

➤ **Establish the case definition for PPR (see table 4)**

➤ **Describe outbreak in terms of time, animal and place**

*Time (draw the epidemic curve by plotting cases against the time from available data-preferably time series)*

- When was the index case?
- What is the exact period of the outbreak?
- Given the diagnosis, what is the probable period of exposure?
- Is the outbreak most likely to be point source or propagated or both?

*Animal (attack rates, risks, etc.)*

- Any differences in the attack rates among different herds, species, etc.
- Which groups (sheep, goat, other small ruminants) have the highest and which have the lowest attack rate?
- Any difference in the attack rate among the different age groups of susceptible animals?

*Place (plot the location of the outbreak on a map with physical characteristics such as road, water bodies, mountains, infrastructures, etc.)*

- What are the geographical distributions of the cases?
- What is the pattern of the cases among different species in different management systems?
- Whether the case farm is close to the international borders, national highways, migratory routes, or other spatial risk factors?

➤ *Develop a hypothesis based on the pattern of disease (animal, time and place)*

- Source of disease outbreak-forward and backward contact tracing
- Mode of transmission.
- Whether the outbreak is a common source or propagating
- If a common source, whether it is a point or multiple exposures
- What are the risk factors associated with the problem?

## ***SOP 2: Humane slaughtering of infected animals***

### ***Purpose:***

The purpose of the SOP is to have a standard procedure for the humane slaughter of PPR infected animals

### ***Scope:***

This SOP describes procedures for the slaughter of PPR infected animals safely and humanely to control the spread of infection.

### ***Users:***

- Veterinary Officer/ Veterinary paraprofessionals

### ***Manpower:***

- Livestock Regulatory and Quarantine Officials, BAFRA
- Hired labours
- Animal owners
- Concerned Gewog Livestock In-charge

### ***Materials/ Equipment required:***

- Hand gloves
- Face masks
- Apron (disposable)
- Gumboot
- Stunning gun-penetrating captive bolt
- Surgical blades for bleeding
- Restraining rope

### ***Procedure:***

- The team shall put on all the necessary Personal Protective Equipment (PPE) before handling the animal for stunning.
- As far as possible, killing infected animals should be carried out on the infected premises. However, during the circumstances where the animals may need to be moved to another location, the site should be away from the water source, residential areas, livestock facilities, and pastures. Preferably it should be away from any footpaths or roads leading to the site.
- The animal should be properly restrained
- The operator should ensure that the head of the animal is accessible
- The operator should fire the captive bolt at right angles to the skull in the optimal position.
- To ensure the death of the animal, pithing or bleeding should be performed as soon as possible after stunning.
- Pithing or bleeding should be done from the jugular vein.

- The animal should be monitored continuously after stunning until death to ensure the absence of brain stem reflexes.

### ***SOP 3: Disposal of carcasses***

#### ***Purpose:***

The purpose of the SOP is to have standard procedures for safe disposal of PPR infected and culled carcasses and infected materials.

#### ***Scope:***

This SOP describes procedures for site selection and burial of carcasses safely to avoid the spread of the virus through contamination

#### ***Users:***

- Veterinary Officer/Para veterinarians

#### ***Manpower:***

- Livestock Regulatory and Quarantine Officials, BAFRA
- Hired labours
- Animal Owner
- Concerned Gewog Livestock In-charge

#### ***Materials/ Equipment required:***

- Hand gloves
- Face masks
- Apron (disposable)
- Gumboot
- Disinfectant -Lime/Virkon-S
- Digging tools: spades, crowbars, peak-axe

#### ***Procedure:***

- Select an appropriate site for carcass burial. The site should be away from the water source, residential areas, livestock facilities, and pastures. Preferably it should be away from any footpaths or roads leading to the site.
- Prepare a pit with sufficient width to accommodate the carcass with a minimum depth of 2 meters considering the size of the carcasses.
- Wear an apron, face masks, gumboot, and hand gloves before handling the carcasses.
- Drop the carcasses into the pit and dispose of the hand gloves, face mask, apron into the pit
- Cover the carcasses with soil, 400 mm is suggested, and add an unbroken layer of lime (calcium carbonate). Do not spray lime directly on to the carcasses as it will slow the decomposition process.
- Close the pit with sufficient soil and make a heap over the site.
- Then put a layer of lime over the soil
- Disposal site should be secured by putting stones, thorns, logs, etc.

- All tools, utensils, equipment used for burial should be thoroughly cleaned and disinfected with the disinfectant solution using the above disinfectant.
- The animal handlers should thoroughly clean and disinfect themselves before leaving the burial site.



#### ***SOP 4: Disinfection and decontamination of contaminated premises and materials***

##### ***Purpose:***

To have a standard procedure for effective disinfection and decontamination of contaminated premises and materials

##### ***Scope:***

The document describes procedures for disinfection and decontamination of contaminated materials and premises.

##### ***Users:***

- Veterinarians/ Para-veterinarians

##### ***Manpower:***

- Livestock Regulatory and Quarantine Officials, BAFRA
- Hired labours
- Animal Owner
- Concerned Gewog Livestock In-charge

##### ***Materials/ Equipment required:***

- Hand gloves
- Apron (disposable)
- Gumboots
- Buckets
- Mugs/jugs
- Water
- Phenol, Virkon-S (2%), Sodium hydroxide (Caustic soda) (2%) and alcohol (available disinfectants)
- Sprayer (if available)

##### ***Procedure:***

- Prepare 2% Virkon or Sodium hydroxide or Phenol solution in a bucket.
- Collect the bedding materials and bury them with carcasses if it is in small quantities or collect and burn it in a pit if in larger quantities.
- Contaminated premises should be disinfected thoroughly with the disinfectant. Allow contact time of 2-3 hrs.
- Disposable items, including used PPEs, must be buried in a pit.
- While leaving the infected premises the personals and vehicles should be thoroughly disinfected.
- All tools, utensils, equipment used for burial should be thoroughly cleaned and disinfected with a disinfectant solution.

### ***SOP 5: Ring/responsive vaccination***

#### ***Purpose***

To prevent the disease from further spread to animals in other “non-infected” areas.

#### ***Scope***

The document describes the ring vaccination in the radius of the infected area thereby the infection is eliminated within the area of the outbreak itself.

#### ***User***

Veterinary Officers/Veterinary paraprofessionals

#### **Manpower**

- Veterinary Officer (Team Leader)
- Para veterinarians (number will be decided by RRT Team leader)
- Laboratory Technician
- Mangmi/ Tshogpa

#### **Materials/Equipment**

- Vaccine
- Auto-syringe
- Coolbox
- Vaccination form

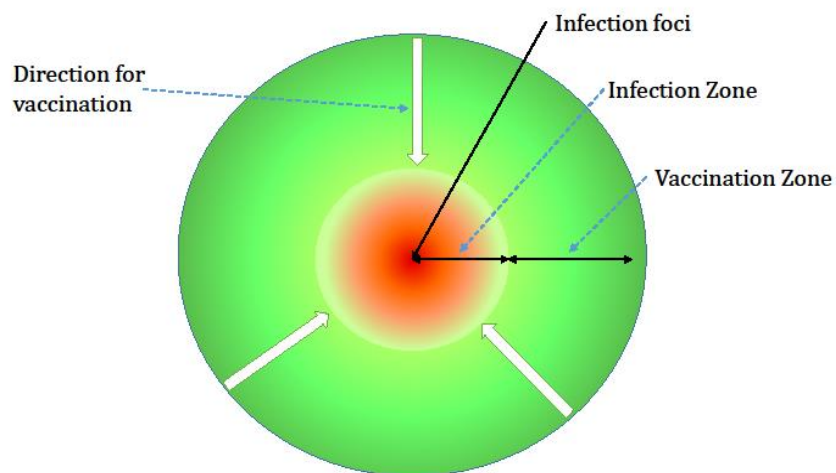
#### ***Procedure***

- The team should draw an imaginary ring measuring 10-15 km radius around the “infected” area or based on the topography of the area.
- All susceptible livestock falling within the imaginary ring is required to be vaccinated against PPR to create an immune belt around the foci of infection.





*Figure 15: Vaccination area*



- The vaccination should start from the periphery to the inside (the focus of infection) until the infected area is reached and completed as soon as possible and preferably within a one-week time.
- The members of this team should not visit the “infected” area nor mix with the members of Team B. This team is solely involved in ring vaccination.

## ***SOP 6: Vaccine evaluation***

### ***Purpose***

To evaluate the effectiveness of the PPR vaccine.

### ***Scope***

The document antibody developed against PPR vaccine in vaccinated animals.

### ***User***

Veterinary Officers/Para-veterinarians

### ***Manpower***

The NCAH team in collaboration with RLDC and SVL are to be mobilized for the collection of sera samples from vaccinated animals.

### ***Materials/Equipment***

- Vacutainers
- Serum vials
- Needles
- Coolbox with an ice pack
- Lab coat
- Gloves

### ***Procedure***

- The blood is collected at 0-day before vaccination and 14 and 28-day post-vaccination
- The blood samples are brought to the National Veterinary Laboratory and serum separated
- A competitive ELISA is used to detect the antibodies in the sera samples
- There will be increased antibody titres in the vaccinated herd

## ***SOP 7: Blood sample collection***

### ***Purpose***

To evaluate the effectiveness of the PPR vaccine.

### ***Scope***

The document antibody developed against PPR vaccine in vaccinated animals.

### ***User***

Veterinary Officers/Para-veterinarians

### ***Manpower***

The NCAH team in collaboration with RLDC and TVH&SL are to be mobilized for the collection of sera samples from vaccinated animals.

### ***Materials/Equipment***

- Vacutainers
- Serum vials
- Needles
- Coolbox with an ice pack
- Lab coat
- Gloves

### ***Procedure***

- Restrain the goat
- Disinfect the neck area from where the jugular vein is located
- Collect the blood from the jugular vein
- With the needle in the vein, the vacutainer is pushed inside the needle holder and into the bottom end of the needle.
- The vacutainer is let to be filled with blood into the vacutainer.
- The vacutainer is left in the cool box for serum separation.
- After the blood is clotted, remove the supernatant and transfer it in the serum vial.



### ***SOP 8: Quarantine and movement control***

#### ***Purpose:***

To have a standard procedure for effective quarantine and movement control during PPR outbreak

#### ***Scope:***

The document describes procedures for quarantine and movement control to contain the disease

#### ***Users:***

- BAFRA officials
- Livestock officials
- Police personnel

#### ***Manpower:***

- BAFRA officials
- Livestock officials
- Police personnel
- Local government officials
- Materials/Equipment required:
  - Barrier tape
  - Signboard
  - Basic PPEs (Mask, Gloves)
  - Disinfectants

#### ***Procedure:***

- Ban and movement restriction of all goats and sheep and their products from the PPR outbreak areas and or routing through an affected area.
- Ban on importation of goat & sheep and their products into/routing through an area affected with PPR.
- BAFRA should mobilize their staff to attend check posts and entry points, and to strictly control the movement of sheep and goat and their products in and out of the outbreak area in the event of an outbreak.
- The slaughter and sale of all sheep and goats for meat should be banned in the outbreak area.
- The animals in the affected herd should be confined within their shed or grazing area and avoid mixing with other healthy animals in the neighbouring village.
- The affected animals within the herd should be segregated from other apparently healthy animals and given appropriate treatment accordingly.
- Sought Local government support for enforcement

### ***SOP 9: Import and quarantine of small ruminants***

#### ***Purpose***

To have standard procedures for import & quarantine of goats and sheep into the country

#### ***Scope***

The document describes standard procedures to be followed:

- for import of goats and sheep
- in quarantine station during the observation

#### ***Users***

- BAFRA officials
- Livestock officials
- Private individuals

#### ***Manpower***

- BAFRA officials
- Livestock officials
- Private individuals
- Facilities/ Equipment required
- Established quarantine stations
- Transportation facilities
- Basic PPEs (Mask, Gloves)
- Laboratory equipment to sample and test
- Required medicines for the treatment of animals in the quarantine station

#### ***Procedure:***

- All Animals shall be permanently identified by the brand or tamper-proof ear tag.
- The animal (s) is/are accompanied by an approved certificate completed by the Government Veterinarian In-charge of the origin of the animal (s) attesting that:
  - ✓ All animals have been clinically examined within three days of movement and were found to be in a state of good health, free from obvious signs of infectious and contagious diseases, and fit for slaughter.
  - ✓ The farm (s) of origin, the area within the radius of 10 Km therefrom, is/are free from PPR, Foot and Mouth Disease, Contagious caprine Pleuro Pneumonia, Haemorrhagic Septicaemia, Blue Tongue, Swine Fever, and place have been free from the outbreak of animal caprine disease during the three months before the date of certification.
- During their movement to the Bhutanese border, the animals do not pass through an area in which there is an active outbreak of PPR and other caprine diseases including, Foot and Mouth Disease, Blue Tongue, and other infectious diseases.
- The Law of the exporting country permits the export of such animals originating from that country.

- Upon entry of such animals into Bhutan, they must be immediately presented to the BAFRA Officials for inspection and then received at the quarantine station.

***Procedures to be followed on arrival at the quarantine station:***

Over and above carrying out the quarantine activities prescribed in animal quarantine station, the following additional activities should be executed in quarantine station for imported goats and sheep:

- Observe for clinical signs of PPR during the quarantine period
- PPR suspected animals shall be sampled for antigen detection by sandwich ELISA
- All the goats shall be vaccinated against PPR 7 days after arrival in the quarantine station with live attenuated PPR vaccine.
- PPR suspected animals during the quarantine period shall be isolated and tested to confirm the disease.
- PPR confirmed animals shall be further quarantined for 14 days from the day of onset of clinical signs.
- Animals shall be released only after completion of the quarantine period as per the Livestock Rules and Regulation of Bhutan, 2017.

## ***SOP 10: Sample collection and conducting rapid antigen detection for PPR virus***

### ***Purpose***

To describe the procedure for rapid detection of PPR virus antigen in the sample

### ***Scope***

These tests are used for the rapid detection of PPR virus antigen in the sample.

The PESTE-TEST is based on sandwich lateral flow immune-chromatographic assay for the qualitative detection of the PPR virus.

### ***Users***

- Laboratory technicians and veterinarians

### ***Materials***

- Test Kits, Reagents, Solution, and Buffer
- The kit contains 25 lateral flow devices with all the necessary buffers and sample tubes to test 25 field samples for the PPR antigen.

### ***Test procedure***

- Ensure buffer and test devices are at ambient temperature before beginning.
- Take one of the sample tubes provided and add 30 drops of the provided buffer from the dropper bottle.
- Take one of the included swabs and use it to swab the inside of the lower eyelid, or the inside of the nose, of the suspected animal. Eye swabs are generally preferred to nasal swabs as they contain less mucus, but either will work.
- Place the cotton-bud end of the swab into the buffer in the sample tube and agitate it in the buffer for 5-10 seconds.
- Remove the swab from the sample tube and discard it.
- Unwrap one test device (LFD) and lay it on a flat surface out of direct sunlight. Transfer 4 drops from the sample tube to the sample application well on the test device.
- Leaving the test device flat, allow the test to develop for up to 20 minutes (if the test is positive before 20 minutes, further incubation is not required)

### ***Result interpretation***

A band appearing at the 'T' (test) position is a positive result.

### ***Waste disposal***

- Dispose the test materials safely
- Ensure that the test materials (swabs, pipettes, vials, containers, etc.) are properly packed and are brought back to the laboratory for proper disinfection by autoclaving and disposed of safely in the pit.

- Alternatively, the test materials and samples should be disinfected in 2% Virkon-S and autoclaved

***Risk assessment***

All specimens from suspected cases should be considered potentially infectious and dispose of properly.

***Troubleshooting***

Viscous sample preparation can prevent the lateral flow of sample and reaction leading to delayed reading time. Avoid bubble formation while loading the sample on cassette





## Annexure 5: Standard Forms

*Form 1: Flash report form*

Sl. No.	Parameters	Data/Information
1	Village	
2	Location	Latitude: Longitude:
3	Gewog	
4	Dzongkhag	
5	Date of outbreak	
6	Date of the report by the owner to LEC/RNR-EC/DVH	
7	Date of the report by LEC/RNR/DVH to RLDC/NCAH	
8	Disease suspected	
9	Species affected	
10	Age and sex of affected species	
11	Number of cases	
12	Number died	
13	Number of households affected	
14	Number of susceptible animals in the village	
15	The probable source of the outbreak	
16	Contact person in the village (Name and phone number)	
17	Control measures are taken	
18	Reported by (Name and phone number)	

*Form 2: Sample collection form*

Sl. No.	Details	Information
A: Details of the sample collector		
1	Name of sampler and designation	
2	Contact details	
B: Details of the farm		
1	Name of the owner	
2	Farm type (backyard/s-commercial/commercial)	
3	Farm location (GPS coordinates)	
4	Farm size (number of animals)	
5	Name of town/village	
6	Name of the Gewog/block	
7	District	
8	Contact no	
C: Details of the sample		
1	Sample ID number	
2	Sample collection date and time	
3	Species	
4	Type of sample: blood/swab/tissue	
5	Transport media used	
6	Age of animal	
7	Source of animal (own farm/purchase)	
8	If purchased, from where?	
9	Health status (sick/dead)	
D: Additional information		
1	Suspected disease	
2	Test requested	

*Form 3: Sample submission form*

## LABORATORY SUBMISSION FORM: Version XXX; Date: XX/XX/XXXX

Sender Ref No:	Sender:	NCAH Ref. No:
Date sent:		Date received:

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DETAILS OF OWNER

Owner:

Village:	Gewog:	Dzongkhag:
Contact No.		Date collected

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DETAILS OF ANIMALS

Animal ID No:	Species:	Breed:	Age:	Sex:
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SPECIMENS

Carcass:	Feces (75% ethanol):	Skin scraping:	Milk:
Whole blood:	Blood smear:	Serum:	Swab:
Organs (fresh):	Organs (formalin):	Others:	

---

## CASE HISTORY

Nos. affected: Nos. dead: Nos. at risk (household/farm level):

Length of illness:

Symptoms:

Summary of PM findings (if performed):

Treatment:

Vaccination:

Disease suspected:

Examination requested (choose from below):

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## LABORATORY SECTION REFERRED

- |   |  |
|---|--|
| <input type="checkbox"/> Parasitology                                     | <input type="checkbox"/> Clinical Pathology (Biochemistry/ Hematology)                     |
| <input type="checkbox"/> Toxicology                                       | <input type="checkbox"/> Bacteriology <input type="checkbox"/> Serology/Virology/Molecular |
| <input type="checkbox"/> Anatomical Pathology (Postmortem/Histopathology) |  |
- 

Submitted by (name):	Signature:	Designation:
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**Form 4: PPR vaccination form**

Name of Centre: ..... Gewog: ..... Dzongkhag: .....

Vaccination campaign period: .....

Sl. No.	Owner name	House No.	Village	Chiwo g	Goat		Sheep		Total number of animals vaccinated	Total number of animals not vaccinated	ID of goat/sheep not vaccinated	Reasons for not vaccinating Write the code: 1: Pregnant 2: Young 3: Animal not available 4. Others	Remarks
					Population	No. vaccinated	Population	No. vaccinated					

*Form 5: Disease outbreak investigation form*

Reference No.:		Date:	
Name of the farm& farm owner:			
Contact telephone number:			
Address: Village:		Gewog:	Dzongkhag:
Geo-coordinates	Longitude (N)	Latitude (E)	
Information about the farm			
Type of farm: Goat - Semi-commercial [   ]; Backyard [   ]; Tshethar [   ], Others [   ] Sheep - Semi-commercial [   ]; Backyard [   ]; Tshethar [   ], Others [   ] Wild ungulates (Specify)-.....			
Number of Animals in the affected household Goat: Improved..... Local..... Sheep: Improved..... Local..... Wild ungulates (Specify)-.....			
Information about the affected village/ Number of Animals in the affected village Total no. of household.....Total human population..... Goat.....Sheep..... Wild Ungulates (Specify): ..... Others (specify).....			
Type of housing (tick or describe briefly) Goat: Permanent shed with concrete floor [   ]; Permanent shed with local beddings [   ]; Temporary shed [   ]; Others (specify)[   ].....			

<p>Sheep: Permanent shed with concrete floor [ ]; Permanent shed with local beddings [ ]; Temporary shed [ ]; Others (specify)[ ].....</p>
<p>Grazing system          Stall fed [ ]; Private pasture [ ]; Common grazing land/ pasture [ ];          Mixing with wild ungulates [ ]; Mixing with other herds [ ]          Others (specify)</p>
<p>Feed: Whether concentrate feed fed to animals?          Goat - [Yes   No] Source.....          Sheep - [Yes   No] Source.....</p>
<p>Other animals present on the farm, give details</p>
<p>Presence of wild animals in the area, give details</p>
<p>Bio-security arrangements in the affected farm          Disinfectant foot bath [ ]; Perimeter wall/fence [ ]; Mixing of different species of animals[ ];          Contact between different herds [ ]; others (specify)</p>
<p>The topography of the outbreak areas:          Road network [ ]; market[ ]; school[ ]; BHU [ ]; RNR/LEC [ ]; Monastery [ ]; Towns [ ]          Others (specify)</p>
<p>Movement of animals and products          The recent introduction of animals from other establishment/ places, [Yes / No];          if yes, from where?          Species..... Source.....Nos..... Date.....          Recent purchase of livestock products</p>

Mutton- [Yes   No].....kg, Date..... Chevon - [Yes   No].....kg, Date..... Others (specify)..... Supply/ sale of animals/ milk/ meat to other farms/ places, [Yes / No]; if yes to where? village.....Gewog.....Dzongkhag.....Date.....			
Movement of people/ vehicle Any recent movement of people or vehicle from other farms/ places [Yes / No]; if yes from where?                      When?  Any recent movement of people or vehicle out of the farm to other farms/ places [Yes / No]; if yes to where?..... When?  Any recent festival or gathering in the village or nearby villages [Yes / No]; if yes to where?.....when?  Any disease seen in the wild ungulates/animals? if yes to where?.....when?			
Vaccination history of the affected household			
Type of vaccine	Date of vaccination	Vaccine details	Remarks
PPR			
FMD			
Whether the affected animals vaccinated in the last vaccination? Yes   No: If no, when was the last vaccination?  What was the reason for not vaccinating during the last vaccination programme?			

Information about the disease outbreak						
Date and time of the report of the outbreak from farmer to LEC/ RNEC/DVH:						
Date and time of report from LEC/ DVH to RLDC/ NCAH:						
Date and time of onset of clinical signs:						
Date and time of onset of mortality:						
Details of animals affected:						
Date	Species	Breed	Age	No. affected	No. died	Remarks
Clinical signs observed						
Necropsy findings (if any)						
If any treatment already given in the present outbreak, give details						





Probable source of infection							
Actions taken or recommendations							
Samples collected							
Sample Id.	Species	Specimen type	No. of specimens	Laboratory referred to	Date of shipment	Test requested for	
Name & Designation of Investigation Team:					Signature		







**NPPR-PCEP 2020**