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PARTICIPANT MANUAL

BIOSECURITY FOR FARMS AND MARKETS IN NIGERIA

JANUARY 12-23, 2009 KADUNA, FEDERAL REPUBLIC OF NIGERIA



January 2009

This publication was produced for review by the United States Agency for International Development. It was prepared by the STOP AI Implementing Partners.

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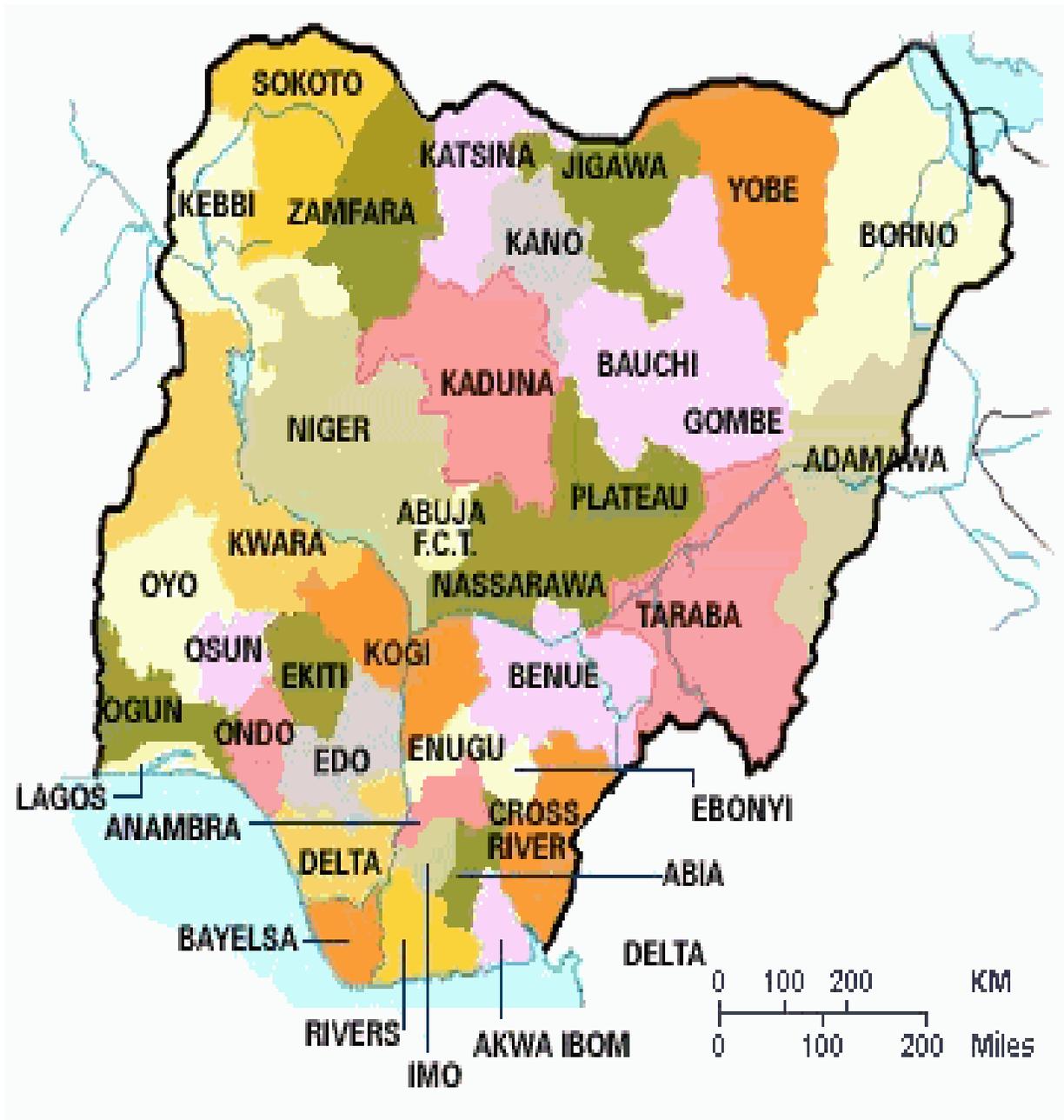
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STOP AI NIGERIA



ACKNOWLEDGEMENTS

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BIOSECURITY FOR FARMS AND MARKETS IN NIGERIA

BLOCK SCHEDULE

TIME	DAY 1	DAY 2	DAY 3
AM	<p>Opening Ceremony</p> <p>Overview of AI in Nigeria</p> <p>Biosecurity Risks and Principles</p>	<p>Biosecurity Practices for Transporting Poultry to Market</p> <p>Biosecurity Practices for Live Bird Markets</p>	<p>Biosecurity Planning exercise</p> <p>Biosecurity Risk Assessment</p>
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OBJECTIVES

By the end of the course, participants will be able to:

- Define avian influenza;
- Make a distinction between different avian influenza subtypes and pathogenic forms;
- Describe how the avian influenza virus is transmitted;
- Define the three principles of biosecurity: isolation, traffic control and sanitation;
- Identify potential biosecurity risks;
- Explain appropriate biosecurity measures for poultry farms (large scale and small holder);
- Explain appropriate biosecurity measures for poultry transport and those that are appropriate for Nigeria;
- Explain appropriate biosecurity measures for live bird markets (urban and rural) and those that are appropriate for Nigeria;
- Advise poultry growers, sellers, and live bird market administrators in developing a biosecurity plan;
- Transfer biosecurity concepts and techniques to various audiences.

TRAINER BIOGRAPHIES

Dr. Paul Abdu is a veterinarian from Nigeria. He has been a consultant in avian medicine since 1989 and has worked on routine diagnosis of AI since 1981. Dr. Abdu has been a member of the National Technical Committee on AI in Nigeria since 2006 and consulted to the FAO on AI disease surveillance. He attended the Bird Flu School at Texas A&M in 2006, and the STOP AI Pre-deployment Consultant Course in Dakar, Senegal in 2007. Dr. Abdu served as one of the core trainers for the series of STOP AI training courses on AI commodities use delivered in Nigeria in April 2008. He is presently employed by Ahmadu Bello University in Nigeria where he also earned his Doctor of Veterinary Medicine degree.

Dr. Garba Maina Ahmed is a veterinary epidemiologist from Nigeria. He has been an FAO consultant since April 2006. In this position, he provides technical advice on the control and eradication of HPAI. He was involved in preparing Nigeria's Active Avian Influenza Disease Surveillance Study. Dr. Ahmed also participated in the review of Nigeria's Avian and Human Influenza Pandemic Preparedness Plan and attended the STOP AI Pre-deployment Consultant Course in Dakar, Senegal in 2007. Dr. Maina served as one of the core trainers for the series of STOP AI training courses on AI commodities use delivered in Nigeria in April 2008. He holds a Doctor of Veterinary Medicine degree from Ahmadu Bello University in Zaria, Nigeria and a Masters degree in Epidemiology and Economics from the Utrecht University of The Netherlands.

INTRODUCTION TO BIOSECURITY RISKS AND PRINCIPLES

MODULE PURPOSE

To learn the basics about biosecurity risks and principles for preventing an H5N1 HPAI outbreak, and to provide an overview of the natural history of AI, with particular emphasis on H5N1 Highly Pathogenic (HPAI) strain.

MODULE OBJECTIVES

At the conclusion of this module, participants will be able to:

- Define the three principles of biosecurity: isolation, traffic control, and sanitation;
- Identify potential biosecurity risks in farms and live bird markets.

LESSON 1: WHAT IS BIOSECURITY?

The term biosecurity means “protecting life.” Protecting your poultry from disease is critical to the success of your farm or market.

What is Biosecurity?
Bio = Life
Security = Protecting
Biosecurity = Protecting Life

Biosecurity is a set of practices designed to prevent the spread of disease into your farm or live bird market. It is accomplished by maintaining the farm or market in such a way that there is minimal traffic of disease-causing agents crossing its borders. In its simplest meaning, it is the process of keeping germs away from poultry and keeping poultry away from germs.

Biosecurity is the cheapest, most effective means of disease control available. Preventing diseases is always cheaper than treating or suffering the effects of disease. Small investments in improved housing and equipment, and creating and training staff on proper biosecurity procedures will lead to healthier and more productive birds.

There are simple steps, or biosecurity practices, that you can use to prevent HPAI, Newcastle disease, and other poultry diseases from entering your farm and infecting your birds.

Biosecurity has three major components:

1. **Isolation** – Keeping your poultry protected from sources of infection – including unauthorized access and carriers of disease – and separating groups of animals to minimize the spread of infection across the population.
2. **Traffic control** – Limiting incoming traffic and traffic within your farm or market, and controlling the movement of equipment, vehicles, people, feed, birds and eggs to prevent exposure to disease.
3. **Sanitation** – Regularly cleaning and disinfecting housing, equipment, vehicles, and people to destroy disease agents.

ISOLATION

Creating an environment where poultry are protected from carriers of disease – people, other animals, air, water, etc. and/or keeping your poultry protected from sources of infection – including unauthorized access and carriers of disease – and separating groups of animals to minimize the spread of infection across the population.

For example:

- Keeping poultry in closed, screened buildings on the farm, and in secure cages at the market
- Practicing All-In, All-Out Management
- Separate poultry from other animals and from other poultry species
- No standing bodies of water on property
- Live bird markets in large municipal markets can be isolated by fencing and creating one single entry and exit point

TRAFFIC CONTROL

Controlling the movement of people, animals, equipment, and vehicles into, out of, and within a farm or market.

For example:

- Not allowing unauthorized persons onto farm property
- Requiring vehicles not used for farm work to be parked at the farm gate
- Working from healthy to sick, young to old birds
- Not allowing poultry dealers on to the farm
- Single entry and exit points can help control traffic in markets.
- Market should be set up so that human traffic flows in one direction – from the entrance to the exit
- An unloading area should be created for vans and other vehicles transporting birds from farms. This controls the flow of traffic and restricts the potential entry point for disease to one area. Also, a single unloading area is easier to clean and disinfect.

SANITATION

Regular cleaning and disinfection of housing, equipment, vehicles and people

For example:

- Workers wash hands and feet, change clothes and shoes before working with birds
- Clean and disinfect equipment regularly
- Clean and disinfect poultry houses and cages between flocks
- Have a pest control program

An essential prerequisite to biosecurity is good management and animal husbandry – keeping poultry healthy so they are naturally resistant to disease, and closely monitoring their health for signs of illness.

In order to effectively guard against the entry of disease, it's important to understand how diseases are spread. Infectious diseases can be spread by:

ANIMALS

- Introduction of new birds that may be diseased
- Introduction of birds that are carriers of disease
- Transfer of birds from farm to farm
- Vertical transmission of diseases through egg transmission. **This does not apply to HPAI.**
- Carcasses of dead birds
- Pests: rodents, wild animals and birds

PEOPLE

- Workers, maintenance personnel, neighbors, family members, poultry sellers and visitors in general can carry disease on their clothes, shoes, hair, etc.

EQUIPMENT AND MATERIALS

- Maintenance equipment, tools, toolboxes, wheelbarrows and buckets can be all easily contaminated
- Feeding equipment – drinkers and feeders
- Contaminated materials such as feed, feed bags, egg flats, crates, coops, etc.

INSECTS

- Insects such as flies and beetles are known to carry disease in poultry houses

VEHICLES

- Any vehicles (trucks and motorbicycles) entering and moving within the premises such as feed and chick delivery vehicles, litter removal vehicles, and vehicles belonging to veterinarians, poultry company salesmen etc. can all potentially introduce disease onto a farm

INANIMATE OBJECTS

- Objects such as plastic bags, empty containers, shoes and clothing can be contaminated easily by fecal material

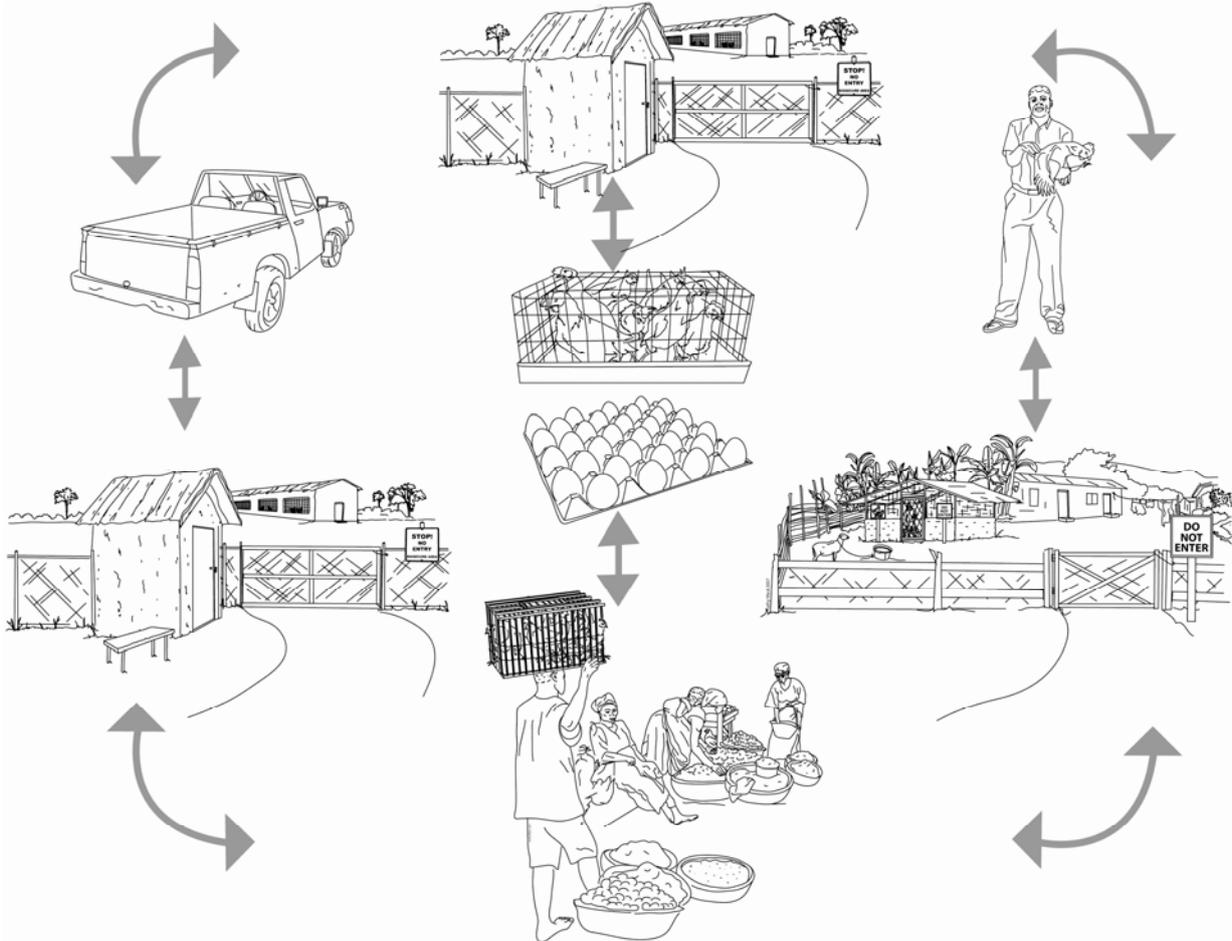
WATER

- Impure water such as surface drainage water
- Ponds and streams attracting wild waterfowl

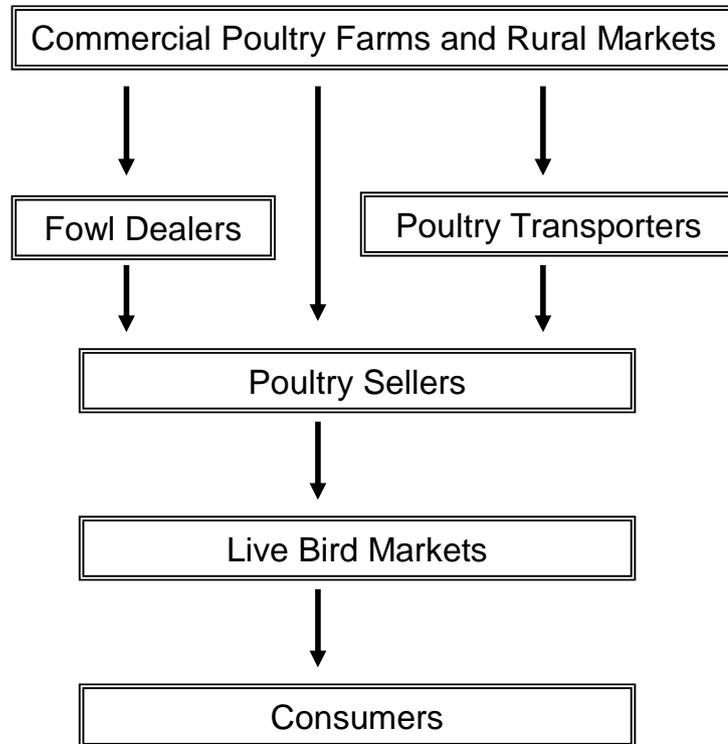
ENVIRONMENT

- Contaminated premises through soil and litter

The introduction of new birds and traffic pose the greatest risk to bird health. Properly managing these two factors should be a top priority on your farm or market.



How disease spreads between farms and markets.



The movement of poultry from farm to market.

EXERCISE: IDENTIFYING RISKS

In your group:

- Identify the common physical conditions and human behaviors that put poultry at risk of disease in the location assigned to your table (commercial farm, smallholder farm, dealers and transporters, live bird markets, consumers).
- Record as many as you can think of on the flip chart.
- Identify one person to present your list.
- Take about 10 minutes to create your list.
- Use the space below to capture your ideas and those of others.

INDIVIDUAL REFLECTION WORKSHEET

What are **three** points you want to remember from this module?

1.

2.

3.

What additional information do you need on this module?

NOTES

BIOSECURITY PRACTICES TO PROTECT YOUR COMMERCIAL FARMS FROM HPAI

MODULE PURPOSE

To learn the basics about biosecurity risks and principles for preventing an H5N1 HPAI outbreak.

MODULE OBJECTIVES

At the conclusion of this module, participants will be able to:

- Define the principles of biosecurity applicable to commercial farms in general and Nigeria in particular;
- Identify the potential biosecurity risks for these farms;
- Propose improved biosecurity measures;
- Define principles and methods of sanitation for commercial farms.

LESSON 1.1: BIOSECURITY PRACTICES FOR COMMERCIAL FARMS OVERVIEW

NOTE: This section contains several recommendations for implementing the principles of biosecurity and protecting your farm from HPAI.

For some recommendations, you will see different options presented – identified as either “Best Practice,” or “Good Practice.” Whenever possible, you should use the “Best Practice.” However, if this is not an option in your current situation, the “Good Practice” suggestion will provide you with an alternative until you are able to upgrade to the “Best Practice.”

1. Practice Good Animal Husbandry
2. Design and Maintain Your Farm to Keep Diseases Out
3. Control Entry to and Movement on Your Farm
4. Keep Your Farm Clean

PRACTICE GOOD ANIMAL HUSBANDRY

Healthy birds are less likely to get sick, and one sick bird can spread disease to many other birds very quickly. Thus, it is very important to maintain good animal husbandry practices that will ensure your birds are healthy and resistant to disease.

1. **Provide Enough Feed and Water**
Sufficient feed and water will make birds healthy, grow rapidly and produce large numbers of eggs.
2. **Remove Dead Birds from Your Flock at least 2 Times per Day**
Often live birds will eat dead birds and the live birds will get the disease that the other bird died from.
3. **Cull Sick Birds Regularly**
Sick birds serve as a source of germs for healthy birds. In large flocks, sick birds will never reach the growth or production potential of healthy birds. Remove sick birds from the flock, kill them humanely, and dispose of the carcasses by burning or burying.

4. Monitor Your Flock's Health by Keeping Good Records

Good records will help you find disease and production problems early when they are easier to treat or correct. Collect the following information for each flock (some sample forms are provided in Appendix D, E and H):

- Bird inventory – the number of birds placed in the house with the daily death loss subtracted.
- Number of dead birds collected each day.
- Amount of food and water consumed each day.
 - You can gather this information by keeping track of how many bags of food need to be added to the feeders each day. That will be the amount consumed during the previous day.
 - Measure a bucket to see how much water it will hold and then record the number of buckets needed to fill the drinkers each day.
- Number of eggs collected each day.
- Vaccines given, plus name, manufacturer and expiration date of the vaccine.
- Drugs, minerals or vitamins added to the food or water.
 - Remember to include how the drug was given (feed, water, etc.) and how long the medicine was given.
- Weight – for all birds, especially meat-type birds, weigh a representative sample, usually 30 to 100 birds, once a week and record that information also.

5. Never Add New Poultry to an Existing Flock

Either adding roosters to a flock of breeders or introducing new hens to replace dead ones often results in bringing disease to flocks.

6. Do Not Keep Multiple Species of Poultry (Chickens, Turkeys, Ducks, Pheasants, and Guinea Fowl) on Your Farm

One species may serve as a disease source for other species. Ducks may be infected with H5N1 HPAI or other avian influenza viruses and show no signs of disease.

Best Practice: The best management practice is “All-In, All-Out”: this means you place all the birds on your farm at one time, raise them (and possibly collect eggs), and then sell all the birds on your farm at the same time.

Allow 2 to 4 weeks between flocks, with no birds on the farm, to break any disease cycle.

Good Practice: If multiple ages of poultry are kept on a farm, *never* have poultry of more than one age in a single pen.

LESSON 1.2: DESIGN AND MAINTAIN YOUR FARM TO KEEP DISEASES OUT

Disease can be brought onto the farm by people, new poultry, equipment, village poultry or wild animals including wild birds; so, it is important that you restrict access to your birds wherever possible. By restricting access, you are practicing *isolation* and protecting your birds from carriers of disease.

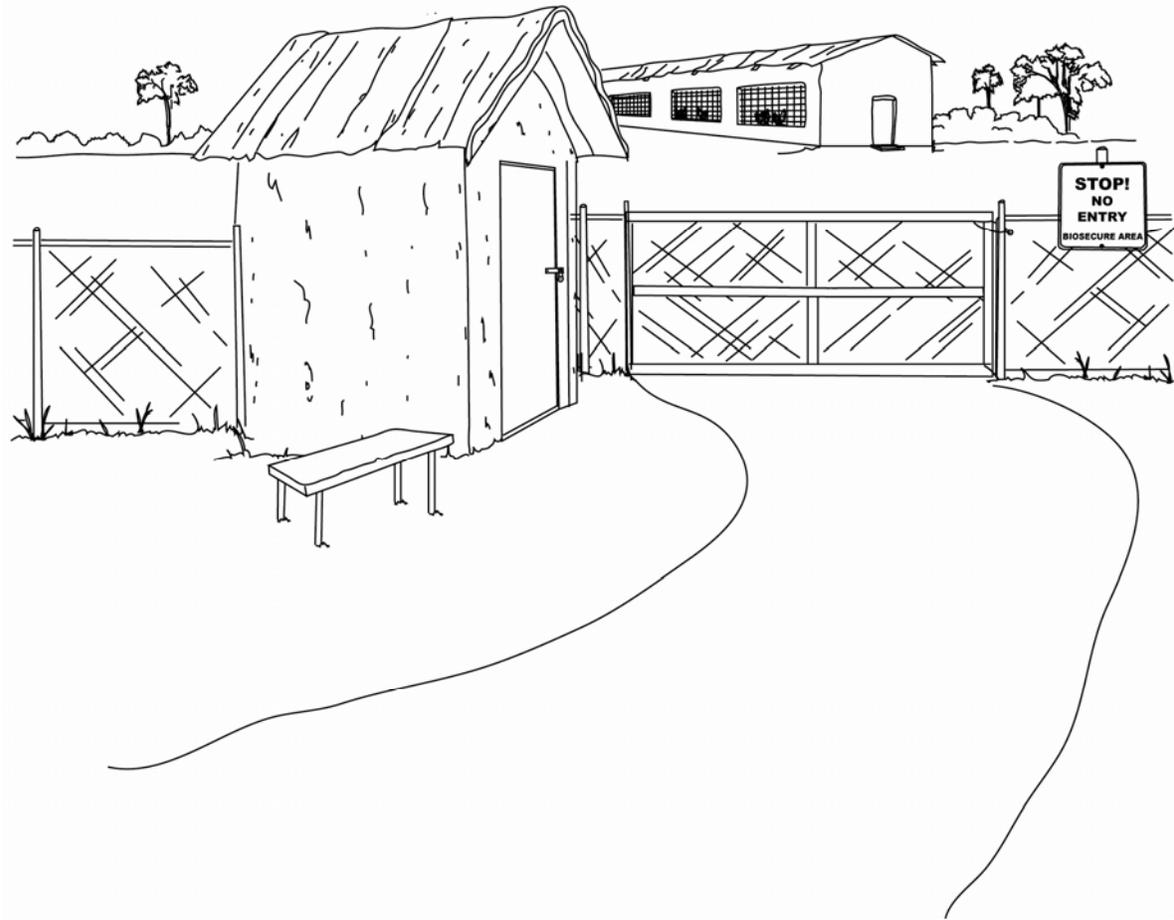
Restrict Access to the Entire Farm

- Build a farm gate and fence to keep out unwanted visitors and animals:
 - Keep the gate closed, and locked if possible, when not in use.
 - Put up signs that say “Do Not Enter” on all gates.
 - Repair holes in fencing so that village poultry and small animals cannot get into your farm or poultry area.

Best Practice: Fence the entire farm and then build another fence or arrange the area where poultry are kept so people will know when they are about to enter the poultry area.

Good Practice: If it is impractical to fence the entire farm, at least fence the poultry area.

- Never allow bodies of water (standing water, ponds) on your farm because it attracts wild waterfowl and can be a breeding ground for insects. Waterfowl are known carriers of HPAI; insects may be carriers as well.



A well-designed commercial poultry farm

This farm has a fence, a closed gate, a warning sign, and a place for workers and visitors to change their clothing and shoes.

LESSON 1.3: CONTROL ENTRY INTO YOUR FARM AND CONTROL MOVEMENT WITHIN YOUR FARM

The previous sections show that a good farm design with gates, fences, doors, and screening, as well as careful planning for re-stocking birds, are important to protect your poultry from outside sources of diseases like HPAI. However, you have to make sure that you, your farm workers, your family, and visitors follow basic steps when moving to and from your farm so they do not bring diseases to your farm.

1.3.1 Entering the Farm

Visitors

- Allow only visitors with legitimate business to enter your farm.
- Keep a written list of people who visit your farm. This will help you to remember who has visited and when, in case they are suspected of bringing disease onto your farm.

Best Practice: Keep a visitor logbook (see Appendix C for an example). Require visitors to write their name, date of visit, contact information, and any poultry facilities visited in the last 10 days. This includes any place where live birds are housed (even if there were no birds on site when visited) or birds are slaughtered. In case of an outbreak of HPAI or any other disease, this information will make it easier to track down the source of infection and to start disease prevention and control measures.

- **Every person** who enters the farm must take precautions not to bring disease onto the farm on their body, clothes, or footwear (see “Best Practices” for farm workers below). Family and visitors should be provided with a change of footwear, water-resistant disposable shoe covers, or have their footwear washed and disinfected at the farm gate.
- Visitors should never be allowed into bird pens. If visitors such as agriculture workers or others must enter bird pens, they must change into clean clothes and footwear, wear a hair cover, and wash their hands or put on clean gloves before entering pens.



Visitors should not enter poultry houses unless absolutely necessary.

Farm Workers

- Do not hire farm workers who raise birds for food or have birds for pets on their property. They may carry disease from their birds to your birds.

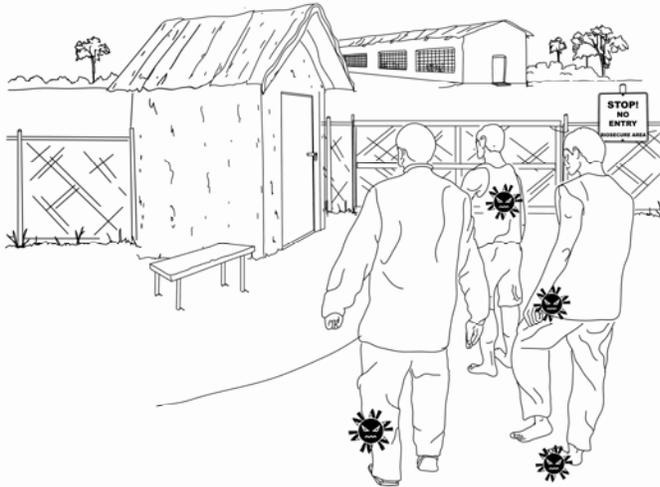
Best Practice: Provide your workers with meat or eggs so they are not tempted to raise birds at home.

- All workers should bathe before coming to work. Make sure you always have soap and water available so that workers can wash their hands and feet prior to entering bird areas. This should also be done whenever they leave and re-enter the farm.

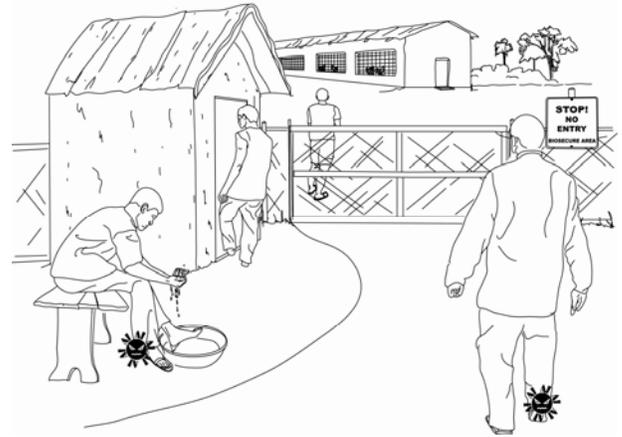
Best Practice: Workers should wear footwear and clothing that never leaves the farm.

- Build a place near the farm entrance for workers to wash their hands and feet and put on clean clothes and footwear, which you provide, before they enter the farm.
- Work uniforms and different colored slippers make it easy to see who is following the biosecurity practices correctly. Slippers can be spray painted to mark them as “farm slippers.”

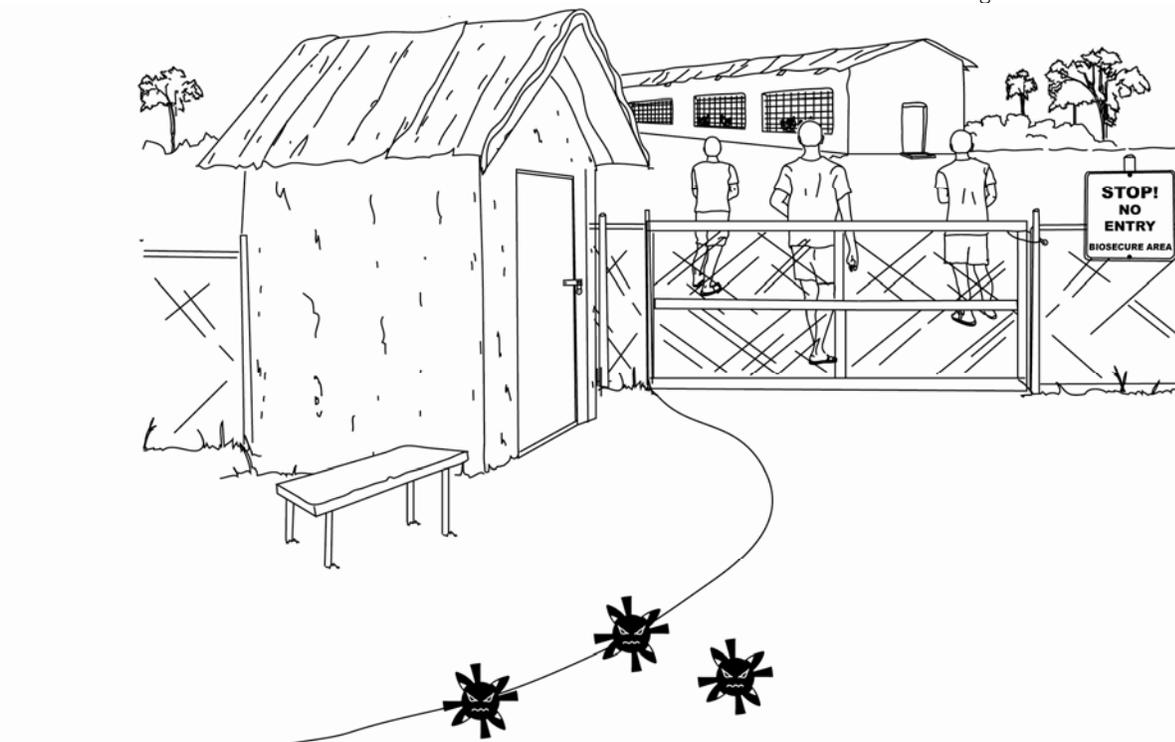
Good Practice: All workers must clean and disinfect their footwear upon entering the farm. They should arrive wearing clean clothing or change into freshly laundered clothing when they arrive.



Arriving at work.



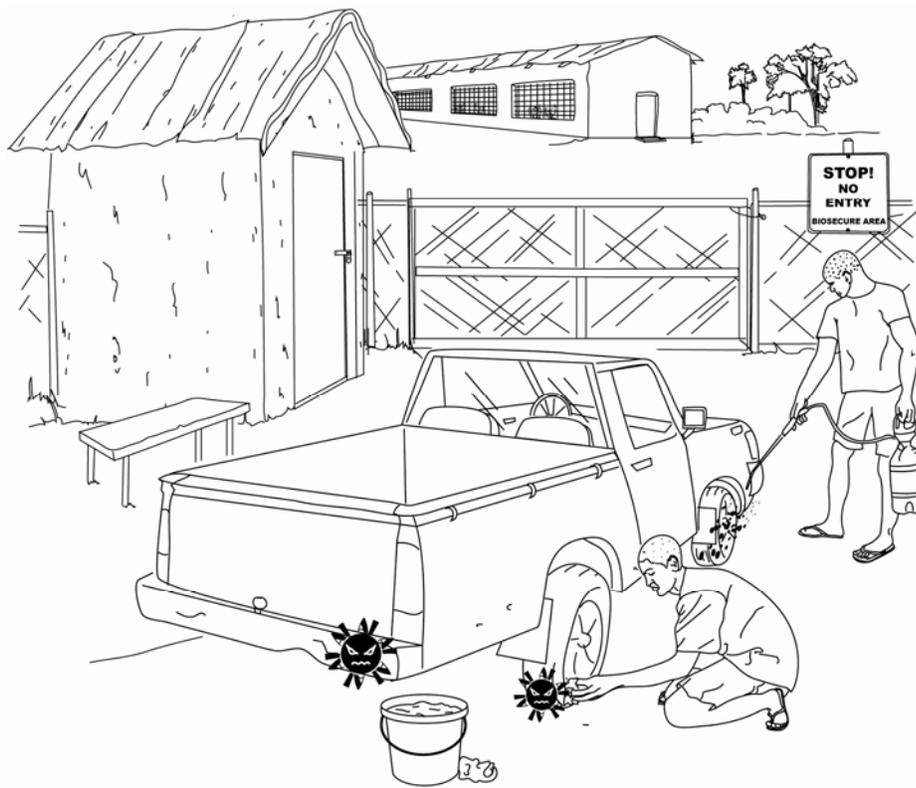
Workers wash hands and feet, and change clothes before entering the farm.



Workers have washed their hands and feet, changed clothes and shoes, and are ready for work.

Vehicles and Equipment

- All vehicles (cars, trucks, bicycles, motorcycles), carts, and equipment that are not used for farm work or business should be left outside the farm gate. All of these can carry disease and must never be allowed near the bird pens.
- Vehicles and equipment that are used for legitimate farm operations (such as feed delivery and hauling of market-age birds or eggs) must be cleaned and disinfected at the farm entrance to remove any organic material (feces, feathers, litter, dirt, etc.) or other disease carrying agents.
 - Clean and scrub vehicles with soap and water (hot water preferred) to remove all dirt, feathers, bedding, blood, and excrement before disinfecting.
 - Clean both the vehicle's wheels and underside, and surfaces that have come in contact with birds or cages on the exterior and interior of the vehicle.
 - Use an appropriate disinfectant, at the recommended concentration for the recommended contact time (usually 10 minutes).
 - Apply disinfectant with a sponge, brush or spray unit.



One person washes. The other disinfects after the truck is washed.

Feed Truck

Best Practice: The feed truck should not come onto your farm, this is especially true if the truck does not belong to you and makes stops at several other farms.

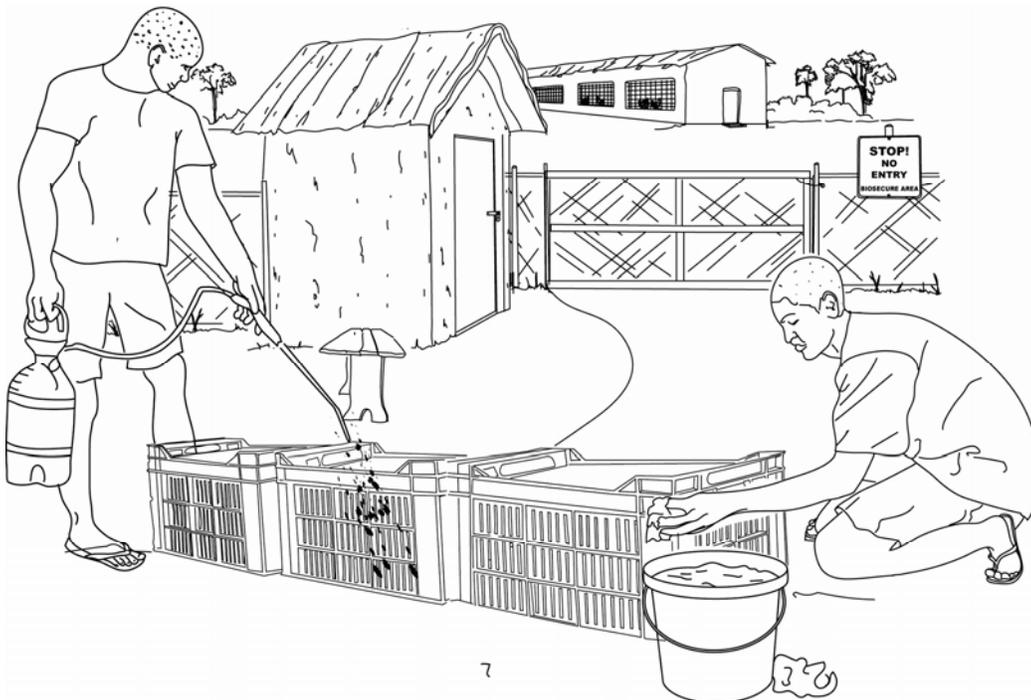
Have the feed delivered to the front gate and then have the workers move the feed into the farm.

Good Practice: If the feed truck must enter your farm:

- Wash and disinfect the truck at the farm gate
- Do not allow the feed truck driver to get out of his truck
- If the driver must get out, he must wear water-resistant shoe covers and should never enter a poultry building
- Be a good neighbor and wash and disinfect the truck as it leaves your farm.

Equipment

- Poultry crates, plastic egg flats, and other equipment that have been taken off the farm must be thoroughly cleaned and disinfected, and allowed to dry under the sun for at least 2 days before allowing them to come in contact with your birds. This destroys infectious agents that may transmit disease to your poultry.
- Do not store or keep flats, crates or other equipment where they can be exposed to wild ducks, geese, swans or other water birds.



One person washes the crates and the other disinfects after all organic material is removed.

Best Practice: Use one color of plastic crates or flats that are used only on the farm and use a different color plastic crates or flats that leave the farm.

Before leaving the farm, eggs can be transferred from the farm-only crates to the external-only crates near the farm gate.

If you have multiple breeder farms and a hatchery, color code the egg crates/flats so that only one color of egg crate/flat is used per farm.

Good Practice: Clean and disinfect any plastic egg flats, crates or equipment taken off the farm as soon as you return, in an area near the gate and as far away from birds as possible.

1.3.2 Movement Within the Farm

- When caring for poultry, work from healthy birds to sick birds and from young to older birds.
 - For example, if all birds are healthy, feed the youngest birds first, then the older birds. If the youngest birds are sick, feed the other birds from youngest to oldest and then the sick birds last. This practice helps prevent the spread of disease from one group of birds to another.
- When moving between poultry houses, wash or disinfect hands, and either disinfect footwear or change into footwear dedicated for each building.
 - Having footwear dedicated to a building is important because it prevents germs outside of poultry buildings from getting inside.
 - Dedicate one color of footwear for each building on the farm. That way, you will know who is not following biosecurity procedures.

Best Practice: Construct a small room just inside the door to the poultry house. In that room, keep flock records, soap and water for washing hands and feet, coveralls to cover clothes, and slippers or boots that are only worn in that poultry house.

Good Practice: Hang slippers designated for each building at the building entrance for workers to change into before entering the building.

Good Practice Alternative: Footbaths for disinfection are another option if they are kept free of organic material and the disinfectant and water are changed regularly. However, they do require a couple of minutes for the disinfectant to work and scrubbing to remove any organic material on footwear, so brushes should also be provided.



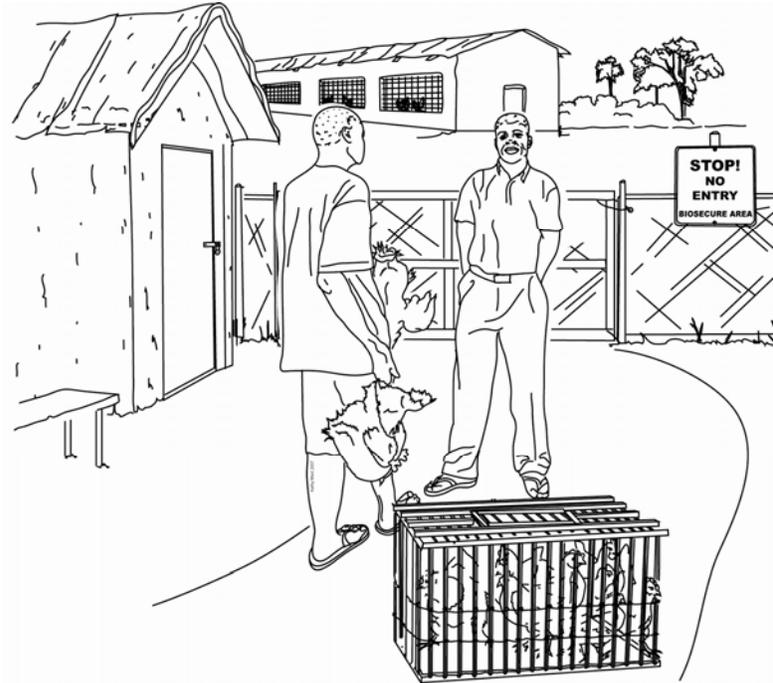
Workers clean shoes, wash hands, and walk through a foot bath with disinfectant before entering poultry houses to work with the birds.

1.3.3 Movement from the Farm

- Never visit live bird markets or other places where birds are present unless absolutely necessary, because the birds there may be infected with a disease like HPAI or Newcastle disease.
 - If you must visit live bird markets or places or events involving birds, disinfect your footwear upon returning to your farm. Bathe and change your clothes before entering any building or bird pens.
 - Never visit a neighbor who has sick poultry. You may bring disease back to your farm. If you have sick poultry, do not let your neighbor visit your sick poultry because he could take that disease back to his farm.

1.3.4 Conducting Farm Business

- If you transport birds or eggs off your farm, be sure to bathe and change clothes before returning to your birds. Clean and disinfect your vehicle as well, especially the passenger cab, tires, cargo area, and undercarriage.
- Never allow poultry dealers or egg buyers on your farm. Birds and eggs can be exchanged at the farm gate.



Meet fowl dealers at the gate of your farm.

For specific biosecurity practices for transporting birds to market, see Section 4. “Biosecurity Practices for Transporting Poultry to Market.”

- **Buying Live Birds**
 - Only buy chicks, pullets or breeders from hatcheries or people you know and trust, and make sure the previous owner or hatchery practices good biosecurity.
 - Do not buy birds showing signs of illness.
 - Never purchase or accept birds from a country, region, or farm where HPAI is present. Although this may save you money in the short run, in the long run the cost to you and your neighbors could be the loss of your business and the possibility of human death; it is not worth the risk.
 - Quarantine any new birds for 2 weeks, at least 10 meters away from other birds.
- **Selling Live Birds**
 - It is best to arrange to have a poultry dealer buy all the birds on the farm or all the birds in one pen at a time (this is similar to All-In, All-Out management).
 - When selling live poultry, use the following practices to protect them from disease:

Best Practice, Transport Offsite to a Poultry Dealer: Have your workers collect the poultry to be sold from your farm in your own clean disinfected plastic or metal crates/coops. Transport the poultry to a location outside your farm where you meet a poultry dealer and transfer the poultry from your crates to the dealer's crates.

Clean and disinfect your crates immediately before you enter your farm and allow them to sit in sunlight for 2 days before storing them near your poultry.

Alternative Practice, Transfer to a Poultry Dealer on Your Farm: When the poultry dealer arrives at your farm, disinfect the wheels and undercarriage of his truck. Inspect crates for cleanliness. If a spot of excrement larger than 3 centimeters is found, ask the driver to leave and come back with clean crates, or have your workers wash and disinfect his crates.

Keep the dealer's vehicle at the farm gate as far away as possible from poultry buildings. Do not allow the driver out of the truck unless he wears water-resistant shoe covers or disinfects his footwear. Never allow him into the poultry buildings or pens.

Have your workers collect the birds and put them in the dealer's crates. Do not put the crates in the buildings or pens where birds are kept. The driver may inspect birds after they are outside the pen and in the crates.

Alternative Practice, Transport to a Live Bird Market: Have your workers collect the birds to be sold from your farm in clean, disinfected crates or coops. Transport the poultry to the live bird market and transfer poultry to cages there.

Clean and disinfect your crates immediately before you enter your farm and allow them to remain in sunlight for 2 days before storing them near your poultry.

Never return birds from a live bird market to your farm. It is better to slaughter them and share the meat with your workers than to risk the possibility of bringing disease back to your farm.

Good Practice, Selling Directly from the Farm: If poultry are sold directly from the farm, they should be sold at the farm gate. Clients should never come onto the farm or enter the bird area to inspect birds. Any birds taken outside the farm gate should never be returned to their original pen, but kept separate from other birds until they are sold.

- **Selling Eggs**

- If you sell eggs, use the following practices to protect your poultry from disease:

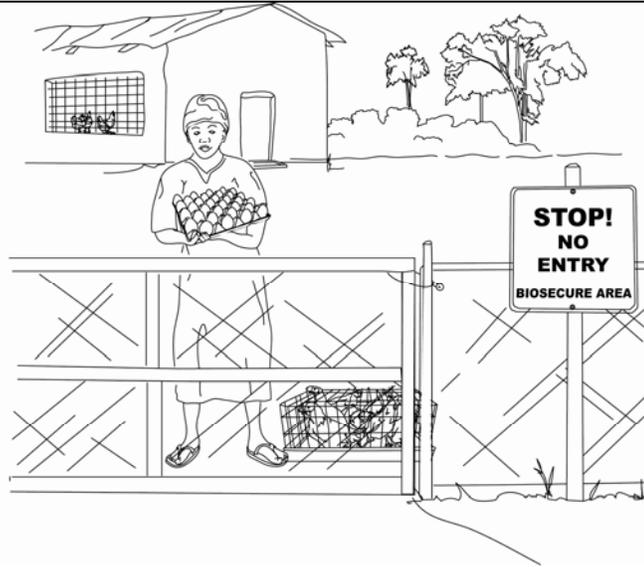
Best Practice: Have your workers collect eggs on plastic egg flats that are cleaned and disinfected daily. This prevents the spread of disease from one pen to another. In the egg room, sort eggs into clean paper flats for sale. *Never return paper egg flats from the market to the farm.*

Good Practice: Have your workers collect eggs on colored plastic egg flats, marked and dedicated for each building or pen on the farm. In the egg room, use a different color plastic egg flat to sort the eggs for sale. Wash and disinfect sale egg flats before they are returned to the egg room.

For example – you collect eggs in blue flats from building #1 and green flats from building #2. These flats are only used on the farm and only in one poultry building; they never go further than the egg room. You use red flats for selling the eggs and these leave the farm, but they are always cleaned and disinfected before being brought to the egg room for filling.

Good Practice – Alternative: Have your workers collect eggs onto paper egg flats, marked and dedicated to each pen. In the egg room sort the eggs into clean paper egg flats for sale. ***Never return paper egg flats from the market to the farm.***

Good Practice if Eggs are Sold Directly from the Farm: Eggs should be sold at the farm gate, not on the farm. Clients should never come onto the farm or enter the bird area to inspect your poultry.



Special Precautions for People Who Must Move Between Farms

Special care must be taken by veterinarians, agriculture workers and company managers who must travel from farm to farm as part of their job. They should not visit more than 2 farms per day. If they visit a farm where the birds are sick, they should go home, bathe, change clothes and not visit another farm that day. They should take the following steps when entering and leaving a farm. As the farm owner, you have the right and the responsibility to ensure that all visitors follow the proper steps when coming onto your farm.

- Park your vehicle (car, truck, motorcycle, and bicycle) outside the farm and walk onto the farm. If it is necessary to drive onto the farm, disinfect the tires and undercarriage of the vehicle as soon as you arrive.
- **Best Practice:** If there is a changing area at the farm, use it to wash your hands and feet and change into farm-supplied clothes. After visiting the farm, return to this area, wash your hands and feet, and change back into your regular clothes.
- **Good Practice:** If a changing area is not available on the farm:
 - Before getting out of the vehicle remove your watch, any jewelry and cell phone; leave them in the vehicle. Put on water-resistant shoe covers or boots. It is best to use disposable shoe covers, but rubber boots that can be disinfected prior to leaving the farm are also acceptable. If shoe covers or boots are not available, plastic bags can be used as boots.
 - Step out/off of the vehicle and put clean coveralls on over your clothing. These should be disposable if HPAI is suspected; washable clean cloth coveralls are acceptable if no HPAI is suspected.
 - If you need to collect samples, put collection materials in a clean plastic bag and then drop that plastic bag into another plastic bag to take with you onto the farm. Do not bring anything extra onto the farm.
 - In the vehicle, leave a waste disposal bag and a clean plastic bag, in an easily accessible place. If rubber boots are being used, leave a bucket of water with disinfectant and a scrub brush ready near the vehicle.
 - Enter the farm, following all biosecurity procedures established for that farm.
- When finished at the farm, return to the vehicle.
 - If rubber boots were worn, use water, disinfectant and a brush to remove all visible organic material and disinfect boots.
 - If cloth coveralls were used, remove them and place them inside the clean plastic bag. Remove the inside bag containing the samples and place them in the clean plastic bag. Put the outside bag in the waste disposal bag.
 - Tie the clean bag and then put it in the trunk of the car or back of the truck so that samples can be removed later and coveralls can be cleaned for re-use.
 - If disposable coveralls and shoe covers were used, place them in the waste disposal bag. Have the farmer burn them so they will not be re-used.
 - If soap and water are not available on the farm, either bring your own soap and water in a container or bring your own hand sanitizer. To make hand sanitizer solution, mix alcohol and glycerin, at a ratio of 1:20, and keep it in a squeeze bottle. Squirt this mixture onto your hands to disinfect them before touching anything in the vehicle.

LESSON 1.4: KEEP YOUR FARM CLEAN

I. Clean Equipment Regularly

- Keep your farm and all equipment that comes in contact with birds clean. Clean all bird areas and equipment, including crates, cages, food and water containers, feed scopes, shovels, rakes and brooms.
 - Using soap and water (preferably hot water), clean and scrub off feathers, bedding, blood, and excrement before disinfecting.
 - Use an appropriate disinfectant, at the recommended concentration for the recommended contact time (usually 10 minutes).
 - Apply disinfectant with a sponge, brush or spray unit.



Best Practice: Once each day thoroughly clean and disinfect watering and other equipment that comes in contact with birds.

Good Practice: At least once each week thoroughly clean and disinfect all bird areas and equipment that come in contact with your birds.

2. Feed Management

- Keep feed and feed ingredients in closed containers to protect them from pests and moisture.



- Keep your feed storage area and feed mill clean and keep the doors closed.
- Clean up feed spills as soon as they are discovered.
- If you have an automatic feed system, clean the bin, angles, and bends at least once a month to prevent fungal growth and mycotoxins.

- If you use bagged feed:
 - Keep the bags in a covered building.
 - Keep the doors closed and all openings should be screened.
 - The area where feed is kept should not be exposed to wide temperature ranges.
 - Do not re-use feed bags. If you must re-use them, they should be washed, disinfected, and dried before they are used again.

3. Litter Management

- Properly managed litter/bedding will help decrease disease problems.
 - Change wood shavings/litter regularly and whenever it becomes wet.

Best Practice: Change all litter after every change of flock.

Good Practice: Change all litter in the brooder area after every flock change. In the grow-out area, remove caked or compacted litter and add fresh litter.

- Do not spread freshly used litter/manure on the ground near poultry buildings. You could be spreading disease. To make litter/manure safe to spread as a fertilizer, do the following:
 - Store in an area that is covered so that it is protected from rain.
 - Compost by using green plant material at a ratio of 2 parts plant material to 1 part litter/manure. The material should be mixed and allowed to sit for 5 to 7 days. After sitting, the material should be mixed again and allowed to sit for another 5 to 7 days.
 - Once it has gone through this process, the material can be used as a mild fertilizer.

4. Cleaning Poultry Houses between Flocks

- As soon as a flock is removed and a pen or a building is emptied:
 - Remove all food from the building.
 - Drain, clean and disinfect all water systems.
 - Brush down dust and dirt onto the floor, starting from the ceilings and working down the walls.
 - Clean out litter.
 - Wash down ceiling and then the walls from top to bottom. Make sure to remove all organic material (feed, litter, manure).
 - Repair holes in walls and screens.
 - Disinfect all surfaces including feed and water equipment.
 - Replace mouse and rat baits.
 - Spray insecticide to kill flies and other insects.
 - Allow buildings to sit empty for 2 weeks so they will dry.
 - Re-stock your building.
- Remember to put feed and water in the building less than an hour before the birds arrive. If you put it there too early, it will attract mice and rats.



- **Pest Control**
 - Keep feed and feed ingredients in closed containers to protect them from pests and moisture.
 - Keep your feed storage area and feed mill clean, and keep the doors closed.
 - Clean up all feed spills as soon as they are discovered.
 - Keep weeds and grasses cut short around poultry buildings. This helps to eliminate areas where pests can hide.
 - Keep the area around poultry buildings free of vehicles, equipment, trash, dead birds and other debris that is attractive to scavengers.
 - Keep the employee clothes changing area clean and orderly to prevent mice and rats from hiding in that area.
 - Use an appropriate mouse and rat poison or traps in a safe manner.
 - Change bait type every 3 months to prevent pests from becoming resistant to the active ingredient in the bait.

Summary of Key Points

The basic biosecurity measures discussed in this section can be summarized as follows:

- Wear clean, protective clothing and footwear; only use it on the farm when working with flocks.
- Keep protective clothing and footwear on your farm for workers and visitors.
- Prevent domestic flocks from mixing with wild birds, other animals, and pests.
- Restrict the movement of animals, manure, eggs, equipment, and people between farms and markets.
- Control the movement of animals, manure, eggs, equipment, and people on the farm so disease does not spread.
- Practice basic hygiene – particularly regular hand-washing and decontaminating footwear.

CASE STUDY SCENARIO

Task 1:

As you go through the case scenario, note down the biosecurity infractions that you are reading about or see in the pictures.

Task 2:

In your group,

- Identify the biosecurity infractions seen in the picture of the problem farm provided as a handout
- Discuss what ideas you have for correcting the infractions. Be ready to share your ideas with the group.
- Take about 20 minutes.

INDIVIDUAL REFLECTION WORKSHEET

What are **three** points you want to remember from this module?

1.
2.
3.

What additional information do you need on this module?

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NOTES

BIOSECURITY PRACTICES TO PROTECT YOUR SMALLHOLDER FARM FROM HPAI

MODULE PURPOSE

To learn the basics about biosecurity risks and principles for preventing an H5N1 HPAI outbreak.

MODULE OBJECTIVES

By the end of this module, participants will be able to:

- Explain appropriate biosecurity measures for smallholder poultry farms;
- Share experiences working with smallholder poultry in Nigeria.

LESSON 1: OVERVIEW OF BIOSECURITY FOR SMALLHOLDER FARMS

NOTE: There are simple steps to follow to keep your birds from getting avian influenza and from spreading HPAI. These steps can also protect your birds from other poultry viruses like Newcastle disease. These steps are part of a set of practices called "Biosecurity."

1. Keep Your Birds Healthy

2. Design Your Farm to Keep Diseases Out

3. Control Movement To, From, and Within Your Farm

4. Keep Your Farm Clean

Keep Your Birds Healthy

Healthy birds are less likely to get sick, and one sick bird can spread disease to many other birds very quickly. Thus, it is very important to keep your birds healthy.

1. Start with Healthy Birds

Buy birds only from people you know and trust. Avoid buying birds from a live bird market. You could be buying birds with disease and not know it.

2. Provide enough Feed and Water

Sufficient feed and water produce birds that are healthy, grow rapidly, and lay large numbers of eggs. Good nutrition strengthens the birds' ability to fight disease.

3. Change Feed and Water Daily

4. Separate Sick Birds from Healthy Birds

Place sick birds in a separate pen or cage as far from healthy birds as possible.

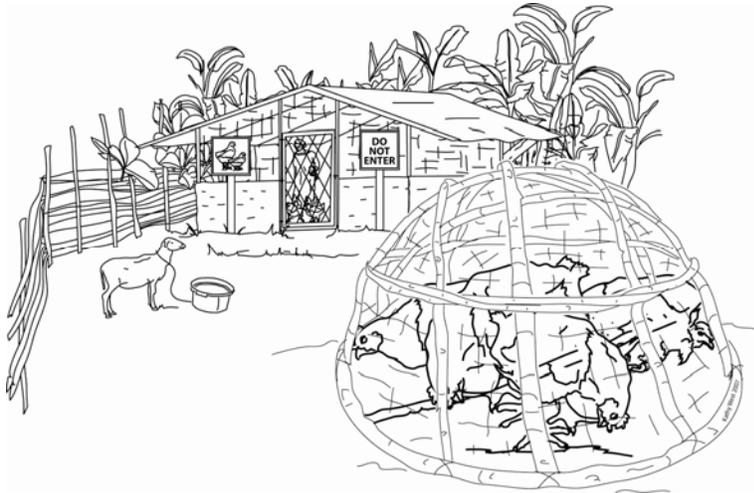
5. Remove Dead Birds from Your Flock at Least 2 Times per Day

Often, live birds will eat dead birds and the live birds will get the disease that the other bird died from.

6. Do not Introduce New Birds to Your Current Flock

By adding new birds, you could be bringing disease into your flock and not know it. If you must add new birds to your flock, keep them in a separate cage at least 10 meters away from your current flock for at least 2 weeks. These two weeks will allow you to know if any of your new birds are sick.

One week before putting the new birds into your flock, put 2 or 3 birds from your existing flock in with the new birds. If you see any signs of illness in any of the new and/or added birds, destroy all birds in that group immediately.



7. Do Not Keep Mixed Species of Poultry (Ducks/Chicken)

One species may serve as a source of disease for other species. For example, ducks may be infected with H5N1 HPAI and show no signs of illness.

If it is absolutely necessary to keep multiple species of poultry, keep them in separate pens and at least 10 meters away from pens with other species.

8. Keep Track of the Health of Your Flock

Good records will help you find disease and other problems in your flock early when they are easiest to treat. Collect the following information:

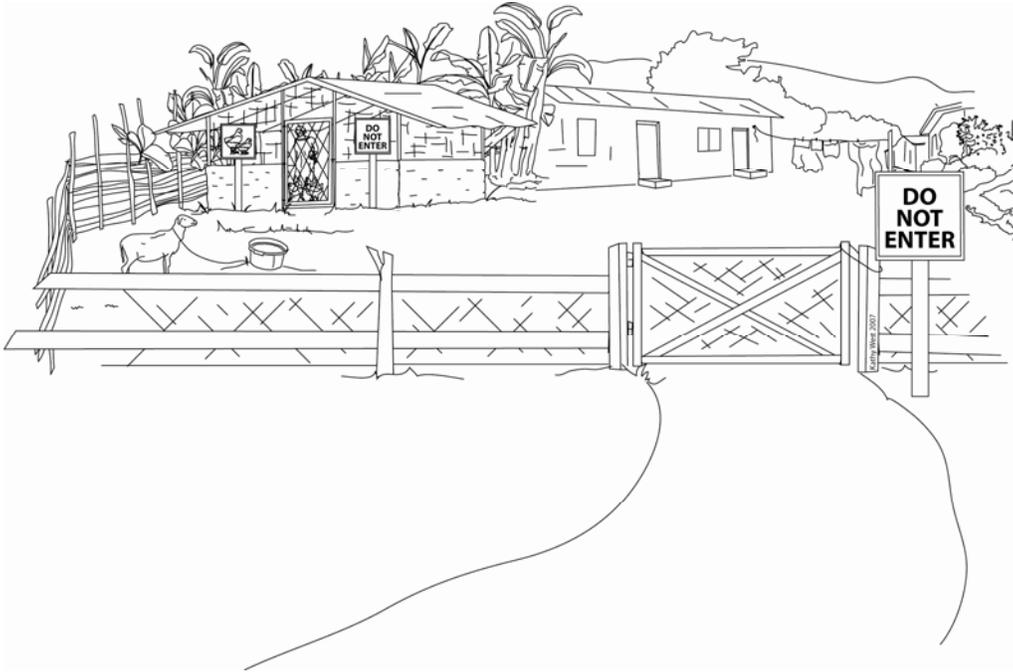
- Bird inventory – total number of birds in a cage, pen, or house
- Number of dead birds collected each day
- Amount of food and water consumed each day (you can gather this information by keeping track of how many bags of feed and buckets of water are added to fill the feeders and drinkers each day)
- Number of eggs collected each day
- Vaccines given (including manufacturer and expiration date)
- Weight – each week, collect and weigh a few birds (especially meat-type birds).

LESSON 1.2: DESIGN YOUR FARM TO KEEP DISEASES OUT

Organize your farm to protect your birds and control entry into your farm. Remember that H5N1 HPAI can be brought to your farm by people (visitors, friends, family members, children and workers, including government agricultural staff), new birds, wild birds, vehicles and equipment.

1. Build a Farm Gate and Keep it Closed when Not in Use

An open gate is an open invitation to unwanted visitors who may bring disease to your farm.



2. Maintain a Fence around Your Farm and Repair any Holes Quickly

A fence keeps your birds in and disease carriers like visitors and wild animals out.

3. Place “Do Not Enter” Signs on all Gates and Building Entrances

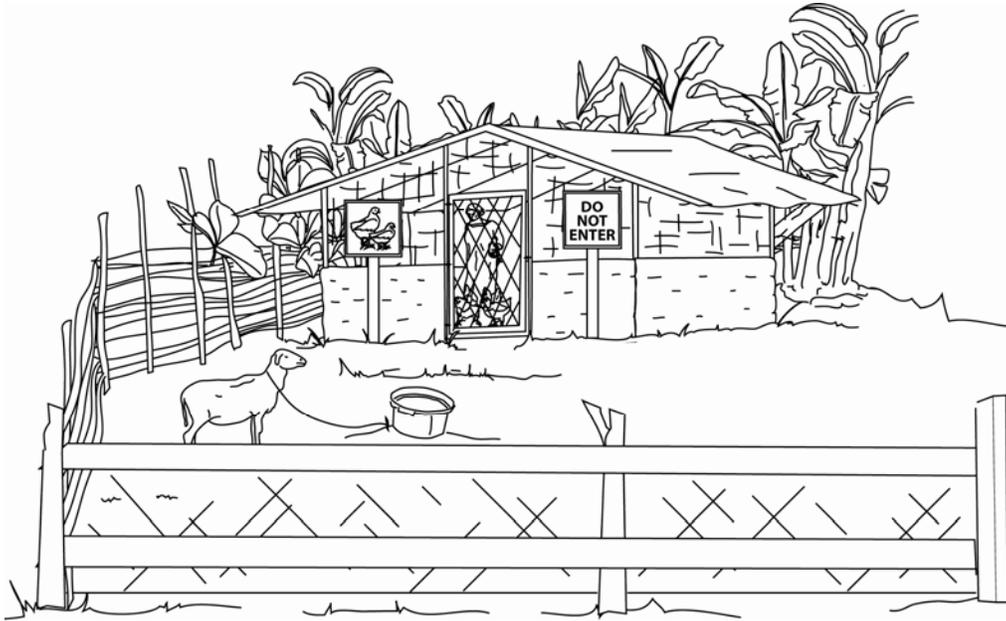
This will keep people away from you farm and facilities.

4. Do Not Allow Water Bodies (Ponds, Standing Water) on Your Farm

Standing water attracts wild waterfowl and insects, both of which can carry H5N1 HPAI.

5. Keep All Birds in Covered, Screened Pens or Buildings

This will prevent your birds from coming in contact with wild birds, other wild animals, and unwanted visitors who may be carrying disease. Regularly repair holes in buildings and screens. If a wild bird, mouse or rat can get its head through a screen, it can get its whole body through the screen.



6. Fence the Bird Area

It is important for people to know that there is a difference between the bird area (where only those who are authorized to care for the birds are allowed) and other areas of the farm.

7. Keep Doors/Gates of Buildings Locked

This will prevent the accidental or unauthorized entry of people who may carry disease that may infect your birds.

LESSON 1.3: CONTROL THE ENTRY AND MOVEMENT OF PERSONNEL, BIRDS, VEHICLES, AND EQUIPMENT TO, FROM AND WITHIN YOUR FARM

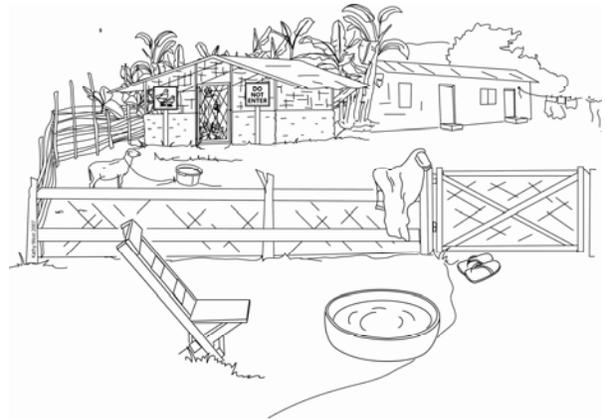
In addition to having gates, fences, and doors to protect your birds from outside sources of disease, it's also essential to make sure that people don't bring disease onto your farm on their clothing, shoes, vehicles, and equipment.

Remember that:

- The shoes and clothes you wear outside your farm could pick up disease that could infect or kill your birds. Anyone coming onto the farm can bring the disease on their clothes, shoes/sandals or vehicles.
- Washing with soap and water (hot water is best) removes most viruses from a person's hair and skin. Bathing and putting on clean clothing and clean, disinfected shoes will prevent you, your visitors and your family from carrying disease-causing organisms.

1.3.1 How to Prevent People from Bringing H5NI HPAI onto Your Farm

- Every person entering your farm must wash their hands, disinfect their shoes, and wear clean clothes.
 - Build and/or provide a place to wash hands, feet, shoes or sandals, and to change clothes at the farm entrance. Make sure you always have soap and water available.
 - Anyone who works with the birds on your farms should have a set of clothes and shoes that are kept and worn only on the farm. This way, these clothes and shoes will not be exposed to diseases outside the farm.
 - Keep extra clothes (like coveralls) and shoes that you can give to visitors who are coming onto your farm.
 - Only visit live bird markets or other places where birds are present when absolutely necessary.
 - When returning from the feed store, hatchery, or live bird market, you, your family, and workers must take extra care before entering your bird area. Remove the clothes and shoes worn outside your farm and wash and disinfect them. Also, take a bath and change into clean clothes and shoes.



- **Never visit a neighbor who has sick birds. You may bring disease back to your farm.**
- **Allow only visitors with legitimate business (like veterinarians and Ministry of Agriculture staff) to enter your farm.**
- **Keep a written list of people who visit your farm.** Require people to write their name, date of visit, origin (where they came from), reason for their visit, and poultry operations visited in the last 10 days.
 - This list allows you to remember who has visited your farm and to know if they have visited a poultry farm or facility with birds that could be a source of disease.
 - In case there is an outbreak of HPAI or any other disease, this information will make it easier to track down the source of infection and to initiate disease prevention and control measures.
- **Don't allow visitors into your bird pens/buildings.**
 - If visitors, including veterinarians and Ministry of Agriculture staff, must inspect and handle your birds, they should bathe and change into clean clothes and shoes before entering the bird area.
 - If they are not able to bathe, they should at least change into clean clothes and shoes before entering the bird area.
- **Hire only farm workers who do not raise birds for food and/or do not have birds for pets on their property.** Their birds may carry disease that these workers may bring to your birds.

If you have no choice but to hire workers with their own birds, these workers should arrive at your farm freshly bathed. They should remove their clothing, wash their hands and then put on the clothes and shoes that you provide. When wearing sandals you must request that your workers wash their feet as well.

HOW TO PREVENT PEOPLE FROM BRINGING AI TO YOUR FARM:



At the market



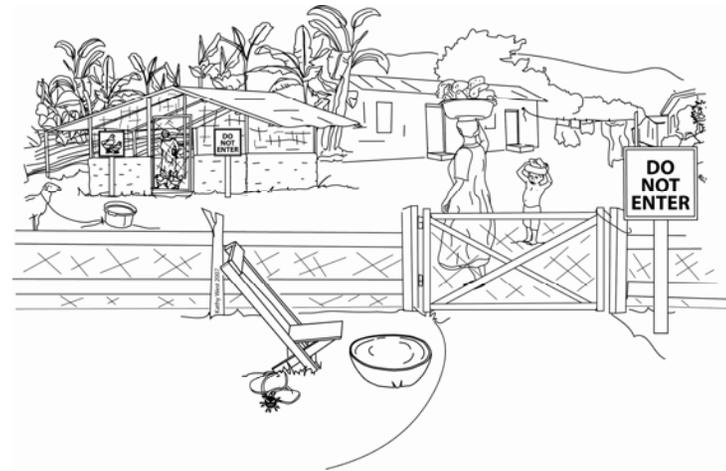
Going back home



Arriving home from the market

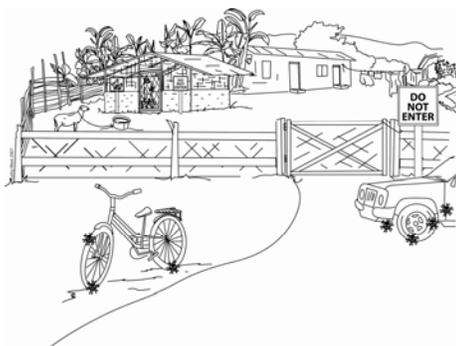


Wash your hands and feet, change shoes, cover your dirty clothes



Enter your farm clean

I.3.2 How to Prevent your Equipment, Vehicles, and Poultry Cages from Bringing AI to Your Farm



After arriving at the farm



Wash off all visible dirt first



Then disinfect and let soak

- **All vehicles and equipment that are not used for farm work or business must be left at the farm gate.**
 - This includes bicycles, motorcycles, cars, trucks, etc.
 - All of these things can carry disease and must never be allowed to enter the area near bird pens/houses.
- **Vehicles and equipment that must enter the farm must be cleaned and disinfected at the farm entrance before they enter the farm.**
 - This includes vehicles delivering feed and collecting market-age birds.
 - Clean the vehicles by first scrubbing off all dirt from the wheels and undercarriage. Then spray with any disinfectant and wait for the recommended amount of time.
 - You can also have a ditch with disinfectant in it at the farm gate that all vehicles entering the farm must drive through. It is essential that you scrub the wheels before driving through the disinfectant. Change the disinfectant daily. It will lose its effectiveness as dirt and other matter build up in it.
 - This will allow the removal and destruction of infectious agents that these vehicles and equipment may carry from outside sources.
- **Clean and disinfect all poultry cages and equipment at the farm gate.**
 - After cleaning and disinfection, allow the cages and equipment to dry under the sun for 2 days before returning them to the farm. This destroys infectious agents that may transmit disease to your birds.
 - Plastic egg flats must be washed and disinfected before coming back on the farm.
 - If any crates, coops or egg flats cannot be washed and disinfected, burn them.



I.3.3 When Working with Your Birds

- Wash your hands and feet with soap and preferably hot water before and after handling birds.
- Take extra care to wash your hands and feet and disinfect shoes/sandals after tending to sick birds. This practice helps prevent the spread of disease from one group of birds to another.
- When caring for poultry, work from young to older poultry, from healthy to sick, and from existing flock to new birds.

For example, feed the youngest birds first. If the youngest birds are sick, feed them last.

I.3.4 When Moving Birds from Your Farm

- Do not allow egg buyers or poultry dealers to come inside your farm to buy eggs or chickens. Bring eggs and chickens out of your farm to sell to egg and poultry dealers.
- If you have to sell to the live bird market, find and invite a poultry dealer to sell your birds for you. Do the following to protect your birds from disease:



- Collect the birds from your farm in crates or coops.
 - Make arrangements to meet the poultry dealer in an area away from your farm where there are no birds.
 - Transport the birds to that area in your coops.
 - Transfer the birds from your coops to the poultry dealer's coops before they are taken to the live bird market.
- If you sell your own birds at a live bird market, **do not** bring back any unsold live birds or dirty coops, crates, and other equipment to your farm since all of these may be carrying disease.
 - Clean and disinfect your coops before you take them back into your farm. If they cannot be cleaned, burn them.
 - Also remember to bathe and change your clothes and shoes before returning to your birds.
 - Clean and disinfect your vehicle as well, especially the passenger cab, tires, cargo area, and undercarriage.

LESSON 1.4: KEEP YOUR FARM CLEAN

HPAI is easily killed by soap and water, direct sunlight, cooking (heat), and any disinfectant. Keeping your farm clean will help prevent disease from infecting your birds:

1. Sweep the Farm Every Day

Wear a mask or cover your nose and mouth with a clean piece of cloth when doing this.

2. Regularly Clean Equipment

Keep your farm and all equipment that comes in contact with birds clean.

Clean all bird areas and equipment, including crates, cages, food and water containers, feed scoops, shovels, rakes and brooms.

- Clean and scrub equipment with soap and water (hot water preferred) to remove all dirt, feathers, bedding, blood, and excrement before disinfecting.



- Use an appropriate disinfectant, at the recommended concentration for the recommended contact time (usually 10 minutes).
- Apply disinfectant with a sponge, brush or spray unit.

Best Practice: Once each day, thoroughly clean and disinfect waterers and other equipment that comes in contact with birds.

Good Practice: At least once each week, thoroughly clean and disinfect all bird areas and equipment that come in contact with your birds.

3. Keep Feed away from Pests and Wild Animals

- Keep feed and feed ingredients in closed containers to protect them from pests and moisture.
- Clean up feed spills as soon as they are discovered.
- Keep the feed bags in a covered building.
- Keep the doors closed. All openings should be screened.
- The area where feed is kept should not be exposed to wide temperature ranges.
- Do not re-use feed bags. If feed bags must be re-used, they should be washed, disinfected, and dried before they are used again.

4. Change the Litter (Wood Shavings or Sawdust) Regularly

- Do not spread freshly used litter/manure on the ground near poultry buildings. You could be spreading disease. To make litter/manure safe to spread as a fertilizer, do the following:
 - Store in an area that is covered so that it is protected from rain.
 - Compost by using green plant material at a ratio of 2 parts plant material and 1 part litter/manure. The material should be mixed and allowed to sit for 5 to 7 days. After sitting, the material should be mixed again and allowed to sit for another 5 to 7 days.
 - Once it has gone through this process, the material can be used as fertilizer.

5. Clean Poultry Houses between Flocks

- As soon as a flock is sent to market and the pen/house is emptied:
 - Remove all food and water from the building.
 - Brush down dust and dirt onto the floor, starting from the ceilings and working down the walls.
 - Clean out litter.

- Wash down ceiling and then the walls from top to bottom. Make sure to remove all organic material (feed, litter, manure).
- Repair holes in walls and screens.
- Disinfect all surfaces including feed and water equipment.
- Replace mouse and rat baits.
- Spray insecticide to kill flies and other insects.
- Allow buildings to sit empty long enough to dry thoroughly. Two weeks is an ideal time.
- Re-stock the pen/house. Remember to put feed and water in the building less than an hour before the birds arrive. If you put it there too early, it will attract mice and rats.

6. Discourage Pests

In addition to keeping the feed away from pests:

- Keep weeds and grasses cut short around poultry buildings. This helps to eliminate areas where pests can hide.
- Keep the area around poultry buildings free of vehicles, equipment, trash, dead birds and other debris that is attractive to scavengers.
- Keep the employee clothes changing area clean and orderly to prevent mice and rats from hiding in that area.
- Use an appropriate mouse and rat poison or traps in a safe manner.

Summary of Key Points

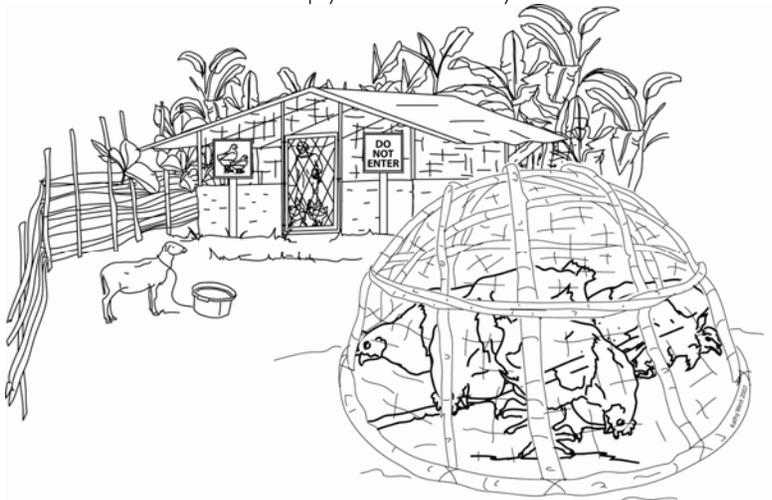
Basic biosecurity measures can be summarized as follows:

- Wear clean clothes and shoes when working with flocks.
- Keep dedicated clothes and shoes on your farm for workers and visitors.
- Prevent poultry from mixing with wild birds, other animals, and pests.
- Control the movement of animals, manure, eggs, equipment, and people between farms and markets.
- Control the movement of animals, manure, eggs, equipment, and people on the farm so disease is not spread.
- Practice good hygiene: regular hand-washing and decontaminating footwear.

Key Messages to Remember about Preventing H5N1 HPAI

- H5N1 HPAI, also called bird flu, can kill an entire flock of poultry very quickly and can make humans sick or kill them.
- H5N1 HPAI can easily be transmitted from bird to bird and from people to birds, and in some cases, from birds to humans.
- If your birds have H5N1 HPAI, up to 90% of them will die within a short period of time; most of them will show symptoms of weakness, paralysis, dark red or purple combs, wattles and legs, severe diarrhea, and difficulty breathing. H5N1 HPAI and Newcastle disease look the same without laboratory testing.
- If you see the signs of H5N1 HPAI in your birds, report it immediately to the nearest agricultural office of the Ministry of Agriculture. The virus must be eliminated from your farm as soon as possible to avoid contaminating other farms and infecting human beings. **CONTACT YOUR NATIONAL AVIAN INFLUENZA HOTLINE.**
- Finally, if you use the following four simple steps you could keep your birds from getting and spreading avian influenza virus:
 1. Keep your birds healthy
 2. Design your farm to keep diseases out
 3. Control movement to, from, and within your farm
 4. Keep your farm clean

Keep your birds healthy



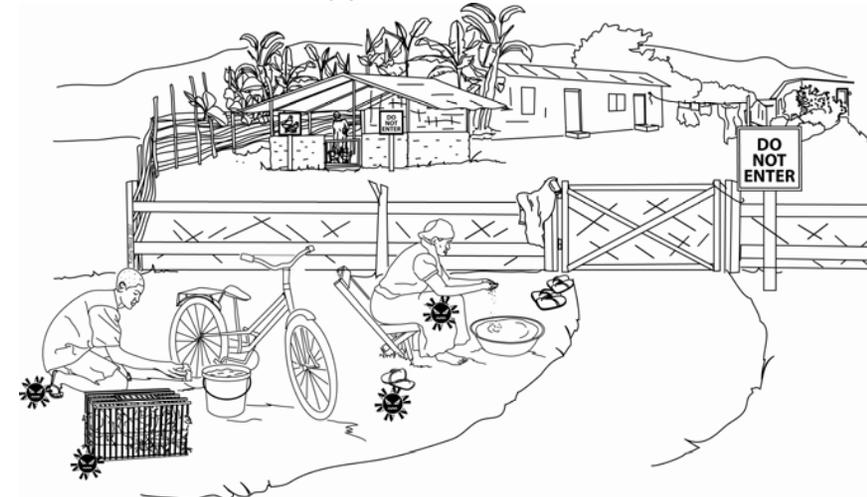
Design your farm to keep diseases out



Control movement to, from, and within your farm



Keep your farm clean



EXERCISE: IDENTIFYING BIOSECURITY INFRACTIONS

Follow the steps below to complete this exercise.

1. Study the illustration of the farm on the next page.
2. Circle each biosecurity risk that you notice.
3. In the space below, write directions for correcting the infractions that you indicated on the graphic.
4. With your table group:
 - Choose 1-2 of the infractions.
 - What should be done to correct the infractions?
 - Given the discussion on how to get smallholders to practice biosecurity, what would you propose to get them to adopt these practices?

Be prepared to share your answers with the group.

HINT: There are at least 10 infractions pictured.

Problem Farm

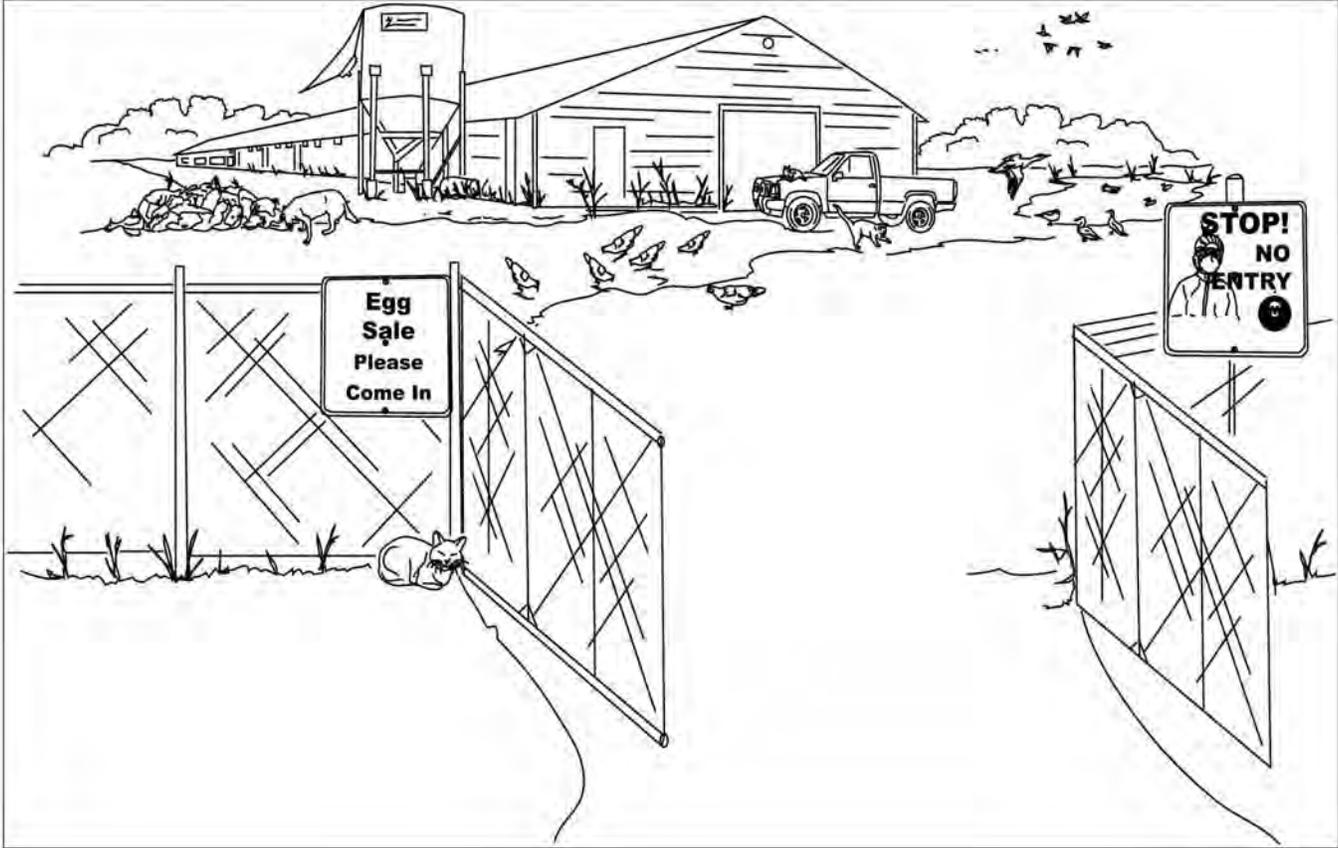


Illustration of Problem Farm

INDIVIDUAL REFLECTION WORKSHEET

What are **three** points you want to remember from this module?

1.
2.
3.

What additional information do you need on this module?

--

NOTES

BIOSECURITY PRACTICES FOR TRANSPORTING POULTRY TO MARKET

MODULE PURPOSE

To learn the basics about biosecurity practices for transporting poultry to markets to prevent the spread of H5N1 HPAI.

MODULE OBJECTIVES

At the conclusion of this module, participants will be able to:

- Explain appropriate biosecurity measures for poultry transport;
- Discuss transport of poultry in the Nigerian context.

LESSON 1: BIOSECURITY PRACTICES FOR TRANSPORTING POULTRY TO MARKET

NOTE: These recommendations are for anyone moving live poultry from farm to market.

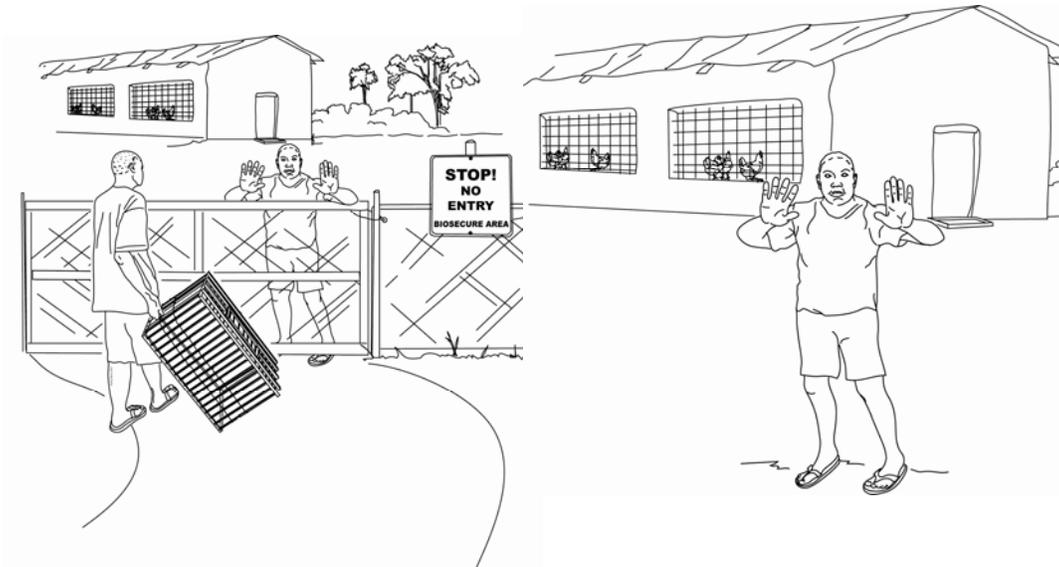


1. Start with Healthy Birds

- Only buy poultry from reliable producers who practice good biosecurity.
- Do not accept or purchase from flocks showing signs of disease.

2. Don't Spread Disease

- Avoid collecting birds from different farms on the same day.
- Dealer and transporter cages should **never** go on farms.
- Have easily identified cages – color-coded or tagged. For example, you can tie pieces of colored cloth to your cages to identify them as yours.
- Do not enter poultry houses to pick up birds.
- Birds should be picked up at a designated location away from the farm.
 - If you must enter the farm, clean and disinfect your vehicle before entering the farm (see details below).
 - If you must enter poultry houses, wash your hands and change into fresh clothes and shoes. Shoe covers and coveralls are best, if available.



Do not bring cages onto farms.

Do not enter poultry houses.



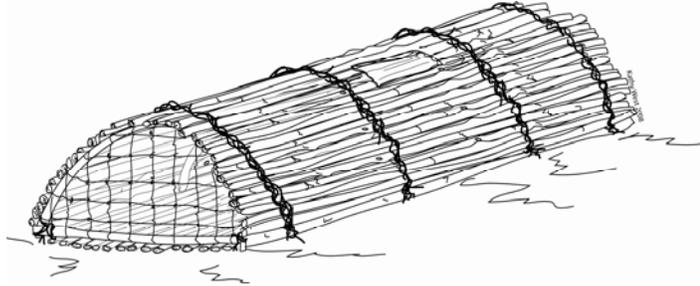
Exchange birds outside the farm gate.

- Avoid carrying people and live poultry together in the same vehicle. Also avoid carrying poultry with other birds or animals.
- Respect poultry movement bans to help in outbreak efforts.



3. Keep it Clean

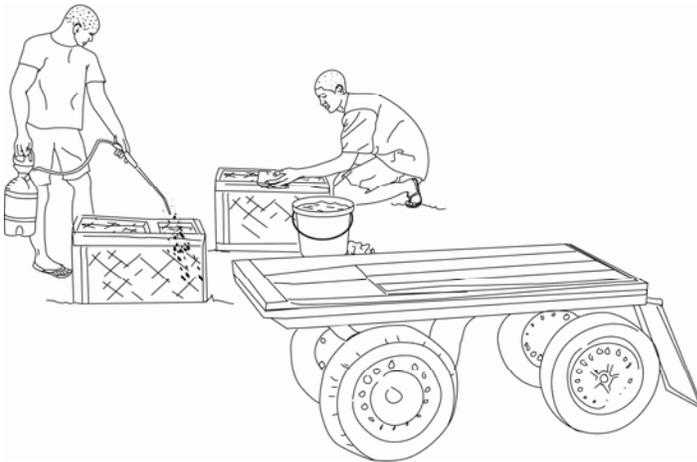
- Use cages made of plastic or metal (stainless steel, galvanized, vinyl coated or wire mesh) for easy cleaning.
 - If this is not possible, frequently replace (burn or bury) the traditional cages made from millet stalks, raffia, palm products or bamboo.



- Clean and disinfect vehicles (cars, trucks, bicycles and motorbikes, animal-drawn carts) before and immediately after hauling birds.

Instructions for Cleaning and Disinfecting Vehicles and Equipment

- Clean and scrub vehicles and equipment with soap and water (hot water preferred) to remove all dirt, feathers, bedding, blood, and excrement before disinfecting.
- Clean both the vehicle's wheels and underside, and surfaces that have come in contact with birds or cages on the exterior and interior of the vehicle.
- Use an appropriate disinfectant, at the recommended concentration for the recommended contact time (usually 10 minutes).
- Apply disinfectant with a sponge, brush or spray unit.



Disinfection and cleaning of vehicles.



EXERCISE: ROLE PLAY FOR TRANSPORTERS

In your table group, you will be assigned a biosecurity practice for transporting poultry to market to discuss with a transporter:

- With your group, decide how you will convince the transporter to adopt the practice. Develop a message you would deliver to him/her.
- Choose one person from your group to be the messenger and one to be the transporter. You will *role-play* the conversation.

Use this sheet to plan your role play.

INDIVIDUAL REFLECTION WORKSHEET

What are **three** points you want to remember from this module?

1.
2.
3.

What additional information do you need on this module?

--

NOTES

BIOSECURITY PRACTICES FOR LIVE BIRD MARKETS

MODULE PURPOSE

To learn the basics about biosecurity risks and principles for preventing an H5N1 HPAI outbreak in live bird markets.

MODULE OBJECTIVES

At the conclusion of this module, participants will be able to:

- Explain appropriate biosecurity measures for live bird markets (urban and rural);
- Share experiences from the different participating countries on how their markets are managed.

LESSON 1.1: OVERVIEW OF LIVE BIRD MARKETS IN NIGERIA

Live bird markets in Nigeria are mostly located in large urban, municipal markets. The sellers who have stalls in these markets pay duties to the local municipality that owns and manages the market. A few live bird markets are located on the sidewalks of busy roads.

In rural areas, live bird markets operate at weekly livestock markets and are a source of birds for the markets in urban areas. Poultry sellers buy poultry directly from farms, rural markets, and to a lesser extent, from dealers.

In the markets, customers buy live poultry species (local and imported breeds of chickens, ducks, guinea fowl, pigeons, and local turkey breeds) and take them home for slaughter and processing. It is also becoming increasingly popular for people to have their chickens slaughtered and processed in live bird markets in many Nigerian markets.

Live bird markets continue to be an important part of the fight against H5N1 HPAI. Many human infections have been traced to live bird markets. When the virus is established in a market, it can spread to other markets and farms by way of contaminated equipment, birds, people, and vehicles. Introducing simple procedures like biosecurity measures to live bird markets will help prevent the spread of HPAI and hopefully protect people from getting infected.

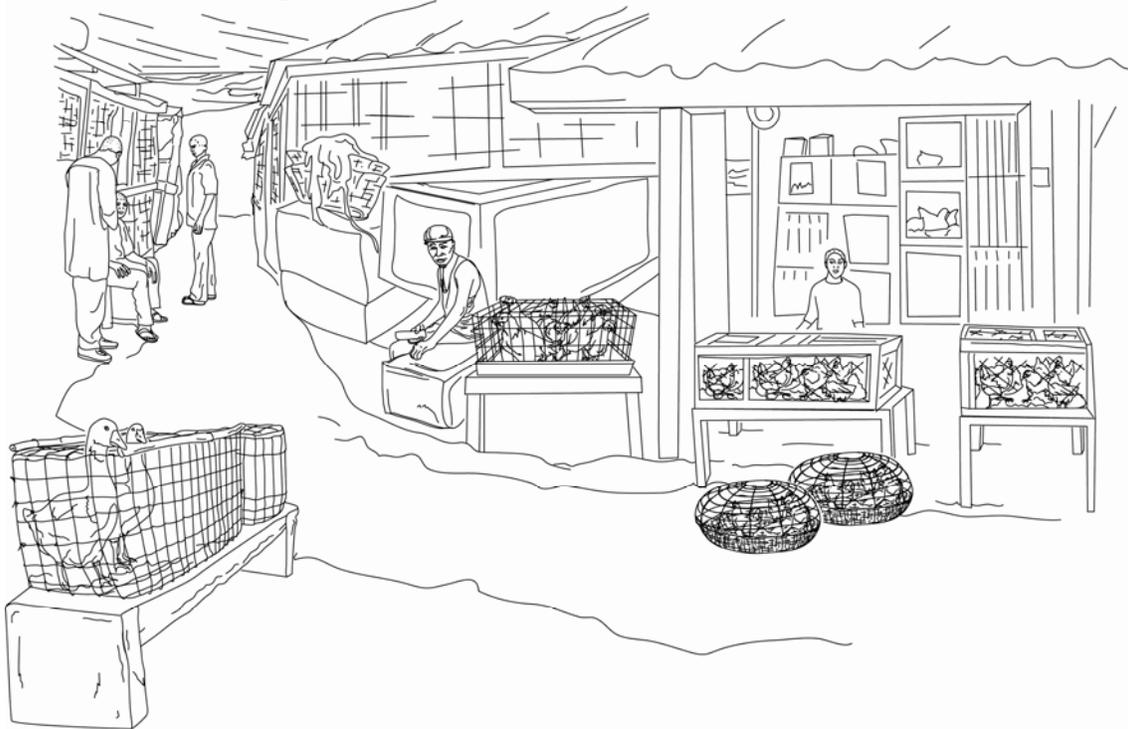
Currently, biosecurity is generally very low in live bird markets. Implementing effective biosecurity will take the combined efforts of the market owners and sellers working together. Market owners and municipal authorities need to provide the necessary infrastructure and management of the market as a whole, while sellers need to adopt biosecurity measures and practice good hygiene in their own stalls.

This section recommends simple biosecurity measures to be taken by the municipal authorities, by sellers in urban markets, and by sellers in rural markets.

A typical live bird market with very little biosecurity.



A well-designed and managed live bird market with biosecurity practices in place.



LESSON 2: BIOSECURITY FOR URBAN LIVE BIRD MARKETS

NOTE: This section includes biosecurity recommendations for municipal authorities who manage urban live bird markets and for poultry sellers in the market.

The municipal authorities who manage urban live bird markets are responsible for ensuring that the markets are organized and equipped to facilitate good biosecurity. The following recommendations on market structure and management are intended as advice to municipal market managers.

1. Locate markets away from food

Best Practice: Locate live bird markets away from the main municipal market and away from areas where food is sold, prepared or cooked.

Good Practice: If the market is already located in the larger municipal market, wall off the live poultry area and provide a separate entrance that would prevent customers from walking through the main market carrying poultry.

2. Control the flow of traffic in the market

- Set up the market so that the traffic of people flows in one direction, from the entrance to the exit.
- Create an unloading area for trucks and other vehicles bringing in birds from rural areas and commercial farms.

This controls the flow of traffic and restricts it to one area that is a potential entry point for disease. Also, a single unloading area is easier to clean and disinfect regularly.

3. Provide for Good Sanitation

- Provide the space and water needed for washing cages, vehicles, etc.
-

Best Practice: Provide an area for washing cages and trucks before they leave the market.

Best Practice: Provide running water from sinks or hoses.

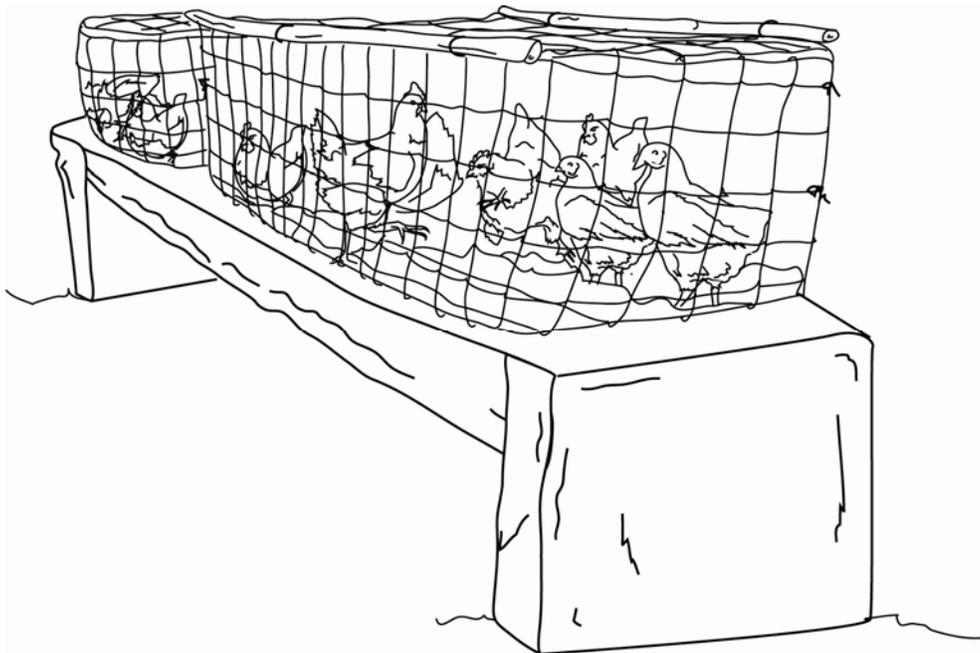
Good Practice: Collect and store waste in barrels and buckets.

- Provide changing rooms and bathrooms for sellers to use to change into work clothes and wash their hands and feet or shoes before and after work.
 - These areas can be as simple as buckets of water in an enclosure if there is no running water.
 -

- Provide sellers with designated booths that are easy to clean.

Best Practice: Build booths with well-built cages made of plastic or wire (stainless steel, galvanized, vinyl-coated or wire mesh).

Good Practice: Install concrete slabs. These are easy to clean and can be lined with a single layer of cages made with a wood frame and wire netting.



-
- Provide the necessary equipment for safe waste disposal at the market.

Best Practice: Provide a central waste bin in the market for the temporary disposal of dead birds, feathers and manure. The bin should have a tight lid to prevent access by scavengers and pests such as rodents. The bin should not leak, spill or produce odors.

Empty the central waste bin every day and dispose of the waste by incineration, burning in a pit, or burial. See Appendix G for a description of the various methods of disposal.

Good Practice: Require sellers to have their own, or provide them with, individual bins that have tight-fitting lids for temporary waste disposal throughout the day. At the end of each day, take the waste bins to a central location for disposal by burning them in a pit or burying them. The bins should prevent access by pests or other animals, should not leak or spill, and should not produce odors.

Empty the whole live bird market of birds to clean and disinfect thoroughly once a month.

-
- Prepare equipment needed for cleaning and disinfecting the market (buckets, brushes, brooms, gloves, masks, disinfectant).
 - Remove all poultry from the market – either by selling or slaughtering any unsold birds.

- Move equipment (cages, scales, tables) away from walls.
- Remove manure and all organic matter from cages, pens or crates.
- Remove organic matter and solid wastes from the room starting with the ceiling, then walls and finally the floor.
- Wash the equipment and room with hot water. Use a pressure spray if available, but a hose or bucket and brush can work just as well. Start with the equipment, then the ceiling and walls and lastly the floors.
- Apply an appropriate disinfectant, such as chlorine bleach, again starting with the equipment and ending with the floors.
- Leave the market empty for 24 hours before restocking.

4. Educate sellers about biosecurity practices

Best Practice: Require poultry sellers to attend a short class on basic biosecurity practices in order to get or renew their license to sell live poultry.

Good Practice: Link the payment of a seller's market duties or taxes with an inspection of the selling area by municipal workers to ensure cleanliness.

5. Conduct regular disease surveillance

- Targeted surveillance and disease monitoring of live bird markets can serve as an early warning indicator of H5N1 HPAI entry into a country. Governments, states, districts and municipalities should set up surveillance programs.
- This can be as simple as visiting the live bird markets and talking to owners and customers on a routine basis.
- Food and meat inspectors can also be trained to carry out surveillance activities in live bird markets.

Best Practice: Food or meat inspectors should inspect live poultry for illness before they are slaughtered. In many countries, public health employees share this duty with the veterinary services.

- All cases of sick or dead birds in the market should be reported to the veterinary, livestock, and public health authorities.
 - Appropriate action such as market shutdown may have to be taken when lab test results are confirmed to be positive for H5N1 HPAI.
 - Remember, the sooner H5N1 HPAI is recognized and controlled, the faster the market can start selling birds again.

- Markets should develop a system that makes it easy to trace birds back to the farm where they were raised. When single sources for birds are used, this is a simple process. When multiple suppliers are used, this process can be extremely difficult.
 - A simple way to do this is to label each cage with the name of the farm that raised the birds, the name of the dealer that brought the birds to the market, and the name of the truck owner that brought the birds if the dealer's own truck did not bring them.

LESSON 3: BIOSECURITY PRACTICES FOR POULTRY SELLERS

NOTE: While the market's management must provide the infrastructure necessary to allow good biosecurity, the ultimate responsibility rests with the sellers themselves to practice good hygiene on a daily basis. The following recommendations are for the poultry sellers themselves.

The most important rules to follow to protect yourself, your birds, and your business from disease are:

- **NEVER BUY OR SELL SICK POULTRY**
- **NEVER SELL THE CARCASSES OF DEAD POULTRY**

I. Start with Healthy Birds

- Only buy poultry from trusted sources that produce good stock and practice good biosecurity.
- Do not mix different species of poultry (chickens, ducks, geese, guinea fowl and turkeys), game birds or pigeons in one cage, or mix birds of different ages in the same cage.

Best Practice: House ducks and other waterfowl in a separate area of the market. These birds can carry avian influenza viruses without showing signs of illness. They are silent carriers of the disease.

- **Practice “all-in, all-sold.”**
- Only buy birds from one source.
- Do not any introduce any new birds during a particular selling period. For example, only pick up new birds from one farm on Sunday or Monday, and buy enough to sell for the entire week.
- Do not return any unsold birds to the farm of origin. Slaughter any unsold birds.

2. Be Alert for Illness in Your Birds

- Separate birds that become sick from the rest of the birds. Have a designated cage for sick birds. Slaughter and dispose of these birds at the end of each day.
- Remove dead birds regularly and dispose of them properly.
 - Keep the carcasses in a secure container and bury or burn them at the end of each day.
 - Do not leave carcasses lying around.
 - Do not throw carcasses into bodies of water such as rivers, streams and lakes.

- **Keep good records** of the birds you bring into the market and how many birds die each day – this can alert you to any disease problems early.
- **Immediately report any unusual mortality or sickness in birds** to the municipal market authorities.
 - If you suspect HPAI, contact the **National Avian Influenza Hotline**.
- **Respect poultry movement bans** and market shutdowns if there is an outbreak of HPAI.

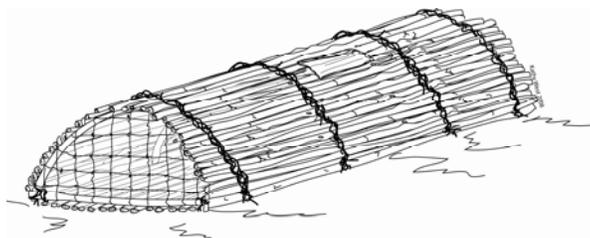
3. Keep it Clean

- **Have specific clothing or a uniform** (for example, coveralls or an overcoat) and shoes that are only worn at the market.
- When arriving at work, **wash your hands and feet**, and change into your work clothes/uniform and work shoes.
- **Wash your hands frequently** with soap and water, especially after handling a bird during a sale.
- **Use well-designed and constructed cages**



Best Practice: Use cages made entirely of plastic or wire (stainless steel, galvanized, vinyl coated or wire mesh) for easy cleaning and good ventilation.

Good Practice: Use locally available materials such as bamboo, millet or sorghum stalks; use them for only one week and discard them. Old cages should be disposed of properly by burning or burial.



- **Do not stack cages** on top of each other. Feces from top cages can fall on birds, water and feed in bottom cages.



Do not stack cages on top of each other.

- **Line the bottoms of all cages** with old newspaper or banana/plantain leaves for easier cleaning of manure build up.
- **Cages should have good feeders and water troughs** that need to be cleaned and filled regularly.
- **Buy feed from a good, reliable source.** Feed can be easily contaminated by viruses and other disease organisms.
- **Store feed in tightly sealed containers** to discourage the presence of rodents and other pests, and to prevent feed from degrading at high temperatures.
- **Sweep your stall** every day to keep it clean and free of manure and feathers, and clean feeders and water troughs.
- **Thoroughly clean your stall weekly**
 - Sell or slaughter all your birds by the end of the week.
 - Clean the cages and feeding and watering equipment in an area away from people, animals, and food to minimize potential exposure to disease.
 - Remove the newspaper/leaf liners from the bottom of the cages and dispose of them by burying or burning.
 - Scrub the cages and equipment with soap and water to remove all dirt, feathers, bedding, blood, and excrement before disinfecting.
 - Disinfect and dry under the sun. To disinfect, use either a locally available disinfectant such as Dettol (see Appendix I and J for a list of other disinfectants) or traditional soaps and ash.
 - Baskets and cages made from local materials such as bamboo, straw, palm and raffia should be burned and/or buried and replaced every week.

- Clean and disinfect the walls, counters or shelves, and floors of your stall.
- First scrub off any dirt, manure, etc. from top to bottom. Then sweep the floor.
- Disinfect all surfaces and allow them to dry before replacing the cages and other items.



Workers cleaning and disinfecting their market stall

LESSON 4: BIOSECURITY IN RURAL MARKETS

The following recommendations are for poultry sellers in rural poultry markets.

The most important rules to follow to protect yourself, your birds, and your business from disease are:

- **NEVER BUY OR SELL SICK POULTRY**
- **NEVER SELL THE CARCASSES OF DEAD POULTRY**

1. Start with Healthy Birds

- Only buy poultry from trusted sources that produce good stock and practice good biosecurity.

2. Be Alert for Illness

- Separate birds that become sick from the rest of the birds.
- Remove dead birds regularly. Burn or bury the carcasses.



3. Organize the Market

- Keep poultry in a separate area from other livestock species and from areas where food is bought, cooked, or sold.
- Confine all birds in cages. Do not leave them piled on the ground, tied to each other, or tied to stakes.
 - The best cages to use are plastic or metal cages because they can be cleaned easily. The cages can be made of stainless or galvanized steel, or vinyl-coated or wire mesh.
 - If these kinds of cages are not available, local cages made from dried millet or sorghum stalks can be used.

Do not stack cages on top of each other. Manure from the top cages will fall into the lower cages, making the birds in lower cages both dirtier and more susceptible to disease.
- Separate different species. Chickens should be separate from ducks, guinea fowl and pigeons.

4. Keep it Clean

- **Wash your hands frequently** with soap and water, especially after handling a bird during a sale.
- **Sweep often** to keep the area clean and free of manure and feathers.
- **Line the bottom of the cages** with large leaves (banana or plantain leaves) to protect the bottom of the cage from manure buildup. Change the leaves at the end of the market day and bury or burn the leaves.
- **Clean and disinfect vehicles, bicycles, and animal-drawn carts** used to bring the birds to market after each use.
 - Clean both the wheels and underside of the vehicle, and surfaces that have come in contact with birds or cages on the exterior and interior of the vehicle.
 - First scrub with soap and water to remove all dirt, feathers, bedding, blood, and excrement before disinfecting.
 - Then disinfect and dry under the sun. To disinfect, use either a locally available disinfectant such as Dettol (see Appendix I and J for a list of other disinfectants) or traditional soaps and ash.
- **Clean and disinfect cages** after they've been emptied of birds, at the end of the market day.
 - Use the same procedure described above for cleaning and disinfecting vehicles.
 - If you're using baskets or cages made from natural materials (wood, millet stalks), replace them at least once every two weeks and dispose of the old baskets/cages by burning or burying.

EXERCISE: CASE STUDY SCENARIO – Live Bird Markets

Task 1:

As you go through the case scenario note down the biosecurity infractions that you are reading about or see in the pictures.

Task 2:

In your group,

- Identify the biosecurity infractions seen in the picture of the market provided as a handout
- Discuss what ideas you have for correcting the infractions. Be ready to share your ideas with the group.
- Take about 20 minutes.

INDIVIDUAL REFLECTION WORKSHEET

What are **three** points you want to remember from this module?

1.
2.
3.

What additional information do you need on this module?

--

NOTES

CLEANING AND DISINFECTION

MODULE PURPOSE

To familiarize participants with the concepts of decontamination and decontamination procedures (cleaning and disinfection) appropriate for use in a farm or live bird market.

MODULE OBJECTIVES

By the conclusion of this module, participants will be able to:

- Define cleaning and disinfection and explain what each accomplishes;
- Describe the safe use of disinfectants;
- Explain the importance of PPE use in cleaning and disinfection;
- Review the information on a disinfectant (chemical) label;
- Explain the process of selecting and preparing disinfectants;
- Describe how to carry out cleaning and disinfection in farms and in live bird markets.

CLEANING AND DISINFECTION

This section includes an introduction to cleaning and disinfection including the safe use of disinfectants, the importance of PPE, understanding the information on a disinfectant (chemical) label and the process for selecting and preparing disinfectants.

What is Decontamination?

Decontamination is the removal or neutralization of disease organisms or hazardous chemicals through a process of cleaning and disinfection.

Cleaning and Disinfection = Decontamination
--

Why is it Necessary to Decontaminate Live Bird Markets?

- Cleaning and disinfection are key components of routine biosecurity in live bird markets.
- Live bird markets have the potential to harbor many different types of disease organisms and are a likely source of spread of the avian influenza virus. Decontamination destroys viruses such as the avian influenza virus and other disease causing organisms such as bacteria.
- Many people visit live bird markets in countries such as Nigeria. Decontamination of live bird markets may prevent people from contracting illnesses such as the avian influenza when they go to the markets.
- Lorries, cars, bicycles, and other vehicles are used for transportation of chickens. These vehicles are decontaminated to destroy any disease organisms they may bring into the market.
- Cages used by both sellers and transporters are decontaminated before new birds are placed in them. Cages made from local materials such as bamboo, millet stalks etc., which are quite common in Nigeria, are very difficult to decontaminate. These materials can be very porous, and it is difficult for disinfectants to penetrate and kill all the organisms lodged in the small pores.

Survival of Avian Influenza Virus

- Viruses can be carried on people's hands, skin, clothes and footwear. Equipment, such as cages and wheelbarrows, bedding, and manure can all be easily contaminated by the avian influenza virus.
- The avian influenza virus can survive a wide range of temperatures, especially if protected by organic matter. Studies have shown that the virus can survive up to 4 days at 22°C, 35 days at 4°C in poultry manure, and more than 30 days at 0°C in water. (Source: OIE disease cards)

- The avian influenza virus can survive for several days in carcasses at room temperature or up to 23 days if refrigerated.

CLEANING

Soaps, detergents, many household cleaners, disinfectants, and other chemicals are effective against the avian influenza virus.

Cleaning involves the removal of dirt and organic matter, and disinfection is the addition of an appropriate disinfectant after cleaning.

Cleaning is normally done in two steps: dry cleaning and wet cleaning.

1. Dry Cleaning

- Involves using a brush, a rag or tools such as blow dryers to remove dry organic material
- Dry cleaning should not be used for cleaning poultry holding houses and cages which may have contained birds infected with HPAI.
- Dry cleaning may cause aerosolization of the virus and increase the risk of infection for humans.

2. Wet Cleaning

- Requires the use of soap and water – it involves soaking the area and scrubbing to remove remaining organic material as well as dirt and grease.
- Wet cleaning reduces the risk of aerosolization of virus.
- Wet cleaning with soaps and detergents destroys the fat in the membrane of the avian influenza virus and are used for cleaning. To completely destroy the virus, disinfectants are needed.

5.2 DISINFECTION

What is a Disinfectant?

Disinfectants are chemical agents that either slow the growth of disease causing organisms or kill them. They work by disrupting the structure of the virus or bacteria blocking its ability to reproduce.

Organic matter such as manure reduces the ability of the **disinfectant** to kill dangerous disease organisms.





Some common disinfectants:

- Oxidizing agents – hydrogen peroxide and Virkon®
- Alcohols – ethanol
- Halogens – sodium hypochlorite (household bleach)

Disinfectants are divided into several classes of chemicals as seen in the tables below.

Chemical group	Examples
Oxidizing agents	Hydrogen peroxide (Hyperox) Virkon®
Alcohols	Isopropyl, Ethanol
Halogens	Betadine (iodine) Sodium hypochlorite e.g Halamid, Bleach
Phenolics	Lysol, Dettol, Prophyl 75, Fenix
Quaternary Ammonium	Timsen, Algene
Coal Tar distillates	Cresolic acid
Aldehydes	Glutaraldehyde, Formaldehyde

Chemical Group	Pros	Cons
Oxidizing agents	<ul style="list-style-type: none"> • Breaks peptide bonds in viruses to destroy them • Good for surface cleaning of equipment • Moderate to high effect in presence of organic matter • Requires 10 minute contact time with cloth 	<ul style="list-style-type: none"> • Corrosive, do not spray on equipment • Does not work well in presence of organic matter • Poor residual activity
Alcohols	<ul style="list-style-type: none"> • Broad spectrum • Low cost • Readily available • Non-toxic 	<ul style="list-style-type: none"> • Requires long contact time, evaporates quickly • Used mainly for labs and lab equipment • Flammable
Halogens	<ul style="list-style-type: none"> • Wide range of applications: water, skin, multi-surface • Low cost 	<ul style="list-style-type: none"> • Moderately corrosive, inactivated by sunlight, not suitable for footbaths, poor residual activity • Does not work well in presence of organic matter
Phenolics	<ul style="list-style-type: none"> • Good residual action • Moderate to high effect in presence of organic matter • Requires 10 minute contact time 	<ul style="list-style-type: none"> • High concentrations can irritate skin, eyes and lungs • Does not kill all bacteria and viruses

Chemical Group	Pros	Cons
Coal Tar Distillates	<ul style="list-style-type: none"> • Wide germicidal activity • Excellent residual activity • Highly efficient in presence of organic matter 	<ul style="list-style-type: none"> • Corrosive and toxic at high concentrations • Moderately expensive
Aldehydes (Glutaraldehyde)	<ul style="list-style-type: none"> • Wide spectrum of activity • Moderate efficiency in presence of organic matter • Slight residual activity 	<ul style="list-style-type: none"> • Moderately toxic • Moderate to high cost
Aldehydes (Formaldehyde)	<ul style="list-style-type: none"> • Very effective against all pathogens • In gaseous form used in closed spaces, such as hatcheries 	<ul style="list-style-type: none"> • Requires careful control of time, humidity, concentration and distribution • VERY TOXIC!

I. Safe Use of Disinfectants

Disinfectants have to be used with caution. They are chemicals that can cause toxicity if not used properly.

Personal Protective Equipment, or PPE, should be worn when mixing and applying chemicals. It is necessary to protect the whole body and face when handling chemicals.

- Protect Eyes
 - Always wear goggles or other eye protection when handling disinfectants. Eyes can be contaminated from accidental spills and rubbing with contaminated gloves or clothing.
- Protect Mouth and Lungs
 - Some disinfectants produce vapors, dust and particles during mixing or application.
 - The best protection is to wear an air-purifying respirator, half-mask (seen below) or full face with a replaceable HEPA filter. Do not use dust masks when spraying chemicals. They will not filter small droplets or particles.



Air-Purifying Respirator,
Half-Mask

- Protect your Body
 - Overalls, gloves, aprons and boots will serve to protect the body, arms, hands and feet.
 - Gloves should cover the forearms and should preferably be rubber gloves that are resistant to chemicals.
 - PVC or neoprene aprons should provide complete front body protection from spills and splashes.
 - BE SURE to wash your hands and face with water AND soap after using disinfectants.

2. Disinfectant Labels

Disinfectant labels give valuable information that will reduce the risk of chemical contamination to the person applying the disinfectant and the live bird market they are trying to protect. The following are elements of a disinfectant label you should be familiar with:

- **Signal Heading**
 - Seen at the very top of the label; cautions the user about the toxicity of the product usually with the words WARNING, CAUTION, DANGER or POISON.
- **Product Name**
 - The trade name of the product which may or may not include the chemical name.
- **Active Constituent**
 - The active ingredient (a.i.) is the chemical material in the formulation that actually destroys the target disease organism or performs the desired function.
 - Disinfectant labels are required by law to show the active ingredient and its percentage.
- **Net Contents**
 - The weight or volume of the disinfectant.
- **Claims for Use**
 - Describes where to use it, e.g. disinfecting poultry houses or markets.
- **Directions for Use**
 - Describes what the product controls and where, how, and when to use it.
- **Name and Address of Company**
 - The name, addresses, and (sometimes) phone number of the manufacturer or distributor is listed.
- **Withholding Period**
 - Directions on when to allow re-entry of animals following disinfection.
- **Limitations on Use**
 - A statement of warning about using the product contrary to the label.
- **Protection Statements**
 - Information on what to do to protect livestock before and after use of the disinfectant.

- **General Instructions**
 - Directions for use of the disinfectant in different situations requiring different concentrations or methods of application.
- **Safety Directions and First Aid**
 - Details the use of PPE and precautions related to exposure.
 - Also lists signs of toxicity and measures to take in case of exposure and spills.
- **Emergency Information**
 - The label provides police and fire service emergency numbers in case of a hazardous spill involving vehicles.
- **Storage and Disposal**
 - Information on storage temperatures and other physical requirements needed to keep the disinfectant ingredient potent and safe.
- **Expiry Date**
 - Date stamped on the product to offer guidelines for disposal dates especially for time-sensitive chemicals that can undergo degradation.
- **Reference to MSDS**
 - A material safety data sheet (MSDS) is a form containing data regarding the properties of a particular substance.
 - Information regarding any chemical can be found at: www.msds.com

3. Choosing the Right Disinfectant

The choice of disinfectant will depend on the following:

- Cost
- How efficiently it destroys viruses and other organisms
- Temperature
- Activity with organic matter
- Toxicity – how safe is it for both animals and humans?
- Contact time and residual activity
- Effect on fabric and metal equipment
- Effect on smell and taste of food
- Solubility (acidity, alkalinity, pH)

4. Temperature

- Increasing the temperature of the disinfectant increases the speed of chemical reactions and the speed of disinfection
- All disinfectants, whether sprays, foams, aerosols or fumigants work best at temperatures above 18.3°C (65°F)
- Temperatures for chlorine and iodine-based disinfectants should not exceed 43.3°C (110°F) to prevent corrosiveness

5. Contact Time

- Contact time is used to calculate how much disinfectant is required to adequately disinfect a defined surface area.

6. Preparing a Disinfectant (where to handle the chemicals):

A chemical storage area should be one that:

- Can be locked
- Is well ventilated
- Can restrict the flow of chemicals if a spill occurs
- Is well away from areas where people work and where poultry are kept

The disinfectant mixing area should be:

- Off limits to all staff who are not wearing PPE
- Well supplied with clean water and good water pressure
- Positioned so that no spills cannot leave the site
- Level and accessible to spraying machinery

7. Calculating the Quantity of Disinfectants

Disinfectant Mixing Formula: (For Virkon S powder)

- a. 300ml (0.3 liters) of mixed chemicals is needed for every square meter of surface
- b. Proper disinfectant formula = Multiple floor area \times 2.5
Example: 10m² of floor area = 25 m² of room area

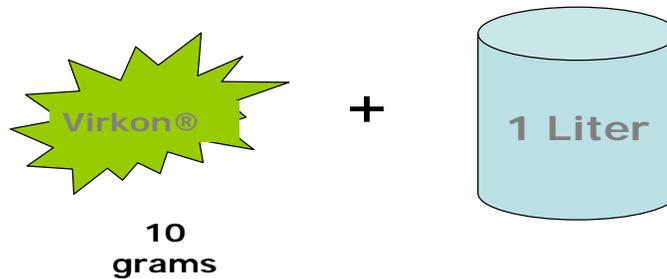
How much water is needed:

- c. Length \times Width (A) = A m²
- d. Entire room area (B) = A m² \times 2.5 (including all walls, floors, and ceiling)
- e. USE 300ml per m²
- f. B \times 300ml per m² = Amount of water to be used

Example: 200m^2 total room area \times 300ml = 200×0.3 liters = 60 liters of water.

Calculating Chemical Dilution Rate:

Preparing and using Virkon®



- Should be used at 1% (10g+1L) or 2% (20g+1L)

NOTE: 1% dilution = adding 1 gram of chemical to every 100ml of water

8. Mixing Procedure:

1. Add water to bucket.
2. Add disinfectant powder (or liquid).
3. Always mix disinfectants with a stirrer. NEVER use your hands to mix disinfectants with water.
4. Add disinfectant mixture into sprayer.

Mixture is complete and ready to be sprayed.

9. When Disinfectant Container is Empty:

1. Rinse out the container with water three times.
2. Make sure that container is never used for food or water storage.
3. Recommend: puncture the container after use so that no one can use it for food and water storage.

10. Applying Disinfectants and Cleaning Principles

1. Remove any chickens from cages and then remove all organic matter (litter and manure) from the cages.
2. Bury or compost away from the market.
3. Use a detergent and pressure washer (if available) to thoroughly soak:
 - Floors
 - Walls
 - Ceilings
 - Cages
 - Feeders
 - Other equipment such as scales, tables and buckets.
4. Allow 10 minutes for detergent to penetrate and then scrub everything accessible with a scrub brush.
5. Disinfect fans, light bulbs or any electrical equipment, using a cloth soaked in disinfectant.
 - Spray all areas with disinfectant, including stalls, cages etc.
 - Allow disinfectant to soak for at least 24 hours before rinsing.
6. Disinfection of all stalls should occur at the end of every day and the whole market should be shut down monthly.

EXERCISE A

Product Name	Active Constituent	Rate of Mixing	Hazard / Toxicity Level
1			
2			
3			

EXERCISE B

Calculate the amount of your assigned chemical that would be needed to clean the room you are occupying now.

EXERCISE C: DECONTAMINATION CASE STUDY

You are part of a team that has been asked to clean and disinfect (C&D) a poultry farm in Kwara State that was depopulated within the past 24 hours due to an outbreak of HPAI.

The poultry farm consists of one large building (35 × 300ft or 10.7m × 91.5 m)) and housed 20,000 4 week-old broilers. The farm owners attempted to do it with only one sprayer and using formalin as a disinfectant (see picture below).

The government of Kwara State has agreed to subsidize the decontamination costs for the farmer.

1. How can you help the farmer do a better C&D (refer to the picture) with the funds the government has allocated?
2. What do you see wrong with this picture?
3. What disinfectants will you recommend?



Figure 1: Poultry farm disinfection

INDIVIDUAL REFLECTION WORKSHEET

What are **two key decontamination procedures** you will remember in the event of an outbreak?

1.

2.

What additional information do you need on this module?

NOTES

BIOSECURITY PLANNING FOR COMMERCIAL FARMS AND LIVE BIRD MARKET ADMINISTRATORS

MODULE PURPOSE

To learn the basics about biosecurity planning for farms and markets.

MODULE OBJECTIVES

At the conclusion of this module, participants will be able to:

- Assist poultry growers, sellers, and live bird market administrators in developing a biosecurity plan for their farm or market.

LESSON 1: BIOSECURITY PLANNING

The regular and consistent practice of biosecurity is necessary to effectively prevent disease from entering your farm or market. Creating a biosecurity plan that is specific to your farm or market – its size, structure, and stock – is essential to ensure the safety of your facility.

Because every person who works on the farm or in the market plays a role in maintaining biosecurity, it is important to make sure that everyone is involved in the development of the biosecurity plan. It is helpful to form a small group of people to guide the process, preferably led by the farm or market manager. They should gather input from people working at each point in the different functions at the farm or market. The initial design of a biosecurity plan should include expert input from veterinarians.

To ensure the successful implementation of the biosecurity plan, it is important to obtain broad political commitment and stakeholder participation. These parties should be familiarized with the biosecured markets or farms concept. Fostering political commitment on the national, provincial, and local authority levels is important to ensure program support and appropriate resources. Local / district / provincial poultry associations and market associations should be established with representation of all stakeholders for regular monitoring of implementation of the biosecurity plan. It is important to develop or adopt communication plans and materials aimed at the general public to raise public awareness on the advantages of good biosecurity in farms and markets.

A method for monitoring and analyzing costs and benefits of biosecurity planning for farms and markets should be adapted or developed to assess the viability to replicate this initiative in other settings. All cost elements like infrastructure, farm or market surveillance, research, training, plan development and implementation should be addressed. The actual costs incurred by the market community and poultry farmers and other contributors like local, district, provincial, national and international stakeholders are also important considerations.

Here is a suggested process for developing a biosecurity plan:

1. Define the Objectives

It is important to be clear about what the biosecurity plan is going to be designed to accomplish. Generally, the objectives of a biosecurity program are to:

- Minimize the risk of the introduction of diseases.
- Prevent the spread of disease from an infected area to an uninfected area.

However, it may not be practical to control all disease from entering the farm or market (such as coccidiosis), so you might want to define which disease(s) you will focus on in your plan. Choose the diseases that pose the greatest threat to the health and productivity of your flocks and the economic health of your farm/market, such as HPAI.

2. Assess Risks

The next step is to conduct a risk assessment to determine the conditions present that may increase the risk of disease.

Use the risk assessment checklist to identify the risks (Appendix A for commercial farms and Appendix F for live bird markets). Distribute the checklist to several people, preferably workers with different functions on the farm or at the market, and ask them to walk around and make observations while completing the checklist.

Come together as a group and compare your assessments, and agree on the top-10 risks facing your farm or market.

3. Establish Biosecurity Procedures

Best Practice: Standard operating procedures (SOPs) are useful to document specific biosecurity procedures to be followed. They are particularly helpful for training new staff or sellers and ensuring that your efforts are consistent.

The group responsible for developing the biosecurity plan, with the help of selected workers and the advice of a veterinarian, should prepare SOPs to respond to the 10 biggest risk factors you identified. The final SOPs should include detailed information and a written protocol that specifies what will be done, by whom, where, and when (see Appendix L for an SOP template).

As you go through the process of developing SOPs, be sure to consider what obstacles you're likely to face when implementing these biosecurity measures, and what options you have for overcoming these obstacles. The effort of developing SOPs will be wasted if your workers or market sellers cannot or will not comply with the procedures due to time and resource constraints, or lack of knowledge.

Good Practice: The group assigned the task of developing the biosecurity plan should write down simple methods that people can use to eliminate or minimize the biggest risk factors.

Biosecurity Plan

I. Field Personnel

- A. Field personnel should avoid entering poultry houses whenever possible.
- B. Required to wear clean clothes and shoes when arriving to the farm.
- C. All employees will wear designated protective coveralls, footwear, hair covering, and will sanitize their hands before entering the farm.
- D. Vehicles are to be parked off-farm in the designated parking site. Vehicles will be completely washed and thoroughly disinfected upon entering the farm.
- E. Interiors of farm vehicles operated by supervisors and/or farm employees are to be kept free of debris and are disinfected upon leaving one farm and entering another

2. Farm Employees

- A. Required to wear clean clothes and shoes when arriving to the farm.
- B. All employees will wear designated protective coveralls, footwear, hair covering, and will sanitize their hands before entering the farm.
- C. Vehicles are to be parked off-farm in the designated parking site. Vehicles will be completely washed and thoroughly disinfected upon entering the farm.
- D. All farm personnel are assigned to one farm only.
- E. Farm personnel are not allowed to own or possess any live poultry and/or birds of any kind.
- F. All family members of farm personnel are required to practice the same biosecurity rules practiced by farm managers.
- G. Farm personnel are not allowed to visit any other poultry operation or location where poultry is raised or sold.
- H. All traffic entering the farm must be disinfected regardless of the purpose of the visit and can be allowed entry onto the farm only if they meet the standards mentioned above.
- I. All employees are trained quarterly in biosecurity. All company employees understand the consequences of coming into contact with poultry/birds off-farm. Employees will clean and disinfect their vehicles and footwear, launder their clothes, shower, and wear different clean clothing and footwear to work the next day.

3. Equipment

- A. All equipment used is cleaned and stored after use. Any equipment brought onto the farm from an outside source is cleaned and disinfected prior to use on the farm.
- B. In the event that two or more farms utilize the same equipment, it is cleaned and disinfected before leaving the initial farm and disinfected again upon entering the second farm.

4. Outside Personnel (Visitors)

- A. All personnel involved or uninvolved with the operations of a farm are considered as possible disease vectors and are instructed in the practice of biosecurity procedures followed by a particular farm prior to entering the farm.

5. Pests

- A. A farm uses rodenticide baited traps that are serviced monthly. Logs are kept of the rodents trapped on the farm.

B. Attractants for wild birds (standing water, spilled feed, and carcasses) are removed as soon as possible.

6. Flock Replacement

A. Houses are fully cleaned and disinfected when a flock is removed.

B. Houses remain empty at least 2-3 weeks before a new flock is housed after cleaning and disinfection.

4. Train Staff

Training is an important part of understanding and implementing the biosecurity plan.

Best Practice for Commercial Farms: All company personnel involved with livestock, growers, livestock contractors and suppliers should undergo at least annual training sessions on the farm's biosecurity procedures.

Once the SOPs are completed, conduct training for all staff on how to implement them.

Good Practice for Commercial Farms: All company personnel should gather together at least once a year to discuss the biosecurity plan. At that time, comments from workers concerning areas that need improvement or awareness of additional risk should be discussed. Agreement should be reached on how the risks will be eliminated.

New workers should be trained by supervisors on proper biosecurity practices and should be assigned to work with a more experienced worker to further reinforce the earlier training.

Best Practice for Live Bird Markets: All stall operators should be required to participate in an annual biosecurity class in order to receive and renew their license to sell poultry.

Good Practice for Live Bird Markets: Once a year gather together all the stall operators in the market to discuss the biosecurity plan. Ask for input from the sellers and discuss any concerns they have about the procedures.

5. Monitor the Effectiveness of the Biosecurity Plan

- Your farm or market's biosecurity plan should be continuously evolving – animal diseases and the local environment are always changing, and so you must regularly evaluate whether your current biosecurity procedures are still effective.
- Monitor the effectiveness through regular HPAI surveillance and testing.
- The farm/market manager(s) should continually evaluate all areas of operation under their direction.

- The on-going input of the farm's staff and market sellers is very important for the success of the plan.
- Periodically – for instance, quarterly – conduct an audit of the plan to see if the procedures are being used as planned.
- Use these audits to determine if modification of specific SOPs or if additional staff/seller training is necessary.

EXERCISE: BIOSECURITY PLANNING

Follow the steps below to complete this exercise.

EXERCISE: BIOSECURITY PLANNING	
I	Describe
	<p>In this exercise, you will be evaluating the biosecurity efforts of a specific setting and creating a plan for improvements. With your group, choose the setting that you will use for this exercise: commercial farm, smallholder farm or live bird market. Discuss characteristics of a typical setting in Nigeria (you may choose a farm that you work with, a market you use, etc.).</p>
	<p>Description of the setting your group will evaluate:</p>
	<hr/>

EXERCISE: BIOSECURITY PLANNING (CONTINUED)					
2	<p>Evaluate</p> <p>Look at the biosecurity measures listed in the <i>Participant Manual</i> for your type of setting. In the columns below, indicate which measures are currently observed and which have not been implemented yet.</p>				
	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">Measures currently implemented</th> <th style="width: 50%;">Measures not currently implemented</th> </tr> </thead> <tbody> <tr> <td style="height: 150px;"></td> <td style="height: 150px;"></td> </tr> </tbody> </table>	Measures currently implemented	Measures not currently implemented		
	Measures currently implemented	Measures not currently implemented			
<p>Prioritize</p> <p>As a group, discuss the relative importance and impact of each of the measures which are not currently implemented. Identify the three measures that you think should be addressed first.</p> <p>1) _____</p> <p>_____</p> <p>_____</p> <p>2) _____</p> <p>_____</p> <p>_____</p> <p>3) _____</p> <p>_____</p> <p>_____</p>					

EXERCISE: BIOSECURITY PLANNING (CONTINUED)					
4	<p>Analyze</p> <p>Identify any likely or potential obstacles that might be faced when implementing the measures your group selected. Then, for each potential obstacle, identify options that would help overcome it.</p>				
	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">Potential obstacles</th> <th style="width: 50%;">Options for overcoming obstacles</th> </tr> </thead> <tbody> <tr> <td style="height: 150px;"></td> <td></td> </tr> </tbody> </table>	Potential obstacles	Options for overcoming obstacles		
	Potential obstacles	Options for overcoming obstacles			
5	<p>Plan</p> <p>Describe, as thoroughly as possible, the steps necessary to implement your top three measures successfully.</p> <p>1) _____</p> <p>_____</p> <p>_____</p> <p>2) _____</p> <p>_____</p> <p>_____</p> <p>3) _____</p> <p>_____</p> <p>_____</p>				
6	<p>Review and Revise</p> <p>Note that in the “real-world,” you should review your biosecurity compliance often and evaluate how successfully you implemented new measures. Once new measures are in place, go through the steps again to identify additional areas for improvement.</p>				
7	<p>Be prepared to share your answers with the group.</p>				

INDIVIDUAL REFLECTION WORKSHEET

What are **three** points you want to remember from this module?

1.
2.
3.

What additional information do you need on this module?

--

NOTES

BIOSECURITY RISK ASSESSMENT – INTERVIEWS

MODULE PURPOSE

To provide an opportunity to apply technical knowledge on biosecurity and surveillance planning to a real world farm and live bird market setting.

MODULE OBJECTIVES

At the conclusion of this module, participants will be able to:

- Complete a risk assessment form for a farm or live bird market;
- Identify biosecurity infractions and recommend solutions for dealing with the infractions.

TEAM TASK: PREPARATION

- With your team, review the field visit forms and checklists that you will fill out. Plan how you will organize yourself in your teams (how you'll use your time, share assignments to complete the forms, etc.).
- Identify what questions you want to ask the farmer, market manager/seller.

TEAM TASK: DURING INTERVIEWS

- Record biosecurity risks and strengths through the team's interview of the farmer and market representatives.
- Complete the risk assessment checklists.

TEAM TASK: DEBRIEFING THE RISK ASSESSMENT EXERCISE

- Prioritize the biosecurity risks.
- Develop recommendations to address the top risks.
- Plan how you would communicate your findings and recommendations.
- Be prepared to share your findings and recommendations with the group.

INDIVIDUAL REFLECTION WORKSHEET

What are **three** points you want to remember from today?

1.
2.
3.

What additional information do you need?

--

TAKING THE LEARNING HOME

MODULE PURPOSE

To provide participants with an overview on what it takes to change behavior and how to transfer the knowledge and techniques from this course to other audiences.

MODULE OBJECTIVES

At the conclusion of this module, participants will be able to:

- Transfer these concepts and techniques to various audiences (poultry transporters, consumers, sellers, and market administrators).

BEHAVIOR CHANGE

What do people need to be aware of to motivate behavior change?

- **What's in it for me?**
 - Remember, it is all about your audience, whether you are delivering a simple message or full scale training. They are constantly wondering how the information you are sharing pertains to them. Make it clear upfront how this information is beneficial to them and keep repeating the message!
- **Recognize and Articulate the Return**
 - Also be sure to tell them about the returns or incentives, this will get them interested in what you have to say. As much as you can, make this very personal – to get the message across to any audience you need to invest the time in getting to know them.
- **Articulate the Risks**
 - Similar to returns you want to be very upfront about the risks involved. This includes acknowledging both the risks of not implementing what you are asking them to and the risks they may encounter if they do take action. Make sure you talk openly about the risks and how, if possible, they can be mitigated.
- **Counter their concerns or fears with examples of and stories on the benefits of change.**
 - Your best tool is to have stories or examples of success. Know upfront what the concerns of others might be and be prepared to share these successes. In addition, collect stories and examples for others to enhance the messages you are trying to get across. Also, be sure to draw from the successes of your audience – perhaps the most powerful tool of all.

BIOSECURITY TRAINING COURSE – LESSON PLANNING WORKSHEET

Target Audience:	Estimated Number of Participants:
Subject:	
Key Concepts:	
Duration of the Lesson:	Setting for the Lesson (classroom, one-on-one, etc.)
How Will You Communicate the Key Concepts:	
What Parts of the Guide Will You Use as Teaching Aids?	

APPENDIX A

FARM RISK ASSESSMENT CHECKLIST

The purpose of this form is to determine conditions present on the farm that may increase the risk of introducing or spreading disease.

In the risk level column, quantify the level of risk of each factor as Very Risky (+++), Risky (++), or Mildly Risky (+).

Risk Type	Yes	No	Risk Level	Comments
A. Environment				
1. Important infectious disease (endemic or exotic) present in the area				
2. High farm density in the area				
3. Larger poultry farm located within 750 meters of your poultry farm				
4. Presence of a backyard flock within 400 meters of your farm				
5. Poultry farm located within 3 km of a poultry slaughter place (wet-market, plant, etc.)				
6. Presence of a pond or dam on the farm or in very close proximity				
7. Poultry house very close to the road (less than 50 meters)				
8. Farm located along a main busy road				
9. Manure piled or spread near poultry houses				
10. Dense vegetation comes to the edge of poultry houses				
11. Piles of equipment and construction material abandoned near the poultry houses				
12. Feed spill or feed from previous flock discarded near poultry houses				
13. Non-poultry farms (swine, cattle/buffalo, goats) nearby				
B. Farm Characteristics				
1. Free access to poultry houses (no locks on doors)				
2. Free access to the farm (no gate, no fence, no signs)				
3. Free range commercial poultry (chickens or ducks)				
4. Birds of two different age groups in the same building at the same time				

Risk Type	Yes	No	Risk Level	Comments
5. Several flocks of different ages on the same farm				
6. Poultry houses oriented so that wind flow goes from older birds to younger ones				
7. Untreated surface water of dam, lake, or creek used for drinking and/or cooking				
8. Untreated ground water used for drinking				
C. Flock Characteristics				
1. Breeder flock health status unknown				
2. Flock composed of multiple breeder flocks of widely differing ages				
3. More than one hatchery is used to populate a flock				
4. Flock composed of multiple breeder flocks of similar age				
D. Wild Birds				
1. Wild birds able to enter the poultry house				
E. Pets				
1. Dead poultry are fed to dogs, cats, etc. on the farm				
2. Stray dogs present on the farm				
3. Pets like dogs and cats present on the farm, but not inside chicken houses				
5. Pet birds like parrots kept on the farm				
F. Other Farm Animals				
1. Other farm animals like pigs, cattle, buffalos, goats, etc., raised on the poultry farm				
G. Pests				
1. Rat and/or mice infestation				
2. Darkling beetle infestation				
3. Fly infestation				
4. Mosquito infestation				
5. Cockroach infestation				
H. People				
1. Farm employees also own poultry				
2. Farm employees attend cock fights				
3. Family of farm employees owns birds or works at another poultry farm				
4. Farm employee owns pet (exotic) birds				
5. Farm employees hunt wild birds				
6. Employee lives on the farm				
7. Poultry dealers or catching crew wear same clothing when going between farms				
8. Grower or employee visits other poultry farms				

Risk Type	Yes	No	Risk Level	Comments
9. Visitors to the farm don't sign a log book, or are not asked if they visited another poultry farm prior to their visit				
10. Non-authorized visitors permitted on the farm				
11. Grower or employee regularly visits places patronized by many other poultry people (restaurant, club)				
12. Farm employees visit homes of relatives or friends who own poultry farms				
13. On farms with flocks of several ages, people go from house to house without consideration of flock age or flock health status				
I. Vehicles				
1. Cars and trucks parked too close to poultry houses (less than 30 meters)				
2. Farm vehicles go off farm				
3. Farm employee rides between two or more houses or farm units in feed, egg, or chick truck				
4. Outside vehicles are not cleaned or checked for cleanliness before entering the farm				
5. Feed truck driver goes on farm				
J. Management				
1. Leaving some birds on farm after load-out				
2. Partial pickup				
3. Short downtime between two flocks (less than a week)				
K. Hygiene				
1. No farm- specific clothes for employees and visitors, or no special clothing requirements				
2. No special footwear requirements for employees or visitors				
3. No showers available on farm, or no shower is taken before entering the farm				
4. Outside equipment brought on farm without special sanitation considerations				
5. No farm washing or disinfection between two flocks				
6. No gloves used and no hand washing before and after handling birds, eggs, feed etc.				
7. People dress wild birds on farm premises				
8. Dirty footbaths filled with an old (non-active) disinfectant solution at the entrance of the poultry house				

Risk Type	Yes	No	Risk Level	Comments
9. No head gear (cap) used by person visiting the farm				
10. No face masks are used by visitors				
L. Feed				
1. Feed shed accessible to rodents or wild birds				
2. Feed can get wet in storage room and feed pan				
M. Dead Bird Disposal				
1. Central location for dead bird disposal used by several poultry growers				
2. Dead birds stockpiled overnight before disposal and exposed to pests (rats, flies) pets (dogs, cats) wildlife (foxes, crows)				
3. Dead birds left inside the shed for many hours				
N. Any Other Risk Factors Present on Farm that are Not on this List				

APPENDIX E

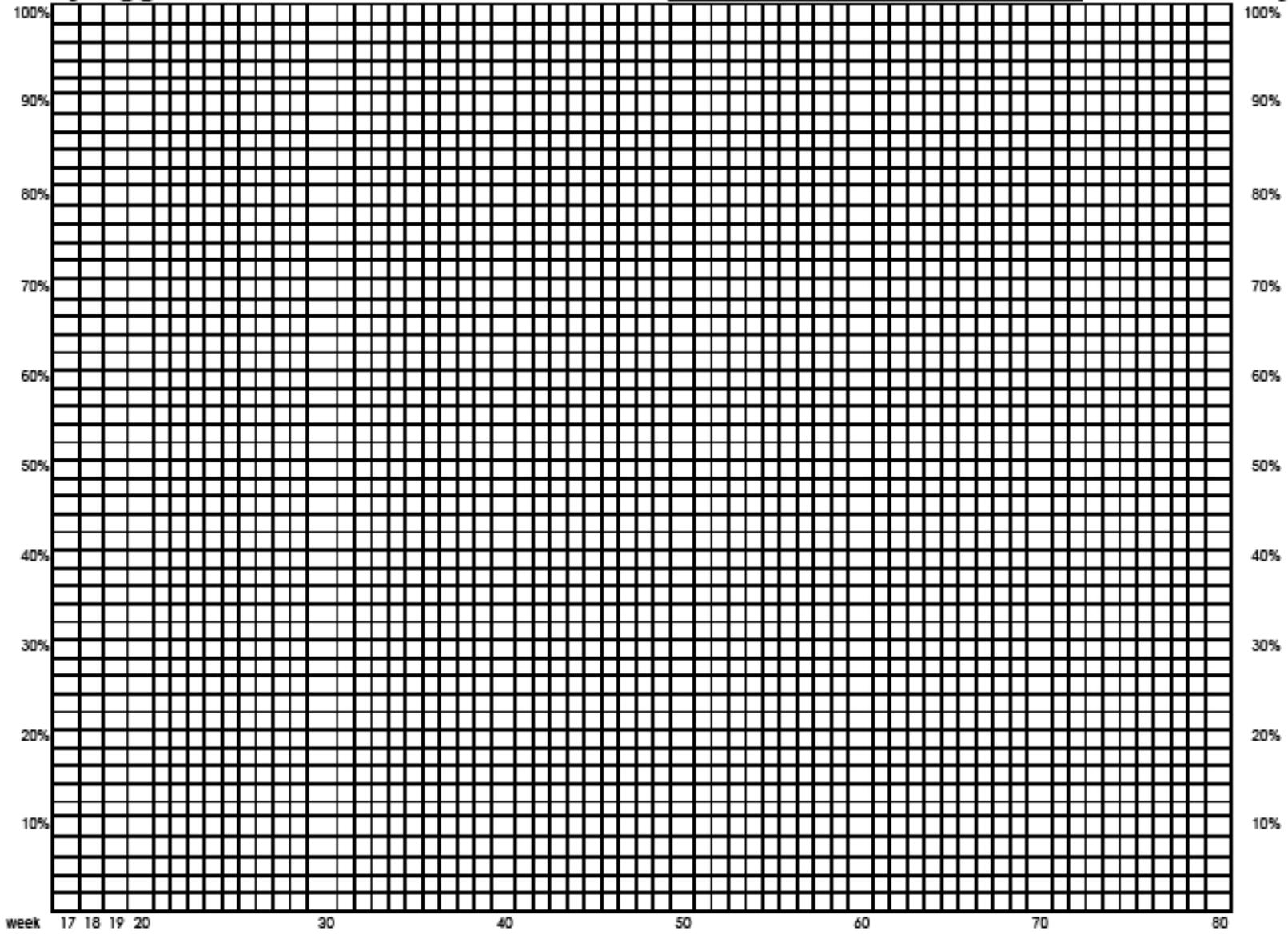
SAMPLE EGG PRODUCTION LOG

You can manage egg-laying chickens more efficiently if you use management guides. These usually include guidelines for feed formulation, pullet raising, body weight targets, targets for water and feed intake, as well as lighting schedules.

These guides are provided by the company that supplies pullets to farmers. Ask your distributor for a management guide for the breed you have.

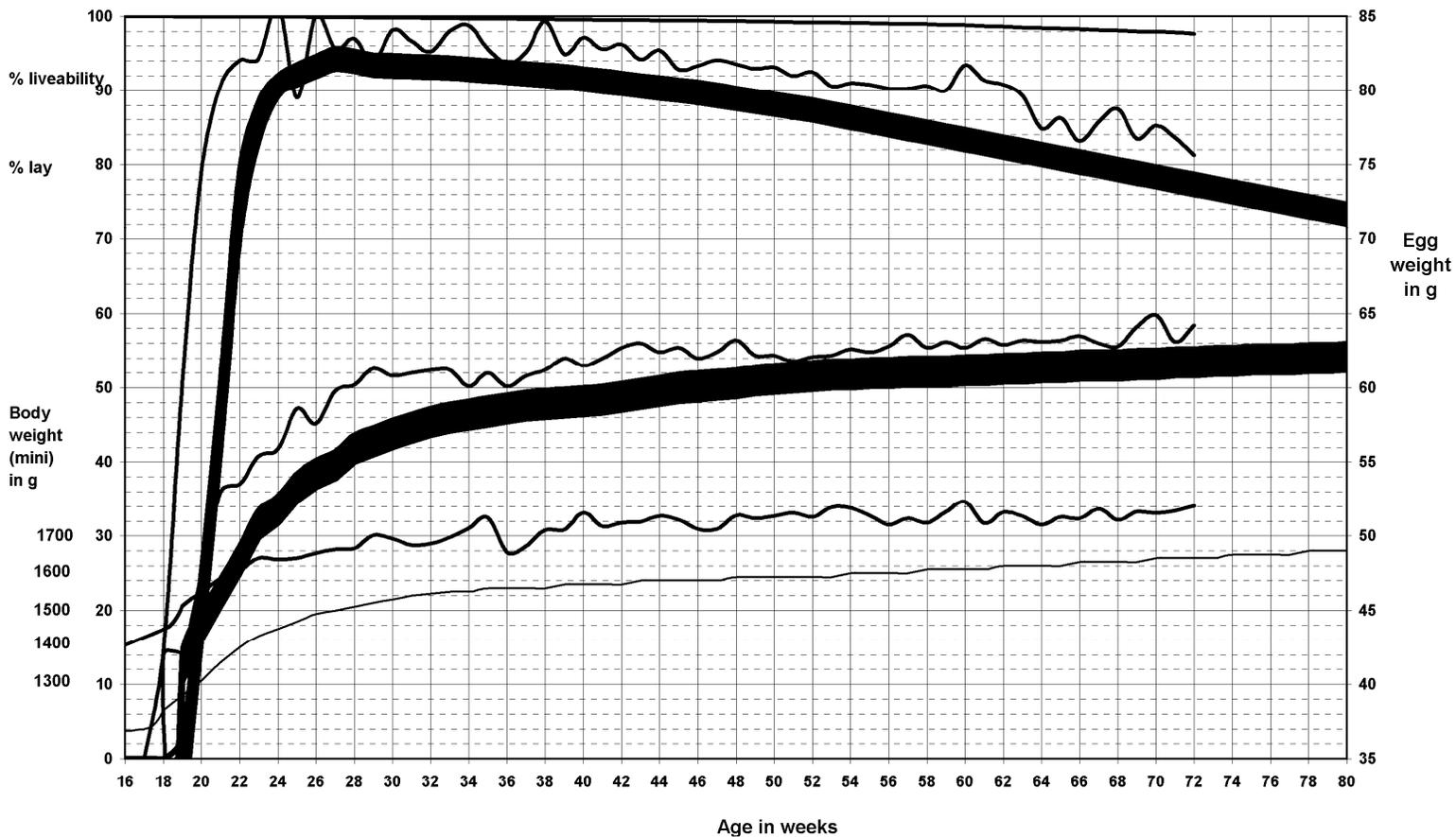
One of the best management tools to use is a graph that keeps track of the weekly egg production, body weight, egg weight and cumulative liveability or mortality. Two examples are included on the following pages.

Daily Egg Production Farm Name _____ **Mortality**



Name
Flock number
Hatch date
Transfer date
Number of birds

PRODUCTION CHART



APPENDIX F

BIOSECURITY CHECKLIST FOR LIVE BIRD MARKETS

The purpose of this form is to determine conditions present in the live bird market that may increase the risk of introducing and spreading disease.

In the risk level column, quantify the level of risk of each factor as Very Risky (+++), Risky (++), or Mildly Risky (+).

Risk Type	Yes	No	Risk Level	Comments
A. Isolation and Traffic Control				
1. Market located in a larger municipal market				
2. Market fenced to separate it from other areas in the large market				
3. Entry and exit doors separate				
4. Unloading area for trucks				
5. Sellers have distinct booths				
6. Good distance between booths				
7. Birds in cages				
9. Cages made of plastic or metal				
9. Cages made of wood				
10. Birds on ground				
B. Management				
1. Sales and mortality records kept				
2. Market license displayed				
3. Healthy birds bought from one reliable source				
4. New birds introduced without quarantine				
5. All birds sold in one day				
6. All birds sold in one week				
7. Birds sold live				
8. Birds slaughtered and processed at market				

Risk Type	Yes	No	Risk Level	Comments
9. Birds separated by species in cages or pens				
10. Stocks include waterfowl				
11. Separate cage for sick birds				
12. Unsold birds returned to farms of origin				
13. Cages are stacked				
14. Cages are lined with paper or other material				
15. Cages have clean feed and water troughs				
16. Clean feed and water provided				
17. Feed stored in airtight and rodent-proof containers				
18. Stray cats and dogs in market				
19. Other livestock species in market				
20. Rodent control program				
C. Sanitation				
1. Clean uniforms worn				
2. Frequent hand washing				
3. Cleaning and disinfection of market				Frequency?
4. Regular cleaning and disinfection of cages and pens				
5. Proper disposal of dead birds				
6. Proper disposal of feathers, manure and other organic material				

APPENDIX G

WASTE DISPOSAL METHODS

Carcasses and other wastes can be safely disposed of using three methods:

- Incineration – **Best practice**
- Burning in a pit or above ground – **Good practice**
- Burial – **Good practice**

G.1 Incineration

Incineration is a waste treatment technology that uses high heat to destroy organic material and change it into ash, gas and heat. The ash generated still has to be buried, but incineration reduces the amount of material to be buried by about 95%. Incinerators are operated according to laws set by government agencies dealing with the environment.

Environmental concerns: Incinerators produce certain gases such as dioxin that are dangerous for human health, so their use is very controversial. Many countries have gas emission standards that have to be observed. Newer models of incinerators emit very little gas and have meters that also record small emissions. The same environmental concerns apply to surface and pit burning, but with the added disadvantage that gas emissions cannot be measured adequately. Sites for burning must be located away from the market.

It is important to:

- Register incinerators with the Ministry of Environment
- Install equipment to monitor emissions
- Keep records of incinerator emissions

G.2 Burning

Carcasses can be burned to ashes in a pit or flat surface before final burial. Like incineration, it reduces the amount of material to be buried. To prepare the fire bed, you will need an area about 2.4 meters x 0.9 m (8 x 3 ft) for every 100 chickens. Carcasses are placed on an amount of fuel – such as firewood – that is enough to reduce everything to ashes.

Do not use fuels such as gasoline, kerosene, or other highly flammable materials!

These cause fires that can quickly get out of control!

G.3 BURIAL

A burial pit for 100 chickens should be at least 2.3 m wide and 3 m deep (7 x 9 ft). After the carcasses are buried, the pit should be covered with at least 2m (6 ft) of soil to prevent scavengers from digging out the carcasses. The covering soil should not be compacted. Decomposition and gas formation cause cracking, bubbling and leaking of fluids from a compacted burial site. The soil should be mounded and graded.

Environmental concerns: It is important to locate burial sites as far away from a market as possible. Potential impacts of burying carcasses are:

- Contamination of groundwater
- Contamination of surface water
- Nuisance odors
- Contact with disease vectors.

To protect drinking wells, the burial site should be at least 152 m (500 ft) from the nearest public well and 45.7 m (150 ft) from the nearest private well.

To protect surface water, the burial site should be 15.2 m (50 ft) from the nearest stream or river.

APPENDIX H LIVE BIRD MARKET WEEKLY MORTALITY RECORD SHEET

MARKET NAME: _____ **MUNICIPALITY:** _____

WEEK DATE _____

Seller's name:

Seller's address:

Seller's mobile phone #:

Day/Date	Cage Number	Total Birds	Number Dead	Total Dead	Comments
Sunday					
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					

APPENDIX I DISINFECTANT GROUPS

Chemical Group	Examples
Oxidizing agents	Hydrogen peroxide *Virkon®
Alcohols	Isopropyl Ethanol
Halogens	Betadine (iodine) *Sodium hypochlorite (bleach)
Acids	*Acetic acid
Phenolics	Lysol Tek-Trol *Dettol
Quaternary Ammonium	Roccal Quatracide
Coal Tar Distillates	Cresol Cresolic Acid
Aldehydes	Glutaral Glutaraldehyde Formaldehyde

* Disinfectants commonly found in West Africa (Virkon is supplied by USAID Avian Influenza Programs)

APPENDIX J

COMMON DISINFECTANTS

Product	Dilution	Mixing Instructions	Comments
5.25% Sodium hypochlorite (NaOCl) household bleach	3%	Add 1 1/2 liters (3 gallons) of chlorine bleach to 8 liters (2 gallons) of water; mix well	
Virkon®	1%	10g Virkon powder to 1 liter water	Virkon-S
Acetic acid	4-5%	192 ml (6.5 fluid ounces) to 4 liters (1 gallon) water; mix well	Vinegar is a 4% solution of acetic acid

Source: The Ohio State University Extension Factsheet.

APPENDIX K

BIOSECURITY IN LIVE BIRD MARKETS WITH SLAUGHTER AND PROCESSING FACILITIES

In many countries, poultry are sold live and taken home for slaughter. The presence of H5N1 HPAI around the world has driven home the importance of safe slaughter and processing. Many human victims of HPAI H5N1 were exposed to the virus during the slaughter and processing of birds. With such a great risk, the trend is to eventually encourage a change from home slaughter to use of more modern markets with slaughterhouses and processing and chilling facilities. Such facilities can more easily implement biosecurity measures to keep out diseases than traditional live poultry markets.

K.1 BASIC REQUIREMENTS TO RUN A BIOSECURE LIVE BIRD MARKET

- Availability of a clean reliable water source
- Good and secure housing for birds
- Provision of appropriate equipment for slaughter and processing
- Facilities for safe disposal of waste products.

K.2 STRUCTURE OF LIVE BIRD MARKETS

- Markets are organized into distinct areas based on function. Functions in live bird markets are usually live bird holding or keeping, slaughtering, and processing. Separation of these areas minimizes the spread of disease by controlling and limiting fecal and blood contamination. The functional areas in a live bird market are:
 - Live Bird Area
 - Slaughter Area
 - Processing Area.

K.2.1 Live Bird Area

This is the area where live birds are kept waiting to be sold.

- Cages for housing birds should be easy to clean. Plastic or metal (stainless steel, galvanized steel, vinyl-coated or wire mesh) cages are preferable because they are easier to clean and disinfect.

- Where plastic cages are not available, cages should be made from hard materials with smooth surfaces to allow thorough cleaning and disinfection.
 - Do not stack cages.
 - Feces (manure) and fluids from birds in the top cages can fall down on birds, water and food containers below.
 - If cages have to be stacked, a tray or lining (newspapers are a cheap source) to catch fecal matter should be used.
 - Keep incoming poultry separate from unsold birds, especially if they are from different sources.
 - Keeping poultry species in separate cages is important, especially for the prevention and control of HPAI.
-

Best Practice: Keep ducks and waterfowl in a totally different area than chickens and other poultry, because ducks and other waterfowl can carry the disease without showing symptoms.

Best Practice: Food or meat inspectors should inspect live poultry should for illness before they are slaughtered. In many countries, public health employees share this duty with the veterinary services.

Good Practice: If birds are observed to be sick, they should be put in separate cages located away from the healthy birds. These birds should be slaughtered and disposed of at the end of the day.

- **DO NOT SELL SICK BIRDS**, even at very cheap prices.
- The “all-in, all-out” principle also applies to poultry markets. Sellers should source birds from one flock and strive to sell all of them by the end of the day.

This allows for proper cleaning and disinfection and prevents birds from being returned to farms or staying overnight at the market.

K.2.2 Slaughter Area

This is the area where birds are killed, their blood drained and their feathers removed (plucked).

- Slaughter areas should be separate from the live poultry and processing area.

- People who slaughter the birds should take precautions: they should wash their hands frequently with soap and water, and avoid splashing blood on their faces or clothes.
- The slaughter area should have a bucket or drain for collecting the blood, especially in countries where manual slaughtering by knife is more common.

Ideally, line the bucket with a plastic bag and add disinfectant (1-2 liters). When the plastic bag is half full, tie the top of the bag closed, pull it out and dispose of it properly in an appropriate drain when you are finished slaughtering birds.

- Slaughter areas should be washed with soap and water and disinfected after each slaughter of a group of birds.
 - If there is only one bird in the group, clean up the slaughter area after slaughtering that bird.
 - By cleaning up several times during the day, you will get rid of viruses and bacteria.
- Care should be taken when de-feathering birds.
 - Feathers are normally plucked by first dipping the birds in very hot water (scalding temperatures range from 50-65° C or 123-150° F depending on the try species being processed).
 - The scalding water should be changed frequently.
 - It is common to see the same container with hot water used over and over again at some markets, filled with feathers and other debris. Large amounts of debris and feathers can encourage pathogen build up and reduce the temperature of the water a lot faster.
 - To dispose of water used for scalding, add disinfectants or reheat the water to scalding levels (50-65° C or 123-150° F) before disposal.

K.2.3 Processing Area

This is the area where birds that have been bled and had their feathers removed will be processed for eating. It should be the cleanest of all of the areas.

- Work surfaces in the processing area should be cleaned after each group slaughter with a brush, hot water and soap followed by disinfectants.
 - It is not uncommon to have thick concrete slabs as work surfaces in many places. To get them clean enough for the disinfectant to work, make sure you scrub them well.
 - Work surfaces made of wood are hard to clean and disinfect because wood is porous and the virus can seep into the surface, out of reach of brushes and

disinfectant.

- Organs, including intestines, should be removed carefully to prevent fecal contamination.
- Be careful not to cut the intestine with scissors or a knife or to squeeze them.
 - If you do and the bird is contaminated by feces (manure) or gut contents, rinse the bird well with water and wash with soap or rub well with salt.
 - A mixture of water and household liquid bleach – at 1 part bleach to 10 parts water – can be used to rinse the bird.
- A bucket should be provided to collect entrails and inedible organs for proper disposal later by burial or burning.
- In hot climates municipalities should provide refrigerators (kerosene ones are cheap and affordable) for poultry sellers to store processed chickens that are not sold about an hour after processing.

Best Practice: Meat and food inspectors should inspect poultry before they are sold.

K.3 Cleaning and Disinfection

Cleaning and disinfection involve the following actions and should be done at least once a month.

- Prepare equipment needed for cleaning and disinfecting the market (buckets, brushes, brooms, gloves, masks, disinfectant)
- Depopulate all poultry from the market
- Move equipment (cages, scales, tables) away from walls
- Remove manure and all organic matter from cages, pens or crates
- Remove organic matter and solid wastes from the room starting with the ceiling, then walls and finally the floor.
- Wash the equipment and room with hot water. Use a pressure spray if available, but a hose and brush can work just as well. Start with the equipment, then the ceiling and walls and lastly the floors.
- Apply an appropriate disinfectant such as chlorine bleach again, starting with the equipment and ending with the floors
- Leave the market empty for 24 hours before restocking.

APPENDIX L

STANDARD OPERATING PROCEDURE TEMPLATE

Standard Operating Procedures (SOPs) describe how you wish a procedure to be done on your farm or at your market. For some SOPs, the steps may be identical for all farms/markets; others will vary widely. For that reason, these documents must be prepared for each farm or market to reflect the needs and conditions of that particular farm or market.

Below is a template you can use to develop your own SOPs.

Standard Operating Procedure:

Farm Name:

Title: [Give the SOP a title. For example, Barn Entry Protocol.]

Date: [Enter the date this SOP was written.]

Replaces: [If this is a new SOP, write "New;" if it is a revised SOP, enter the date of the previous one.]

Responsibility: [Type in the names or positions of the people who will be responsible for carrying out these procedures.]

Objective: [Employees responsible for carrying out the SOP will have a much better understanding and will do a much better job at their tasks if they understand the reasons for doing it. This also keeps the document focused on one specific purpose.]

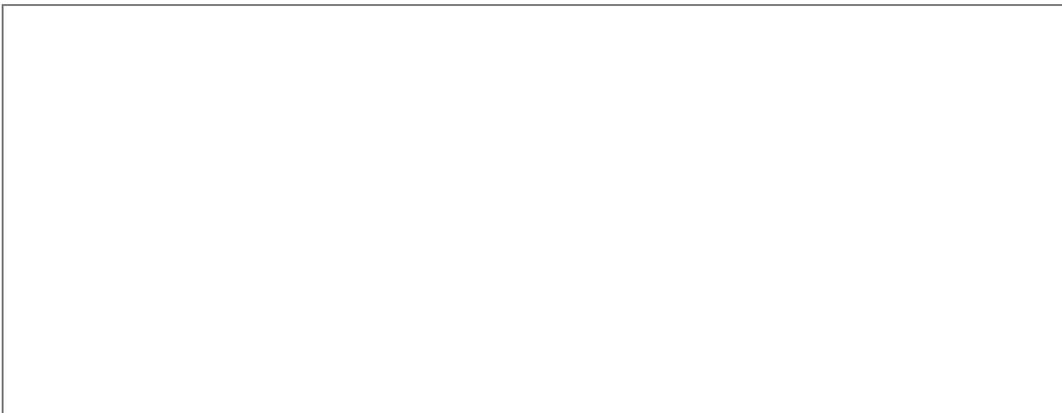
Procedures: [Enter the procedures in a step-by-step manner, like writing a recipe. This makes the procedure clear and concise, improving compliance. Write the procedures in the simplest terms, without compromising the spirit of the objective. Also, make sure each step put in this section meets with the objective.]

INDIVIDUAL REFLECTION WORKSHEET BIOSECURITY EXERCISE

What new ideas are you taking away about communicating and working with different groups on biosecurity?



What additional information do you need?



Commercial Farm Scenario

You have been requested to assist GHANIG GAMSILI's Fine Poultry Farm to increase their biosecurity, with the goal of protecting the farm from future outbreaks of H5N1 HPAI. Your first task will be to assess the biosecurity risks on the farm. You visit the farm and gather the following information:

Farm Name	GHANIG GAMSILI's Fine Poultry Farm
Location	GHANIG GAMSILI, West Africa
Number of Poultry	6,200
Type of Poultry	Brown commercial layer hens (6000), ducks(100), and turkeys (100)
Housing	6 pens of 1,000 brown hens each
Number of Workers	3

The brown hens on the farm are currently around 40 weeks old. Periodically, new birds are added to the flock to compensate for normal mortality. Overall, the hens appear to be in good condition. The hens are bright and alert, and produce eggs at a normal rate of 85%.

In the poultry houses, the birds are kept on the floor rather than individually caged. The litter is made of wood shavings. The pens are screened with wire netting which overall is in good condition, but with some visible tears in the screens.

The small number of ducks and turkeys are kept in small separate pens and the ducks are allowed to roam and forage around the farm for six hours each day. A herd of about 25 sheep and one bull are kept in separate pens about 50 meters away. The sheep attract quite a few flies.

The feed is purchased from a local feed mill. The feed is poured into a wheelbarrow and manually distributed into the feeders. The feeders and drinkers in the pens are aluminum, and are locally made. The supply of feed is kept outside the poultry pens, in an open bin.

You observe that there are a number of other poultry farms in the area, with another commercial layer farm next door.

Much like the other local farms, GHANIG GAMSILI's sells eggs to customers directly from the farm. The sign outside the farm gate advertises eggs for sale. The gate is kept open for customers to enter freely.

The eggs are kept on paper egg flats. The egg room is kept clean and organized. Most of the eggs are sold at the local market and at local shops; the on-farm purchases represent a small part of the overall egg sales. The eggs are sent out to market and the flats are returned to the farm and reused.

There is a dense growth of grass and weeds around the pens, and you see a couple of chicken carcasses that have been removed from the pens laying exposed nearby covered with flies.

The workers share responsibilities for caring for all the poultry and livestock on the farm. Mr. ECOWAS, the owner, tells you they are hard working and reliable and have been working for him for years. While you are on the farm, they are refilling the feeders and drinkers for the day. You observe that there are no footbaths either at the entrance to the farm or the poultry houses. The workers do not wash their hands between pens. It does not appear that they have special clothing or footwear that they wear while working with the birds.

Below are some photographs you took of the farm site:





**COMMERCIAL FARM
DATA COLLECTION FORM**

Farm Name:	Phone #:
Location:	GIS:
On-farm contact:	Farm owner(s):
Birds kept at other locations: Y / N	

Province	Locality	Location
Latitude	Longitude	

Production System

Layers	
Broilers	
Mixed	

--	--

Number of flocks (batches)

Flock 1:	Size		Age	
Flock 2:				
Flock 3:				

Sample collected:

Flock	Size	Age	Sera collected	Tracheal	Cloacal	Other	S.Label

The age of the chicken when introduced _____

Source of the chicks (company-farm) _____

The number of cages in the farm _____

Source of feed _____

Vaccines used in the farm

1. _____

2. _____

3. _____

Disease outbreak occurrence in the farm (from records of the owner)

1. _____

2. _____

3. _____

Treatment in the farm (Records)

1. _____

2. _____

3. _____

Number of flocks (batches)

Initial number of population introduced	
Current population	

Checklist

1.	Outside fence						
2.	Footpath						
3.	Supervising veterinarian						
4.	Store						
5.	Incinerator						
6.	Records						
7.	Personal hygiene of labour	Uniform		Gum boots		Mask	
8.	Mesh wire status	Good		Old		Bad	
9.	Wild birds nests inside the shed						
10.	Wild birds inside the shed						
11.	Stray animals in the farm						
12.	Stray animals in the farm						
13.	Presence of backyard chickens in the farm						
14.	Presence of rodents						

COMMERCIAL FARM RISK ASSESSMENT CHECKLIST

The purpose of this form is to determine conditions present on the farm that may increase the risk of introducing or spreading disease. In the risk level column, quantify the level of risk of each factor as Very Risky (+++), Risky (++) , or Mildly Risky (+).

Farm Name:	Phone #:
Location:	GIS:
On-farm contact:	Farm owner(s):
Birds kept at other locations: Y / N	

Risk Type	Yes	No	Risk Level	Comments
A. ENVIRONMENT				
1. Important infectious disease (endemic or exotic) present in the area				
2. High farm density in the area				
3. Larger poultry farm located within 750 meters of your poultry farm				
4. Presence of a backyard flock within 400 meters of your farm				
5. Poultry farm located within 3 km of a poultry slaughter place (wet-market, plant, etc.)				
6. Presence of a pond or dam on the farm or in very close proximity				
7. Poultry house very close to the road (less than 50 meters)				
8. Farm located along a main busy road				
9. Manure piled or spread near poultry houses				
10. Dense vegetation comes to the edge of poultry houses				
11. Piles of equipment and construction material abandoned near the poultry houses				
12. Feed spill or feed from previous flock discarded near poultry houses				
13. Non-poultry farms (swine, cattle/buffalo, goats) nearby				
B. FARM CHARACTERISTICS				
1. Free access to poultry houses (no locks on doors)				
2. Free access to the farm (no gate, no fence, no signs)				
3. Free range commercial poultry (chickens or ducks)				

Risk Type	Yes	No	Risk Level	Comments
4. Birds of two different age groups in the same building at the same time				
5. Several flocks of different ages on the same farm				
6. Poultry houses oriented so that wind flow goes from older birds to younger ones				
7. Untreated surface water of dam, lake, or creek used for drinking and/or cooking				
8. Untreated ground water used for drinking				
C. FLOCK CHARACTERISTICS				
1. Breeder flock health status unknown				
2. Flock composed of multiple breeder flocks of widely differing ages				
3. More than one hatchery is used to populate a flock				
4. Flock composed of multiple breeder flocks of similar age				
D. WILD BIRDS				
1. Wild birds able to enter the poultry house				
E. PETS				
1. Dead poultry are fed to dogs, cats, etc. on the farm				
2. Stray dogs present on the farm				
3. Pets like dogs and cats present on the farm, but not inside chicken houses				
5. Pet birds like parrots kept on the farm				
F. OTHER FARM ANIMALS				
1. Other farm animals like pigs, cattle, buffalos, goats, etc., raised on the poultry farm				
G. PESTS				
1. Rat and/or mice infestation				
2. Darkling beetle infestation				
3. Fly infestation				
4. Mosquito infestation				
5. Cockroach infestation				
H. PEOPLE				
1. Farm employees also own poultry				
2. Farm employees attend cock fights				
3. Family of farm employees owns birds or works at another poultry farm				
4. Farm employee owns pet (exotic) birds				

Risk Type	Yes	No	Risk Level	Comments
5. Farm employees hunt wild birds				
6. Employee lives on the farm				
7. Poultry dealers or catching crew wear same clothing when going between farms				
8. Grower or employee visits other poultry farms				
9. Visitors to the farm don't sign a log book, or are not asked if they visited another poultry farm prior to their visit				
10. Non-authorized visitors permitted on the farm				
11. Grower or employee regularly visits places patronized by many other poultry people (restaurant, club)				
12. Farm employees visit homes of relatives or friends who own poultry farms				
13. On farms with flocks of several ages, people go from house to house without consideration of flock age or flock health status				
I. VEHICLES				
1. Cars and trucks parked too close to poultry houses (less than 30 meters)				
2. Farm vehicles go off farm				
3. Farm employee rides between two or more houses or farm units in feed, egg, or chick truck				
4. Outside vehicles are not cleaned or checked for cleanliness before entering the farm				
5. Feed truck driver goes on farm				
J. MANAGEMENT				
1. Leaving some birds on farm after load-out				
2. Partial pickup				
3. Short downtime between two flocks (less than a week)				
K. HYGIENE				
1. No farm- specific clothes for employees and visitors, or no special clothing requirements				
2. No special footwear requirements for employees or visitors				
3. No showers available on farm, or no shower is taken before entering the farm				
4. Outside equipment brought on farm without special sanitation considerations				
5. No farm washing or disinfection between two flocks				

Risk Type	Yes	No	Risk Level	Comments
6. No gloves used and no hand washing before and after handling birds, eggs, feed etc.				
7. People dress wild birds on farm premises				
8. Dirty footbaths filled with an old (non-active) disinfectant solution at the entrance of the poultry house				
9. No head gear (cap) used by person visiting the farm				
10. No face masks are used by visitors				
L. FEED				
1. Feed shed accessible to rodents or wild birds				
2. Feed can get wet in storage room and feed pan				
M. DEAD BIRD DISPOSAL				
1. Central location for dead bird disposal used by several poultry growers				
2. Dead birds stockpiled overnight before disposal and exposed to pests (rats, flies) pets (dogs, cats) wildlife (foxes, crows)				
3. Dead birds left inside the shed for many hours				
N. ANY OTHER RISK FACTORS PRESENT ON FARM THAT ARE NOT ON THIS LIST				

ADDITIONAL NOTES

LIVE BIRD MARKET RISK ASSESSMENT CHECKLIST

The purpose of this form is to determine conditions present in a live bird market that may increase the risk of introducing or spreading disease. In the risk level column, quantify the level of risk of each factor as Very Risky (+++), Risky (++), or Mildly Risky (+).

Market Name:	Phone #:
Location:	GIS:
Market contact:	Market Administrator(s):

A. ISOLATION AND TRAFFIC CONTROL	YES	NO	Risk Level	COMMENTS
Market located in a larger municipal market				
Market fenced to separate it from other areas in the large market				
Entry and exit doors separate				
Unloading area for trucks				
Sellers have distinct booths				
Good distance between booths				
Birds in cages				
Cages made of plastic or metal				
Cages made of wooden materials				
Birds on ground				
B. MANAGEMENT				
Sales and mortality records kept				
Market license displayed				
Healthy birds bought from one reliable source				
New birds introduced without quarantine				
All birds sold in one day				
All birds sold in one week				
Birds sold live				
Birds slaughtered and processed at market				
Birds separated by species in cages or pens				
Stocks include waterfowl				
Separate cage for sick birds				

Unsold birds returned to farms of origin				
Cages are stacked				
Cages are lined with paper or other material				
Cages have clean feed and water troughs				
Clean feed and water provided				
Feed stored in airtight and rodent proof containers				
Stray cats and dogs in market				
Other livestock species in market				
Rodent control program				
C. SANITATION				
Clean uniforms worn				
Frequent hand-washing				
Cleaning and disinfection of market				Frequency?
Regular cleaning and disinfection of cages and pens				
Proper disposal of dead birds				
Proper disposal of feathers, manure and other organic material				
D. ANY OTHER RISK FACTORS PRESENT AT THE MARKET THAT ARE NOT ON THIS LIST				

ADDITIONAL NOTES

Live Bird Market Scenario

The Metropolitan Authority Council of ABUJA has asked you to help them increase biosecurity in the live bird section of the market they administer. The live bird market is located within a larger municipal market that has a number of different sections devoted to selling different commodities: food (produce, meat, prepared foods), live animals, clothes, shoes, electronics. The Council is composed of 12 members who are elected officials. The Director of Markets, Mr. Osagie, has inspectors under him that come to the market every day to collect tax levies from the poultry sellers.

Your task is to list the biosecurity infractions and using two of the infractions, come up with recommendations to improve the biosecurity in the market.

You visit the market and observe the following:

- As you enter, you notice that some poultry sellers have set up stalls at the main entrance to the market, to catch potential customers before they even reach the live bird section of the market.
- In the live bird section, you notice species of birds are mixed in together throughout the market. Ducks, turkeys, and chickens are kept together in cages, in some cases.
- The cages are poorly constructed and in disrepair – holes are patched with string, sometimes to the extent that the cages seem to be made entirely of string. The cages are stacked on top of each other and look as if they haven't been cleaned in quite some time.
- Poultry stalls are set up in between stalls selling prepared foods.
- Chickens showing signs of illness are not quarantined into separate cages, and are being sold at reduced prices. Carcasses of dead birds are routinely disposed of on the garbage heap.
- Some poultry sellers have a slaughter and processing area right next to the live bird stalls (see picture for infractions).
- The market does not have running water and there is insufficient drainage. Waste water pools are observed in various places in the market, and attract flies and scavengers and are filled with debris.
- Birds are often brought to the market on top of trucks and buses, in cages that are reused again and again without being cleaned.

You took the following photos at the market:







NIGERIA BIOSECURITY FOR FARMS AND MARKETS

EVALUATION

Your evaluation of the course is important to us. Please provide your feedback so that we can continue to improve the course materials and facilitation. *Thank you!*

I. Classroom Modules

How successful were each of the classroom modules in providing you with **useful technical content** that you will be able to apply in your work? Please use the scale below and circle the numbers that apply to your opinions.

	<i>Not Successful</i>	<i>Somewhat Successful</i>	<i>Neutral</i>	<i>Successful</i>	<i>Extremely Successful!</i>
Nigeria AI overview	1	2	3	4	5
Introduction to Biosecurity Risks and Principles	1	2	3	4	5
Biosecurity Practices to Protect Commercial Farms from HPAI	1	2	3	4	5
Biosecurity Practices to Protect Smallholder Farms from HPAI	1	2	3	4	5
Biosecurity for Transporting Poultry to Markets	1	2	3	4	5
Biosecurity for Live Bird Markets	1	2	3	4	5
Cleaning and Disinfection	1	2	3	4	5
Biosecurity Planning	1	2	3	4	5

II. Practical Biosecurity Assessment Activities

How successful was the interview activity in providing you with an opportunity to **apply and practice** the technical content from the course?

	<i>Not Successful</i>	<i>Somewhat Successful</i>	<i>Neutral</i>	<i>Successful</i>	<i>Extremely Successful!</i>
Field Visit	1	2	3	4	5



4. How effective were the **training methodologies** used? Please describe.

5. What **suggestions** do you have for the trainers as we prepare to offer this course again?