



TECHNICAL BULLETIN No.45

Farm Level Biosecurity Measures for Sheep and Goats farms



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FORWORD

This Technical Bulletin titled “*Farm Level Biosecurity Measures for Sheep and Goats farms*” is the 45th produced by the Ethiopia Sheep and Goat Productivity Improvement Program (ESGPIP). The ESGPIP is a USAID funded Project with the objective of improving the productivity of Ethiopia’s sheep and goats.

Diseases cause by and large the greatest loss of animals through death and reduced production of sheep and goats. It is a very expensive undertaking to treat animals after they are sick. It is always better and cheaper to prevent the occurrence of diseases in the first place.

This technical bulletin provides guidelines useful for effectively preventing disease transmission by following biosecurity measures. The information can help development agents to assist producers about the importance and advantages of following biosecurity measures and reduce losses. The underlying principles apply to all animal enterprises even though the presentation in the bulletin makes reference to sheep and goats.

At this juncture, I would like to thank all those involved in the preparation and review of this technical bulletin.

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Farm Level Biosecurity Measures for Sheep and Goats farms

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1. Introduction

Sheep and goats play a significant role as a means of livelihood for millions of Ethiopians. Most sheep and goats are raised under traditional husbandry practices characterized by frequent mixing of different herds resulting in the rapid spread of many contagious diseases.

Efforts are underway to improve the productivity of sheep and goats to contribute to the national economic development and food security. The Ethiopia Sheep and Goat Productivity Improvement Program has developed small ruminant biosecurity guidelines for producers and traders to assist them in preventing disease entry to their herds. Improving animal health by minimizing the impact of diseases will assist producers and traders to maximize productivity, decrease treatment costs, and improve enterprise profitability.

2. Background

Historically, disease management of sheep and goats did not begin until one or more animals in a group became sick. The outcome of the illness and management steps taken may result in partial or complete recovery or death resulting in economic loss to the producer either by reduced productivity, purchase of medicines, or loss of an animal. In recent years, there has been a change in attitude from fighting diseases in individual animals to preventive health management for the whole population.

An integral part of health management is the biosecurity of the flock. A biosecure flock is one in which the chance of disease entry, either through other sheep and goats or mechanical transmission by vectors, is minimal.

2.1. Impact of diseases

Diseases are among the major limiting factors affecting the reproductive and productive performances of sheep and goats. Though death of sheep and goats is the most visible loss encountered as a result of a disease, this is usually only a small portion of the true cost of the disease. Additional productive or economic losses caused by disease include:

- Diseased sheep and goats require treatment, feed, housing and labor costs;

- Loss of weight or reduced reproductive efficiency;
- Some diseases cause restriction of export trades of live animals or their products; and
- Recovered animals may have poor lifetime productivity.

The cost of disease is high but many of these costs are **hidden**, such as reduced long-term productivity, whereas costs associated with prevention programs, e.g., vaccines, syringes, needles, etc., are very **obvious** in that they require an outlay of cash. Many producers feel that it is more cost effective to spend money treating sick animals than to spend money preventing them from being exposed to disease. For this to change, producers need to understand the extent of lost revenue caused by not preventing diseases from entering the farm compared to expenses incurred in keeping those diseases out.

It should be clear that no single biosecurity measure provides an answer to preventing all diseases. However, an integrated program of related precautionary measures should be considered at local or individual farm levels.

2.2. Disease transmission

Disease agents can be transmitted to animals either directly or indirectly.

Direct transmission occurs when a susceptible animal is exposed to sick animals and their secretions or excretions, such as respiratory air droplets; saliva; nasal, ocular or genital mucus; fetal fluids; feces or urine; milk; skin; or blood. Disease may also be transmitted directly through reproductive acts and in the uterus.

Indirect transmission occurs when animals come in contact with **infected inanimate objects, environmental fomites and animate vectors**. Needles, balling guns, dehorner, trucks, trailers, tires, shovels and wheelbarrows, contaminated soil, food and water, and other objects can spread disease indirectly. People can carry pathogens among animals and operations on their clothing, shoes and hands. Arthropods such as ticks, flies, mosquitoes and fleas can transmit pathogens from an infected animal to a susceptible animal.

Pathogens on air droplets can be transmitted through aerosol inhalation by sneezing or coughing of affected animals.

Pathogens can also be transmitted orally when susceptible animals consume contaminated soil, food or water, or lick or chew contaminated objects. Milk of infected ewes and does can transmit disease to nursing lambs and kids. Pathogens also can enter the body through breaks in the skin and cause a systemic infection.

To reduce the level of contaminants in the environment, routinely dispose of manure, disinfect feed and water troughs, and remove objects that animals might chew or lick.

Diseases entering the body by the reproductive route infect the genital organs of adult animals, fetuses and placenta of pregnant dams. A disease enters by the blood route when an animal is bitten by an infected vector, such as an arthropod, or injured by a contaminated instrument such as a needle, ear notcher, dehorner or balling gun.

3. Biosecurity

Biosecurity is a process or procedure of protecting a flock or herd from infectious diseases that do not currently exist on a property. It includes any precautionary measures that are taken to prevent diseases from emerging or from entering the farm. This process can be applied to an individual, a farm, a district, or an entire country.

The consequences of a serious disease outbreak may place an entire enterprise at risk. By having in place a clearly documented set of disease prevention and control strategies, producers can greatly reduce the risk of disease entering or spreading within the property.

3.1. Why is biosecurity important?

Preventing disease occurrence through biosecurity is the most cost effective way of protecting animals against disease. Diseases reduce the efficiency of production and decrease profits. Thus, it makes economic sense for sheep and goat farmers to ensure an adequate level of biosecurity to protect against losses and unnecessary costs associated with the control of diseases. The application of biosecurity measures will not necessarily guarantee prevention of disease entry but will limit the likelihood of entry and reduce disease incidence and dissemination.

3.2. Phases of Biosecurity

Biosecurity has four sequential phases: **mitigation, preparedness, response and recovery.**

- **Mitigation** is a type of prevention that lessens danger or harm by securing premises against infectious diseases.
- **Preparedness** includes planning and implementing mitigation practices. Producers analyze the weaknesses and strengths of their facilities to determine the most effective ways of protecting them.
- **Response** is handling a disease outbreak efficiently and effectively. The first 24 hours are crucial. Abnormal animal health issues, including massive die-offs and unusual symptoms must be immediately reported to the nearest animal health personnel, development agent or animal health regulatory officials.
- **Recovery** begins when the disease outbreak has been eradicated or controlled. During recovery, premises and facilities are restored to an acceptable operational level. Covering pits and disinfecting premises might be part of the recovery process.

3.3. Biosecurity program principles

A successful herd biosecurity program utilizes three important factors:

1. Increase the animal's ability to resist disease;
2. Minimize the number of contacts that result in disease; and
3. Eliminate the sources of the infectious agent.

3.3.1 Increase the animal's ability to resist disease

. Resistance to disease may be non-specific, meaning that an animal is in good enough health to generally fight infection; or resistance may be specific, meaning that the animal's immune system is prepared to defend against a particular disease agent.

Vaccines increase an animal's specific resistance to disease. Developing immunity to a disease is the protective response stimulated within an animal by vaccination. However, vaccinated animals may still get sick because of the following reasons:

- Pathogens different from those included in the vaccine were involved;
- The immune system was overwhelmed by the infection; or
- The vaccinated animal failed to mount a protective immune response.

Therefore vaccination programs must be considered as a supplement to other disease control procedures but do not replace them.

3.3.2 Minimize the number of contacts that result in disease

The number of effective contacts that may result in disease transmission can be reduced by physically separating animals. Methods of physical separation include quarantine of animals; segregation, often by age or class of animal; isolation of individuals; or reducing animal density by diluting the number of animals over a larger geographical area.

3.3.3 Eliminate sources of the infectious agent

Reservoirs of infection for sheep and goats are other animals or objects that the agent depends on for survival; including other sheep and goats, cattle, people, birds, rodents, manure, soil, and others. Infectious agents may reside in carrier animals that are infected but show no clinical illness or they may survive in the environment waiting to be transmitted to the host animal by direct or indirect contact.

The infection status of a herd is often classified as disease-free, usually meant in terms of specific diseases. This claim is often supported by disease testing or lack of incidence of a particular disease in that herd. When searching for new stock, it is best to acquire animals only from source herds that known to be free of infected animals.

3.4. General Biosecurity measures

The following steps are recommended for establishing a biosecure farm:

- Keep a flock or herd history. This records the details of all individual animals.
- Start a herd or flock with good, healthy individuals.
- Design and follow a quarantine protocol for animal additions to the herd.
- Prevent unplanned contact with other animals over which you have no control.
- Provide medication only as necessary, or as recommended by veterinarians.
- Practice good sanitation and keep the farm clean.

- Provide adequate housing and shelter for all sheep and goats.
- Minimize animal stress through good management practices.
- Provide sufficient feed in a balanced ration formulated for different seasons of the year.
- Limit visitors to the farm.
- Limit vehicle traffic onto the farm to those that are essential for farm business and provide an area outside the farm to disinfect tires.
- Control insect populations and the access of wildlife, rodent, bird, and domesticated animal populations to your farm.
- Ensure that feed is not contaminated by manure or urine.
- Disinfect reusable equipment between animals.
- Examine the herd for diseases.
- Design and implement a disease control program as soon as potential diseases are detected inside the farm.
- Consult animal health personnel and vaccinate the herd against clostridial and other important locally endemic diseases.
- Formulate and follow a strategic deworming program designed to prevent internal parasite problems and maintain dewormer drug effectiveness.
- Treat animals returning from market or exhibition as new additions to the herd and follow a quarantine protocol for these animals.
- Necropsy all animals that die on the farm as a means to diagnose any diseases present.

3.5. Specific biosecurity measures

3.5.1 Bringing new animals into the herd

The most common source of new infections is new animals introduced into the herd. Sheep and goats can appear healthy while at the same time carrying a range of diseases. Purchasing sheep and goats that have the least disease risk must be a primary aim of farmers. The risk of buying infected sheep and goats cannot be totally eliminated, but can be significantly reduced by making careful enquires regarding the health status of the sheep and goats.

Once a decision is reached on buying an animal, follow these steps:

1. Find out the disease history of the herd of origin, the results of previous disease testing and the herd's current health.
2. Determine the pre-purchase disease status of the individual animal(s) that you are purchasing. Check teeth, udders, and in the case of males, ensure they are reproductively sound. Examine feet of all the sheep and goats and treat as necessary for foot rot. A veterinary examination prior to purchase and transport may help in identifying important diseases in sheep and goats.
3. If the sheep and goats appear healthy, transport them in clean vehicles to your herd and place them in quarantine or an isolation area. The quarantine area should have adequate fencing to ensure containment of isolated sheep and goats. The location is important to minimize contamination of other paddocks and areas of the farm. If a disease has been introduced, vigilance will help detect the outbreak in the early stages, so that its spread can be prevented and damage minimized.

The ideal duration of quarantine is 30 days. A quarantine facility or isolation area is an animal holding facility that is physically separated from the rest of the herd. There should be no fence line contact, no aerosol contact, no manure runoff contact and no potential for spread by fomites or vectors. Change boots and clothing before entering quarantine facilities and don't go back to the main herd after you have been in the quarantine unit.

4. At the midpoint of the quarantine period a careful physical examination should be performed to ensure the animal is free of physically obvious diseases. At the same time consider retesting the animal for critical diseases to exclude from your herd. There exists a distinct possibility that the purchased animal will test positive to a disease for which it was negative at time of purchase. The following situations could cause this scenario:
 - The animal was incubating the disease at the time of purchase.
 - The initial test was a false negative.
 - The stress of movement caused a latent infection to reactivate.
 - The animal was exposed to the disease in transit or after reaching your farm.
 - Some form of dishonesty or "laboratory error" has occurred.

5. At this time it may be beneficial to administer appropriate antibacterial drugs; deworm and vaccinate for common diseases found in the area and herd.
6. Acclimatize new animals to the environment, feed and water. This will allow the animal's innate resistance to be minimally stressed and will help the sheep and goats in preventing disease. Sudden changes in food and water are viewed with suspicion which means they may eat or drink less than they should.
7. At the end of the quarantine period it would be wise to allow exposure of the new animal to a small group of the herd. If these selected animals don't get sick after mixing with the purchased animal one can assume that the rest of your herd will be safe. If the selected animals do get sick, they can be kept in quarantine until cured or removed from the herd. By following this procedure, you prevent the whole herd from being infected with a potential disease and you have proven that the incoming animal is not a carrier of disease.

3.5.2 Other sources of contact

In addition to bringing a new animal into the herd, direct animal contact can occur when grazing along fence lines in the presence of neighboring animals, during communal grazing times, or during movement of animals for sale and returning home unsold. These exposed sheep and goats should go through a quarantine period before being reintroduced to the herd. In order to avoid fence-line contact with other animals, double fencing of the perimeter is required. When greeting new arrivals sheep and goats snort and blow nasal secretions. These droplets will travel up to 1 meter so animals should be separated by fencing at least twice that far (2 meters).

Diseases from other species

Cattle, sheep and goats share a number of diseases and mixing these species is not necessarily safe. Other animal species can also transmit disease. For instance, Toxoplasmosis is a disease that causes abortions in sheep and goats. The infectious agent is a protozoan parasite that is transmitted by the domestic cat. Cats get infected by eating diseased mice. Sheep and goats get infected when they fed grain contaminated with cat feces. Control rodent populations on the farm.

Diseases introduced by fomites

People (visitors): A strategically placed notice on the entry gate of the farm will help ensure that all visitors check in at the office before having contact with stock. Disinfecting footwear and wearing clean outer clothing should become routine practice for personnel arriving for work on the farm. It is best to keep people (especially other livestock producers) from entering and walking through your facility without following biosecurity measures.

Trucks and trailers: Trucks and trailers that are used for hauling livestock accumulate manure and other body fluids. If these vehicles are not washed and sanitized between loads they can serve as a very efficient fomite. Similar arrangements should be made for feed trucks and other farm service vehicles.

Feed: Feed can be a source of infectious material onto your farm. The feed can get contaminated at the mill, at the store, or on your farm by feces from birds or rats. This contamination could result in feeding grain mixed with Salmonella or other infectious agent to your animals. The solution is to buy feed from reputable suppliers, keep the feed in rodent proof containers and avoid having spilled grain on the premises as it serves to draw birds and rodents.

Water: Well water can be a source of contamination from manure or chemical (fertilizer, pesticide, etc.) runoff and may serve as a source of disease. Water that flows onto the property from other livestock enterprises should always be fenced off.

Movement of effluent between properties: Contact of uninfected animals with infected effluent coming from an adjacent infected farm or property can spread disease.

Dead animals: All mortality should be handled and disposed of properly to prevent access by herd mates, predators, rodents, cats, etc., and eliminate the opportunity for disease transfer.

Movement of contaminated personnel and equipment: Movement of people, clothing, footwear, equipment and vehicles between infected and uninfected premises should be avoided to limit disease spread within and between enterprises

Vectors: Vectors are animals or insects that spread disease. Select livestock facility sites on areas that are not prone to water logging and vector multiplication. It is also good to use fly repellants and immunize the sheep and goats against the common vector borne diseases.

4. Biocontainment

After protecting the herd from outside threats, it is also important to control diseases which already exist within the established herd.

4.1. Limit disease spread

Limiting the disease to a certain population of animals in the herd or to a certain geographic location in the herd and not allowing it to spread can be achieved by:

- Isolating affected sheep and goats in a pen away from the rest of the herd.
- Removing non-infected lambs or kids from infected dams to prevent potential infection.

4.2. Follow an all-in-all-out policy

Another important concept of biocontainment is to bring a set of animals into a facility, raise them to a specified production level, remove all animals at the same time, then clean and disinfect the facility prior to introducing the next group.

4.3. Immunization of the established herd

Health in sheep and goats is a balance between the resistance of an animal to disease and the dose of disease to which it is challenged. Sanitation is the tool used to reduce disease challenges to animals.

Disease resistance is composed of environmental factors and immunologic factors. Sheep and goats that are well fed and housed will be more resistant to disease than those that are poorly nourished and poorly housed.

Sheep and goats that are immunized through vaccination against a specific disease will be more resistant to it than those that have not been vaccinated and consequently do not have immunity. To protect sheep and goats from disease through vaccination, it is important that vaccination be carried out prior to the challenge of the disease.

By combining local information on disease occurrence with epidemiological knowledge, disease prevention program could be developed by animal health staff and the Kebele Development Agent (KDA).

The program should include routine annual vaccination of sheep and goats for the following diseases:

- Pasteurellosis ovine;
- Sheep and goat pox;
- Anthrax;
- Pest des petits ruminants (PPR)
- Caprine pleuropneumonia (CCPP) for goats.
- Blackleg

During an outbreak of disease, a ring vaccination program for sheep and goats found around the outbreak area is conducted, serving as a barrier to halt the spread of infection.

Table 1. Locally available vaccines for bacterial and viral disease of sheep and goats.

Disease	Vaccines	Dosage, administration, revaccination, and precaution	Package	Storage °C
<i>Peste des petits ruminants</i> (PPR)	PPR 75/1, Vero 76	Sheep and goats, inject 1ml under skin, immunity lasts one year, revaccination after 1 year	Vial of 100 doses	-20
Ovine pasteurellosis	Pasteurella multocida type "A"	Sheep and goats, inject 1ml under skin., immunity lasts for 1 year, revaccinate after 1 year	Vial of 50 doses	+4
Antrax	Sterne 34 F ² strain of Bacillus anthracis	Sheep and goats, inject 0.5ml under skin, immunity lasts for one year, revaccination after 1 year	Vial of 100 doses	+4
Sheep & goat pox	Sheep & goat pox ksgp-0180	Sheep and goats, inject 1ml under skin., immunity lasts for one year, revaccination after 1 year	Vial of 100 doses	-20
Contagious caprine pleuropneumonia(CCPP)	F38	Goats, inject 1 ml under skin, immunity lasts for one year, revaccinate after 1 year		+4
Blackleg		Sheep and goats, inject 0.5 ml under skin, immunity lasts for 1 year, revaccination after a year.	Vial of 50 doses	+4

Source: National Veterinary Institute, Debre Zeit.

5. Disease Surveillance

Disease surveillance is a very useful tool in disease control programs. Disease surveillance lets someone know how a disease control program is working at various points in time.

There are two general methods to survey the level of disease in a herd, examining animals and examining data collected from animals.

As an example, if the level of clinical parasitism in a herd of sheep and goats is a concern, one can look at the animal itself using a FAMACHA protocol. Examine the color of the conjunctiva (inner lid) of the eye and give a score between 1 and 5 as described on a FAMACHA chart. A score of 1 is given if bright red. If pale and white, the animal receives a score of 5. Sheep and goats with scores of 3, 4, and 5 are anemic as a result of clinical parasitism. If your sheep and goats score 1 or 2 your parasite control program is working very well. To examine data collected from animals, fecal and blood samples could be collected and tested by a laboratory to determine the presence of parasitism.

Some diseases may present few external signs. Instead of waiting for disease signs, it would be appropriate to request the nearest diagnostic laboratory to test for disease by serology or bacterial culture. It is important to understand that when clinical disease is seen in one sheep or goat that herd mates may also be infected leading to a larger disease problem. With most diseases, 10 to 20 subclinical cases can be found for every clinical case seen.

5.1 Necropsy

A very useful surveillance tool is to have necropsies performed on dead and moribund animals. Whenever there is an unexpected death in the herd it would be appropriate to have your veterinarian perform a necropsy to find the cause of immediate death. Further information can be found in ESGPIP Technical Bulletin No. 33 Postmortem techniques for sheep and goats.

6. Carcass disposal

Mortality happens on all farms. A biosecurity protocol should have a disposal plan. The following methods of carcass disposal can be applied:

- **Incineration:** the most expensive way but has the advantage of speed.

- **Burial:** cheap but may cause problems of contamination of ground water and odors. It is recommended to bury the carcass at least 1 meter deep and at least 2 meters above the water table.
- **Composting:** cheap, environmentally friendly method of carcass disposal but requires some knowledge of the technique to work successfully. If done improperly, composting can create odors and contaminate ground water.

7. Identification

Individual identification of animals will help to evaluate individual animals. Each animal will need a tag, tattoo or ear notches so that anyone can identify it. Due to the nature of sheep and goats it is wise to use at least 2 forms of identification in case one is lost.