TCP/TAJ/3302: Assistance for Improving Sheep and Goat Health – Respiratory Disease Syndrome Diagnosis and Control

Recommendations for Controlling Small Ruminant Respiratory Diseases in Tajikistan

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Introduction

Recurring epidemics of newly introduced infectious diseases, particularly peste des petites ruminants (PPR) and sheep and goat pox, cause high mortality among sheep and goats since the early 2000s. In 2006 and 2009 epidemics of an acute respiratory disease were observed in sheep and goats in several rural parts of Tajikistan resulting in high mortality rates in many village flocks. Two newly introduced agents – PPR virus (2006) and *Mycoplasma caprine capripneumonia* (agent causing caprine contagious pleuropneumonia or CCPP) (November 2009) -- were definitively diagnosed and are thought to contribute to this acute respiratory syndrome disease. CCPP was diagnosed in goats from Rogun district near Dushanbe and Vanj in Gorno-Badakhshan (OIE CIRAD Reference Laboratory, Montpellier, France). Apparent morbidity and mortality rates were 59.7 and 11.9 per cent, respectively. This is the first confirmed diagnosis of this disease in Tajikistan.

Sheep and goats in Tajikistan also periodically suffer from *Pasteurella sp.* pneumonia and lungworms. Thus these two new agents (CCPP and PPR) greatly complicate the clinical diagnosis and prevention of respiratory diseases in small ruminants. These periodic epidemic losses and decreased productivity particularly affect poor households, and in particular those headed by women, as small ruminants are the most commonly found livestock in poorer rural households. FAO estimates that nearly 500 000 rural households raise sheep or goats and these are all at some risk of contracting these diseases over coming years.

Because of the complex aetiology of this syndrome, more information on the causes, distribution, seasonality and contributing factors needed to be known before control plans could be recommended.

Strategies for prevention & control of small ruminant respiratory diseases

After review of the Tajikistan-specific surveillance data on small ruminant diseases carried out since 2010 during a Small Ruminant Disease Control Workshop held in Dushanbe in October 2013, it was agreed to recommend these control strategies. The strategies will broadly follow recommendations from the international literature, the Food and Agriculture Organization (FAO) and the World Organisation for Animal Health (OIE). The agreed strategies are, however, specific to socio-economic conditions in Tajikistan at this time.

The strategies for prevention and control of respiratory diseases in small ruminants are divided into three categories. The first is for prevention and control of CCPP predominantly in goats, the second is for prevention of PPR in sheep and goats, and the third for control of several miscellaneous causes of respiratory diseases in small ruminants.

The State Veterinary Inspection Service (SVIS), the Veterinary Association of Tajikistan (TVA) and several national institutions now have the capacity for detecting, diagnosing and advising livestock owners on effective prevention and control for these respiratory diseases.

Prevention and control of CCPP in goats

Analysis of serosurveillance data indicated that 85 per cent (51 of 60) of districts where small ruminants were sampled monthly (except November) over 23 months contained ELISA test-positive CCPP animals (Table 1). The cumulative monthly frequency over 23 months of these CCPP ELISA test-positive animals had two seasonal peaks, one in the spring and a second in winter (Figure 1). Sero-positive small ruminants were, however, recorded in every month except November where no samples are traditionally taken as breeding females are pregnant. Samples were randomly obtained each month and animals were not identified nor purposively resampled.

Serosurveillance shows that of all districts surveyed (60), an average of 24.2 per cent (1,051 out of 4,336 sampled) of small ruminants were CCPP test-positive (Table 1) during the 23 month survey. A total of 516 (11.9 per cent) animals received one of two commercial CCPP vaccinations and vaccination was carried out in 16 districts.

Table 1. CCPP data from serosurveillance and intensive surveillance studies.

CCPP ELISA test-positive animals in 60 sentinel districts over 23 months			
Negative	**Positive**	**Total**	**% positive**
3,285	1,051	4,336	24.2
Districts with one or more CCPP test-positive animals			
No	**Yes**	**Total**	**% positive**
9	51	60	85.0
Proportion of animals receiving CCPP vaccinations			
Not vaccinated	**Vaccinated**	**Total**	**% vaccinated**
3,820	516	4,336	11.9

Figure 1. Monthly cumulative frequency of CCPP ELISA test-positive titres by month

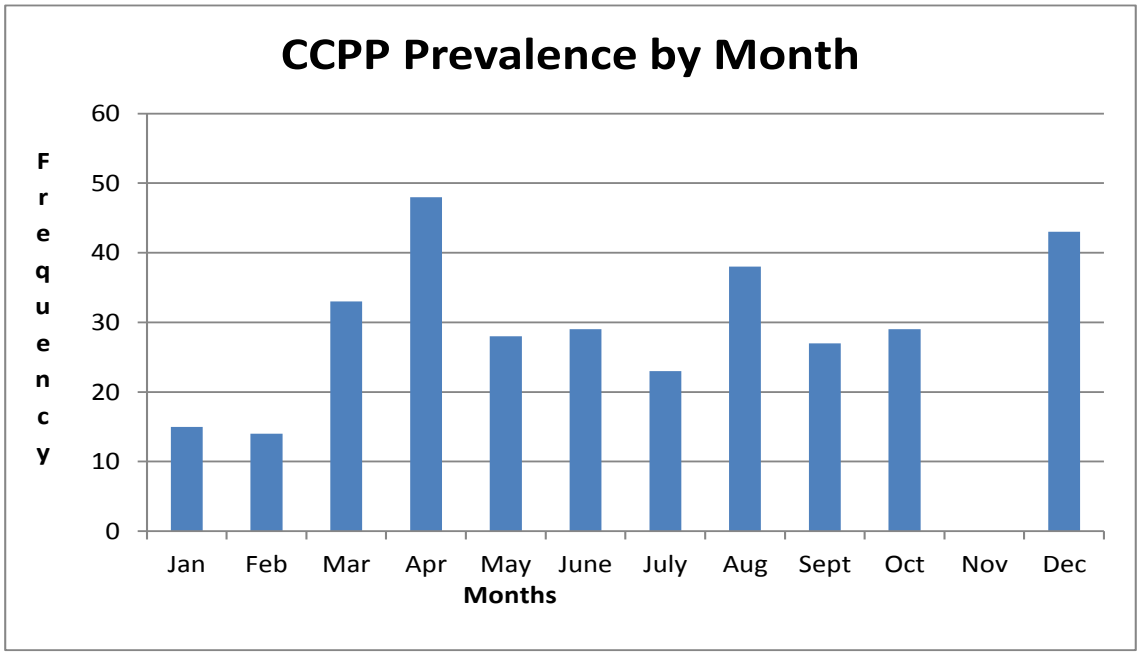
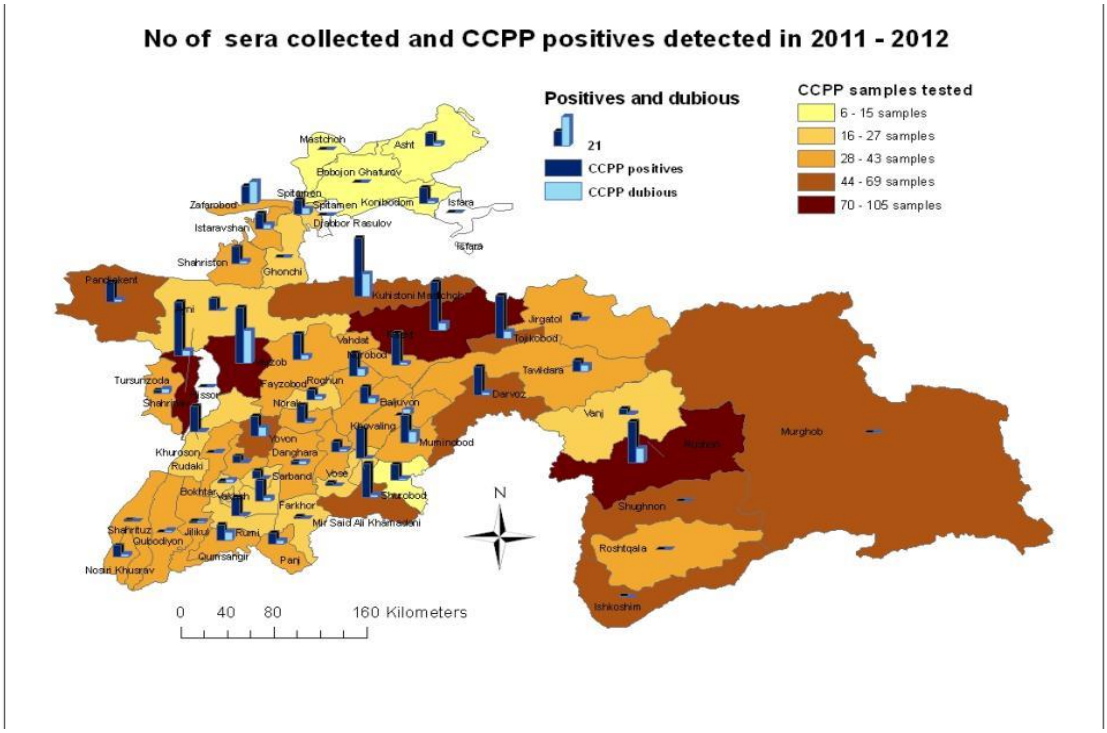


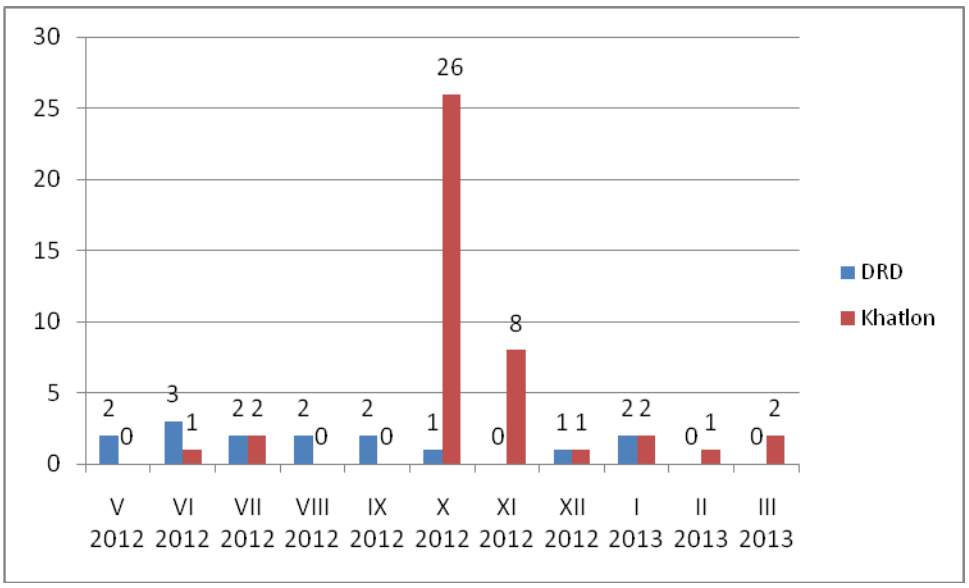
Figure 2 shows the distribution and frequency of CCPP ELISA test-positive sera collected from goats over 2011 and 2012. Mountainous and southern border areas were most at risk for CCPP disease in goats during these two years.

Figure 2. Distribution and frequency of CCPP ELISA positive samples over 2011 and 2012



During 11 months of ***intensive surveillance*** (flock clinical plus post-mortem diagnosis) in 11 zones[1], 58 outbreaks of CCPP were observed and investigated. CCPP was diagnosed based on clinical signs and postmortem pathology. The number of outbreaks by month and region are shown in Figure 3. Most morbidity was recorded in October to November in Khatlon region but no peaks of CCPP were detected in DRD region.

Figure 3. Seasonal dynamics of morbidity of goats with CCPP



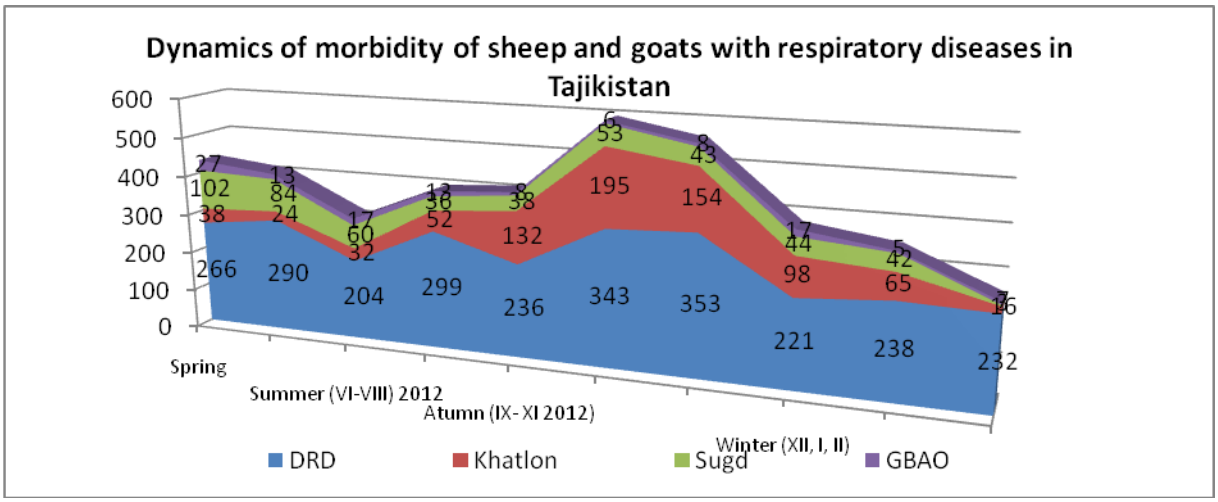
[1] 5 districts in Khatlon region and 6 districts in DRD region, i.e. Farkhor, Muminobod, Dangara, Yavan, Varzob, Rogun, Shakhrinav, Tajikabad, Jirgital, Gissar and Jomi districts

y axis is the number of outbreaks; x axis is the month and year

The findings of the serosurvey results and the intensive disease surveillance are only generally in accord. Two peaks of CCPP disease, spring and winter, were shown by ELISA testing while intensive disease surveillance studies indicated that while CCPP was recorded in every month, there was one distinct peak in October – November and only in Khatlon region. These patterns show the value of well focused serosurveys, even with small sample sizes, as compared to intensive surveillance in a few flocks.

Other respiratory diseases of sheep and goats are spread across all regions of Tajikistan. High morbidity and mortality rates are observed in DRD and Khatlon regions. The seasonal dynamics of morbidity of sheep and goats with respiratory diseases includes spring, summer, autumn and winter seasons and peak of outbreaks is observed in September – November (Figure 4). All breeds, sex and age groups of sheep and goats are susceptible to respiratory diseases, but more often female and young sheep and goats born in the current year are affected. The most common clinical and pathological diagnoses of these respiratory disease cases included CCPP, ectyma, pox, lungworm and pasteurellosis.

Figure 4. Seasonal distribution of morbidity in sheep and goats with respiratory diseases in intensive surveillance zones



y axis is the number of diseased animals in the 58 outbreaks; x axis is the season and year

AS shown in table 1, survey data indicated that only in 11.9 per cent of 4,337 animals sampled was any of the CCPP vaccines (JovaplasmaC® vaccine, Jovac and . Capridoll® vaccine, Dollvet) used in this project . Of the total 516 animals vaccinated and tested, only 30.6 per cent (158 animals) had evidence of an ELISA titre to CCPP. This is in accord with post-vaccination data specifically testing antibody response in two commercial CCPP vaccines (Table 3).

Table 2 indicates that over all animals sampled, there was no significant protection from CCPP disease resulting from vaccination with the two vaccines tested in this project. Efficacy of vaccination in terms of morbidity shows the 'no vaccination' category with a higher number of cases and higher mean number of cases (14.99) of disease compared with the 'vaccinated' category where mean number of cases is 6.32. The difference on the average between vaccinated and non–vaccinated small ruminants is about 9 animals which is not significantly different in this sample.

Reviewing individual district vaccination and disease data indicates that even high rates of CCPP vaccination in selected districts did not provide protection from the morbidity. Thus no

matter which vaccine used (Jordanian, Turkish) there was no significant protection from the disease.

Table 2. Efficacy of CCPP vaccination compared in terms of morbidity

	CCPP vaccination	N	Mean	SD	SEM
Morbidity	No	4162	14.99	77.226	1.177
Morbidity	Yes	171	6.32	18.082	1.383

There could be multiple causes for the apparent ineffectiveness of the two CCPP vaccines used. In the field, individual vaccinated animals were not marked nor well followed and case-control studies could not be carried out as planned. Most worrying was that vaccination in CCPP-naive goats resulted in low rates of seroconversion at 28 days post-vaccination for both vaccines. Table 3 gives the results of three trials. It is possible that the two vaccines tested do not contain any or contain insufficient *Mycoplasma caprine capripneumonia* specific antigen to elicit a protective immune response. Alternatively, the strains contained in each vaccine or the limited amount of antigen do not react with the CCPP ELISA monospecific antigen in the test.

Table 3. Post-vaccination seroconversion to CCPP ELISA test of two commercially available vaccines

Number (N) vaccinated[1]	District	N sero-positive	% sero-positive	N sero-negative	% sero-negative
32[2]	Varsob	2	6.3	30	93.7
18[2]	Shakhrinav	5	27.8	13	72.2
20[3]	na	13	65	7	35

1. All goats were CCPP ELISA test-negative at the time of vaccination; sera tested 28 days post-vaccination.
2. JovaplasmaC® vaccine, Jovac, Jordan, F38 biotype in saponin
3. Capridoll® vaccine, Dollvet, Turkey, live, freeze-dried *Mycoplasma mycoides capri* strain

For these reasons and that no CCPP vaccines are registered in Tajikistan at this time, early detection, prompt diagnosis and early antibiotic and supportive treatment with segregation of affected animals are the recommended actions for controlling CCPP in goats in Tajikistan. See Text Box 1. Despite antibiotic treatment of goats infected with CCPP being controversial in other parts of the world, it is justified in Tajikistan at this time as potent vaccines are not readily available and the disease is only newly introduced.

Bacterial culture of various tissue specimens were not attempted because frozen samples were quite old when laboratories were supplied with reagents. Several *Mycoplasma* sp. were isolated for preparing an autogenous vaccine. These preparations and efficacy trials are in progress.

Areas of high risk for CCPP disease during the two year study were found in mountainous and southern border areas of the country. These areas warrant intensified surveillance and improved diagnostic capability.

The study was not able to determine if antibiotic treatment in CCPP diseases goats was cost-effective or not. Animals receiving the most antibiotic treatment had the highest mortality but this could be because they were more severely ill with the disease. Case-control studies could examine this question but were not done under this study. There is anecdotal evidence that where shepherds detected respiratory diseases early and initiated early antibiotic treatment plus segregation of infected animals, morbidity and mortality were low. Small ruminant

raisers in Tajikistan have few options at this time for preventing the disease as no effective vaccines are available.

Prevention of PPR in sheep and goats

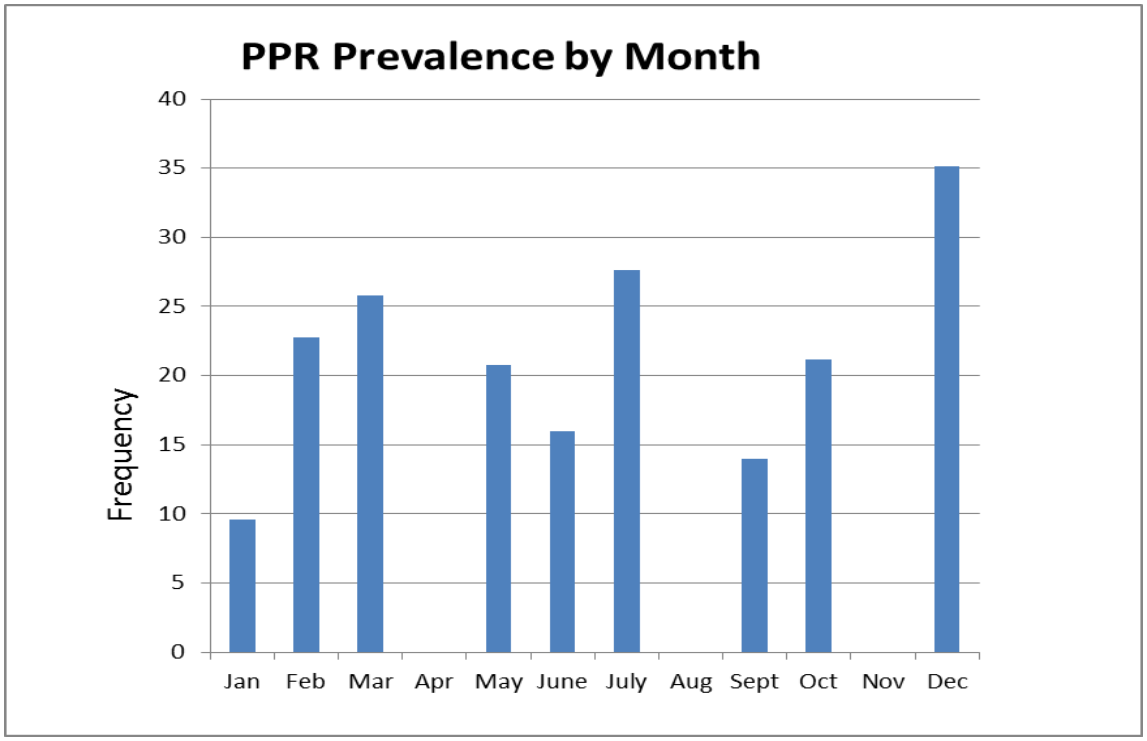
Analysis of the survey data indicated that 83 per cent of 60 districts sampled over 23 months experienced PPR disease (Table 4). Four of the 10 districts not recording any PPR disease occurred in Khotlan oblast. Surveillance showed that in only 8 (13.3 per cent) of 60 Tajik districts did PPR vaccination take place (Table 4) in the previous few years. The average rate of vaccination against PPR in all surveyed animals was only 2.4 per cent in all districts, with a range of 9 to less than 50 per cent of the animals in these vaccinated districts having a PPR titre (Table 4).

The surveillance data indicated that PPR disease lacks distinct seasonal peaks and can occur year-around (Figure 5).

Table 4 PPR data from serosurveillance and intensive surveillance studies.

PPR ELISA test-positive animals in 60 sentinel districts over 23 months			
Negative	**Positive**	**Total**	**% positive**
1,373	337	1,710	19.7
Districts with one or more PPR test-positive animals			
No	**Yes**	**Total**	**% positive**
10	50	60	83.3
Recorded PPR vaccination by district			
Yes	**No**	**Total districts**	**% of districts with vaccinations**
8	52	60	13.3
Proportion of animals vaccinated in all 60 districts			
Yes	**No**	**Total animals**	**% of all animals being vaccinated**
45	1,838	1,883	2.4

Figure 5. Frequency of PPR ELISA test-positive animals by month



Twenty per cent of goats and 11 per cent of sheep had ELISA test-positive PPR titres (Table 5) either recovered from disease or from vaccination.

Table 5. PPR ELISA test-positive sera by species

Species	N tested	N without titre	N with titre	% positive
Goats	1,628	1,300	328	20.1
Sheep	82	73	9	11.1

There is a worryingly low rate of vaccination (about 2) per cent) against a disease known to exist in the country and which causes such high economic loss. Herd immunity levels according to our sample are now about 20 per cent in goats and nearly half that (11.1 per cent) in sheep suggesting that most animals and flocks are unprotected and an epidemic could occur easily in the near future. Vaccination rates in the years from 2007, when PPR was first diagnosed, were likely much higher up until recently. Government authorities and the Association of Tajik Veterinarians have an obligation to alert livestock owners to this risk and make provision to have PPR vaccine available for preventive vaccinations.

Live, quality controlled PPR vaccine is registered in Tajikistan and available in the country. PPR *Morbilliviruses* virus vaccines are known to be very effective in preventing PPR disease and produce a long-term protection. Other than a poor cold chain or poor quality vaccine, colostral antibody ingestion may prevent the development of solid immunity in young, naive sheep and goats. The Seasonal Herd Health Calendar takes this into account by staging vaccinations of sheep and goats twice in order to overcome this risk of lack of protective active immunity to PPR virus infection resulting from interfering colostral antibodies.

The proposed PPR control strategy is vaccination (and ear notch) of young replacement small ruminants 4 weeks of age or older in the spring. A second PPR vaccination is given in the fall

for all ***unvaccinated*** breeding age females and males and the young replacement stock will be ***revaccinated*** with quality controlled PPR vaccine.

Preventing miscellaneous causes of respiratory diseases

No lungworm disease was diagnosed or recorded during the surveillance over 23 months in 2011, 2012 and 2013. Likewise no primary *Pasteurella* pneumonia was diagnosed nor *Pasteurella* sp. cultured.

The control strategy for these less frequent causes of respiratory disease in small ruminants will rely on better herd health management including early detection, prompt diagnosis and early treatment with effective antibiotics. See Text Box 1.

Practical control strategy for ALL small ruminant respiratory diseases

Small ruminant respiratory disease control plan objectives

1. To prevent the majority of economically important respiratory and other diseases with practical control programmes in order to reduce morbidity in small ruminants;
2. To carry out early disease detection, prompt diagnosis, early treatment and control practices in small ruminants at the village and farm levels;
3. To widely disseminate information on and begin carrying out a locally adopted comprehensive 'Seasonal Herd Health Calendar' in order to rapidly improve productivity from small ruminants throughout the country;
4. To use a surveillance scheme that provides early detection and prompt diagnosis of diseases in small ruminants and helps identify risk factors for respiratory and other diseases;
5. To monitor the effectiveness of control programmes for small ruminant respiratory and other diseases and to implement quality control management procedures that make adjustments, based on scientific judgement of surveillance data, to the control or treatment programmes;
6. Facilitate Tajik veterinarians to promote scientifically based locally adopted 'Seasonal Herd Health Calendar' throughout the country; and
7. To develop a 'Seasonal Herd Health Calendar' that may have application in neighbouring countries.

The text box below summarizes the recommended practical control strategy for all small ruminant respiratory diseases based on epidemiological information collected and tools available at this time.

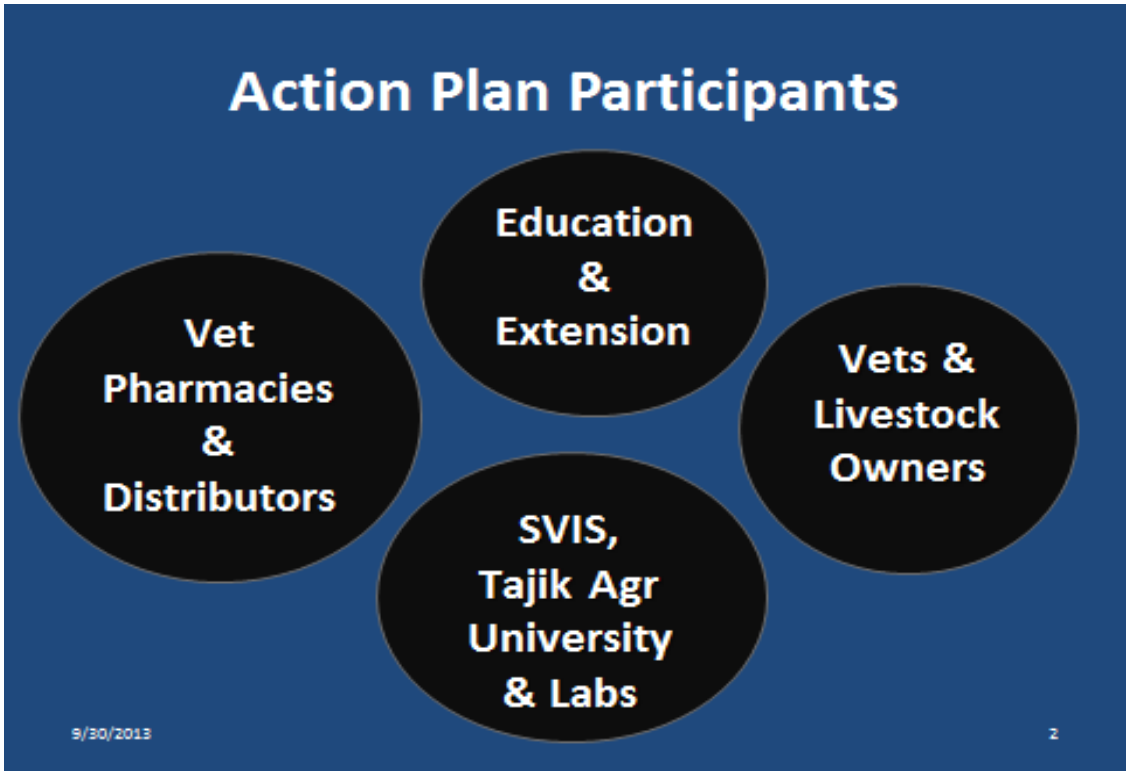
Text Box 1. Practical control strategy for small ruminant respiratory diseases

- **Shepherds, farm managers, village heads & veterinarians maintain a high index of suspicion**
- **Prevent PPR by routine and wide spread vaccination according to local Seasonal Herd Health Calendars**
- **Early detection, prompt diagnosis & early treatment of ALL cases of respiratory diseases**
- **Reduce disease spread through separate management of infected versus healthy animals including separate flocks of infected animals with separate pasture and watering facilities.**

Action Plan for controlling small ruminant respiratory diseases

Participating groups

The proposed Action Plan centres around four key groups, each with different responsibilities and activities but each highly interrelated and interdependent. The four key groups include:



The activities and main responsibilities of each group include:

Vet Pharmacies & Distributors

- Procures remedies & vaccines on time
- Advertises to smallholders, veterinarians, large and small farms
- Distributes items increasing availability for vets or livestock owners
- Maintains cold chain and storage conditions according to Tajik laws
- Collaborates with SVIS for registration and quality control

Education & Extension – Veterinary Association of Tajikistan, individual vets and local associations

- Informs vets and livestock owners on seasonal activities
- Informs vet pharmacies on seasonal vaccine and remedy needs
- Modifies seasonal calendar advice according to local conditions
- Modifies seasonal calendar advice in light of new research findings

Veterinarians, SVIS District Vets & Livestock Owners

- Organizes districts, villages & large farms for seasonal vaccination days
- Collaborates on all seasonal activities, breeding, feeding, management & health
- Vets provide goods and services to carry out seasonal activities

SVIS, Tajik Agrarian University, Research Institutions & Laboratories

- Monitor seasonal vaccination days & national campaigns (brucellosis plus PPR)
- Register vaccines & remedies used
- Disease outbreak investigation, diagnosis & reporting
- Pharmicovigilance and reporting adverse remedy or vaccine reactions

Small Ruminant Herd Health Package for Tajikistan

Principles for offering a Seasonal Calendar for herd health & management

Herd health and production programmes are commonly offered to clients on the assumption that prevention of selected infectious and non-infectious diseases is less expensive than treating conditions as they occur. Likewise packaging health and management interventions at appropriate seasons that take into account the production cycle of various classes of animals should result in most cost-effective livestock management. Veterinarians and researchers can assemble a package of preventive measures fitting specific locations, villages or even farms depending on the known situation. Packages on offer are altered as new disease risks are identified or as new preventive products become available. Based on the epidemiological findings for small ruminant respiratory diseases in Tajikistan and historical knowledge, a suite of best management and health practices can be bundled into a Seasonal Calendar. A regional Seasonal Calendar is described below.

Seasonal Herd Health Calendar - DRD & Rasht Valley regions

Season	Preventive Activity
FALL	
Parasites	Deworm breeding herd of females, males & replacements coming off pastures; use a larvicidal anthelmintic such as ivomectin or others at recommended dosages. *Valbazen* dose in goats is 7.5 mg/kg which is higher than label.
Lice	Check for lice in late fall / early winter and delouse all animals if lice found. Avoid handling or treating sheep and goats when they are pregnant.
Brucellosis	Vaccinate adults according to the NBCP schedule and start of flock breeding (see table below); vaccinate young stock 4 – 7 months old that were not vaccinated during the spring campaign. ***Do not vaccinate early pregnant females.***
PPR	Vaccinate and ear notch all unvaccinated (and unmarked) breeding herd females and males. Revaccinate (and give a 2nd ear notch) all young replacement stock.
Anthrax	Vaccinate breeding herd females, males and replacements in high-risk areas. Bi-annual vaccinations recommended in high risk areas.
Vitamin & minerals	Administer vitamins A & E and selenium to all breeding animals and replacements
Culling / selling	Remove females with mastitis or damaged udders. Cull / sell males & females in poor health, poor body condition and females that did not give birth in previous season.
Other	Trim feet as needed.
WINTER	
Clostridia vaccination	Vaccinate breeding herd females, males and replacements with multi-strain clostridial vaccine; include enterotoxaemias and tetanus prevention in vaccine. Vaccinate breeding herd females 2 – 6 weeks before lambing/kidding begins (see table below) to ensure colostral immunity for suckling lambs and kids.
Winter housing	Make sure good ventilation even if very cold. If moisture collects on ceiling or strong ammonia smell is noted, more ventilation is needed – uncover windows, open doors. If possible remove wet straw bedding and add clean straw.

Feeding pregnant females	Feed sufficient hay and supplement to maintain or increase body weight of breeding females. Boost supplement levels to females due to give birth in 4 – 6 weeks.
Feeding replacements	Feed replacements so they are gaining body weight.
Males	Do not let males eat excessively; keep separate from breeding females and growing replacements. Castrate males missed from previous year.
SPRING	
Parasites	Deworm breeding herd of females, males & replacements when turn out to pastures. ***Or*** better practice is to monitor herd parasite load with faecal egg counts; deworm only individuals with heavy load of parasites. *Valbazen* dose in goats is 7.5 mg/kg which is higher than label.
Feeding pregnant females	Feed sufficient hay and supplement to maintain or increase body weight of breeding females. Boost supplement levels to females due to give birth in 4 – 6 weeks.
Feeding lactating females	Boost grass hay or supplement levels to lactating females for 4 weeks after parturition.
Brucellosis	Vaccinate adults according to the NBCP schedule and start of flock breeding dates (see table below); vaccinate young stock 4 – 7 weeks old. ***Do not vaccinate early pregnant females.***
Vaccinate young stock- PPR & Clostridia	Vaccinate (and ear notch) all young stock 4 weeks of age or older against **PPR, enterotoxaemias & tetanus** (see table below)**.**
Anthrax	Vaccinate breeding herd females, males and replacements in high-risk areas. Bi-annual vaccinations recommended in high risk areas.
Males	Castrate unneeded young males.
SUMMER	
Parasites	Monitor herd parasite load with faecal egg counts; deworm only individuals with heavy load of parasites. *Valbazen* dose in goats is 7.5 mg/kg which is higher than label.
Males	Examine for breeding soundness & trim feet as needed. Deworm as needed; provide extra feed as needed.
Feed	Stock up on good quality (green) grass or Lucerne hay for winter feeding
Other	Ensure adequate pasture forage, shade and water. Trim feet as needed.
YEAR AROUND	
CCPP	**EARLY detection, prompt diagnoses and early treatment of respiratory diseases are the keys to reducing animal losses**. If CCPP, *Pasteurella* or other causes of pneumonia are diagnosed by clinical, post-mortem or laboratory methods, promptly separate infected animals; begin whole flock treatment as soon as possible with *tylosin tartrate* (11 mg/kg body weight once daily for 5 or more days) or *Long acting tetracycline* (22 mg/kg once every 2 days for two or three times). Consult local veterinarian for most effective treatments; consult local SVIS or laboratory to consider preparing and using an autogenous CCPP vaccine.
PPR outbreak	Vaccinate entire flock at first detection and diagnosis. Treat affected small ruminants with a broad spectrum antibiotic; teach owner to provide medical support including force feeding soft concentrate feed (three times daily) and force oral rehydration fluids (4 – 6 times daily). Mix in 2 litres of warm water: 15 gms (1 tsp.) table salt, 30 gms (2 tsp.) baking soda and 100 gms of honey. Mix solution well and feed a total of 0.5 litres per 4 kg body weight daily. Let young lambs and kids suckle mothers daily.
Other respiratory	**Lungworms**: detect, diagnose (usually with post mortem examination) and treat with injectable ivomectin (0.2 mg/kg once) plus long acting tetracycline injections

diseases	(22 mg/kg once every 5 days for 2 – 3 times).
Disposal of dead animals	Few deaths (1 – 10): best is to burn carcases; deep burial with lime is an alternative. Large number of deaths (>10): pile carcases, sprinkle lime liberally among layers of carcases, cover mound with a tarpaulin sheet, seal edges well with rocks and dirt or fence to prevent predators from disturbing the mound. Leave to compost for at least 9 months before collecting bones for burial.

Table: Preferred periods for vaccinating adult sheep and goats based on four start of mating dates and ages of young animals at a second round of brucellosis vaccinations during July and August.

START OF MATING	BIRTH PERIOD	VACCINATE ADULTS	VACCINATE YOUNG
1 September	24 January to 20 March	mid-March to April-early May	5 to 7 months old
15 September	7 February to 3 April	April to early May	5 to 7 months old
1 October	23 February to 19 April	early April to mid-May	4 to 6 months old
15 October	8 March to May	late April to mid-May	4 to 6 months old

Assumptions: Gestation length = 145 days; Length of main breeding period = 56 days; Start date for vaccinating young animals against brucellosis = 1 July; Finish date for vaccinating young animals = 31 August.

The above basic Seasonal Herd Health Calendar describes in some detail the activities and production groups requiring attention during various seasons in order to obtain best feeding, breeding, management and health of small ruminants in DRD and the Rasht Valley. The locally specific Seasonal Herd Health Calendars can be promoted as current best practices by Tajik veterinarians for their sheep and goat raising clients or preferably promoted in a whole village. Government authorities, the TVA and vet remedy and vaccine distributors all have a role in facilitating the wide spread and timely implementation of seasonal activities described in the calendar. Likewise, government authorities and research institutions have the opportunity to monitor the efficacy of the recommended activities and make changes as research results suggest. The details for a package of vaccination and package of parasite control with indicative costs are in Annex 1.

In several years, monitoring results could be reported on the cost-effectiveness at farm, district or national level when the above package of activities is followed.

Surveillance component of the control programme

Surveillance for small ruminant respiratory disease complex can continue using the methods developed under this FAO/TCP project and adding to the data collected in 60 sentinel villages and districts over the last 23 months.

In addition to early warning, monitoring herd immunity and advising livestock owners on the best methods of prevention and control, the methodology developed could be most valuable in estimating small ruminant productivity and losses. This information is urgently required by the SVIS Anti-epizootic Unit for reporting information to international organizations (OIE, FAO) and for supplementing periodic census data on small ruminants.

Objectives of the surveillance component

1. To monitor herd immunity level changes over time in flocks by periodic serological surveys in sentinel flocks and districts;
2. To provide regular updates of respiratory and other diseases to government, field veterinarians, remedy suppliers and extension bodies, livestock owners and the general public;
3. To identify and give early warning of new disease outbreaks, locations or new diseases;

4. To make annual estimates of small ruminant production, losses and offtake for reporting to government and international institutions; and
5. To provide regular reports of results of surveillance activities to the Central Anti-epizootic Unit and the Chief Veterinary Officer.

It is recommended that the **Surveillance Unit** will carry out the surveillance activities listed above and will function independently. No costs for the Surveillance Unit are presented here but the cost of collecting samples and serological testing will be significant at about US$1.50 per sample.

Annex 1. Details of seasonal vaccinations and parasite control, castration, culling & sales

Seasonal Activities – package of vaccinations

Season	Vaccinations	Production Groups	Comment
FALL	**Rev1 brucellosis + PPR**	**Rev1**: Vaccinate adults not vaccinated in the spring because they were pregnant; vaccinate 4 – 7 month old young stock that were not vaccinated in the spring because they were too young. **PPR**: vaccinate + ear notch all unvaccinated adults; 2nd vaccination for all young stock born the previous spring and vaccinated (and ear notched) at that time.	**Rev1**: vaccination dates vary according to the breeding dates. **PPR for young stock born the previous spring**: this is an important 2nd vaccination guaranteeing protection in case young stock were protected by colostral antibodies at time of first vaccination.
WINTER	**Anthrax + Clostridial diseases vaccine**	**Anthrax**: vaccinate breeding females 2 – 6 weeks prior to lambing/kidding. **Multi-strain clostridial vaccine**: breeding herd females, males and replacement young stock.	**Anthrax**: recommend annual vaccination of whole herd in high risk areas. **Multi-strain clostridial vaccine**[2] is preferred for convenience and wide protection; including tetanus
SPRING	**Rev1 + Clostridial diseases + PPR**	**Rev1**: vaccinate adults according to breeding dates and NBCP schedule: vaccinate 4 – 7 week old young stock. **Multi-strain clostridial vaccine**: vaccinate all young stock 4 weeks or older and ear notch. **PPE**: vaccinate all young stock 4 weeks or older and ear notch.	**Rev1**: ***do not vaccinate females in early pregnancy***. If in doubt skip vaccination until following fall. **Multi-strain clostridial vaccine**: This is 1st vaccination of young stock; they will receive a booster vaccination in fall. **PPR**: this is 1st vaccination for young stock.

[2] Multiple strains of *Clostridial* sp. vaccines are widely used for protection against these diseases; they are considered safe, effective and are relatively inexpensive. Multiple strain vaccines are recommended as safe until proved otherwise in Tajikistan.

Seasonal Activities – parasite control, castration, culling & sales

Season	Activities	Production Groups	Comment
FALL	**Deworm, delouse, vitamins & minerals, mark for culling & selling**	**Deworm**: breeding herd of females, males & replacements coming off pastures. **Delouse**: look particularly on sides of neck and head. **Vitamins & minerals**: principle is to supplement essential vitamins and minerals as animals go into stress of winter. **Mark for culling / selling**: examine females for udder quality, all animals for sound feet, sound teeth, etc.; mark those for culling.	**Deworm**: use a larvicidal anthelmintic such as ivomectin or others at recommended dosages. *Valbazen* dose in goats is 7.5 mg/kg which is higher than label. **Delouse**: use recommended insecticide powder or dip. **Vitamins & minerals**: consult local vet for recommended products; vitamins A, D & selenium seem appropriate. **Cull / sell**: unsound animals before winter to avoid expense of feeding unsound animals.
SPRING	**Deworm**	**Deworm**: breeding *herd* of females, males & replacements when turn out to pastures. Deworm any *individuals* showing clinical signs of diarrhoea, anaemia or weight loss.	**Deworm**: contact local vet for recommended product to use. *Valbazen* dose in goats is 7.5 mg/kg which is higher than label.
	Castration	**Castrate**: unwanted male lambs and kids.	**Castrate**: extra males or males with poor breeding qualities; keep only best genetic replacement males

Representative cost of vaccines and remedies

The cost of the vaccination and treatments will vary with the prevalence of infection, service delivery costs and costs of vaccines or remedies used.

Anthrax vaccine USD36/50 or 100 doses	0.72 per dose
7 Way Clostridial vaccine USD30/50, 100, 250 or 500 doses	0.60 per dose
PPR vaccine USD40/50 or 100 doses	0.08 per dose
Ivomec USD35/50 ml or USDS104/200 ml	Varies
Albendazole 11.66% USD40/500 ml or USD73/ 1000 ml	Varies
Tylosin 200 mg USD29/250 ml	Varies
LA Tetracycline 200 USD20/100 ml or USD63/500 ml	Varies