RESEARCH PROGRAM ON Livestock

More meat, milk and eggs by and for the poor

Integrated training manual on herd health and biosecurity for smallholder pig value chain actors in Uganda

Zachary Nsadha[1] and Dione Michel[2]

[1]College of Veterinary Medicine, Animal Resources and Biosecurity, Makerere University, Kampala, Uganda

[2]International Livestock Resaerch Institute, Dakar, Senegal

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Patron: Professor Peter C Doherty AC, FAA, FRS
Animal scientist, Nobel Prize Laureate for Physiology or Medicine–1996

Box 30709, Nairobi 00100 Kenya
Phone +254 20 422 3000
Fax +254 20 422 3001
Email ilri-kenya@cgiar.org

ilri.org
better lives through livestock

ILRI is a CGIAR research centre

Box 5689, Addis Ababa, Ethiopia
Phone +251 11 617 2000
Fax +251 11 667 6923
Email ilri-ethiopia@cgiar.org

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1. Background

In Uganda, pig farming and pork consumption have risen in the past three decades. This growth is attributed to many factors, which include human population growth that widens the horizon of the prospective buyers of the pig farm products, and increased urbanization, which has brought about many centres of leisure where people converge for relaxation at major pork consumption points. Increasing incomes of the population is also another factor responsible for the rise in pork consumption as more people have money to buy substantial amounts of pork products. In some parts of Uganda, members of the affluent young generation make merry at leisure points where pork is a delicacy, and some of them have succeeded in breaking through the traditional barriers which used to prevent members of certain cultures from eating pork. All the above factors have resulted in high pork consumption of pork and Uganda now has the highest per capita consumption of pork in East Africa (3.4 kg per person per year). High per capita pork consumption in a country is an indicator of a good market for the pig products and is a powerful drive for investment in pig farming if other deterrents to pig farming are mitigated to limit their negative impact on the pig production.

Many households in Uganda have taken on the pig farming. It is estimated that more than one million households keep pigs. The increase in the number of households carrying out pig farming, has resulted in a rise of the population of pigs. In the last three decades, the pig population in the country has increased more than tenfold, i.e. from 200,000 pigs to 3.2 million pigs. Most of these pigs are kept in rural areas under the traditional extensive (free range) system. In the urban/peri-urban areas, the pigs are kept in intensive systems.

In the few intensively managed pig farms, some measures of herd health, biosecurity, disease control and farm hygiene are practiced. But in many instances, there are reports of outbreaks of diseases such as African swine fever in intensively kept pigs in Uganda. In the extensive systems, the measures for proper herd health, biosecurity, disease control, and farm/product hygiene are not easily put into practice and everything is left to chance. It is common knowledge that whenever an animal enterprise is left to chance, without mitigation (interventions) by the management, many diseases occur in the animal enterprise and losses are very common. In the pig enterprises, where diseases like African swine fever can be devastating, leaving the enterprise to chance is hazardous and massive deaths of pigs are usually realized when African swine fever outbreaks occur. These losses make farmers lose income and interest in the pig farming and hence are great disincentives to prospective investments in the pig industry.

The pig production chain has many actors: the pig farmers, pig traders, pig transporters, pig processors (abattoirs and butchers) and the consumers (end users of pig products). Each of the actors in the pig production chain can be a focus or vehicle of spread of disease along the entire pig production chain. Diseases in the pig farm cause direct losses to the farmers and indirect losses to the rest of the actors in the pig production chain. Once there are animal deaths on the farms, the rest of the actors in the pig production chain are affected by low/unreliable supply of pigs, resulting in poor transactions for each actors in the pig/pork trade.

It is therefore critical that each actor in the pig production chain applies the expected prevention measures to limit the spread of diseases along the pig production chain. This can be achieved if each actor in the pig production chain knows what is expected of them in the control of pig diseases. This integrated manual aims to equip each actor in the pig value chain with information on the appropriate measures they need to carry out for the betterment of the pig

production, i.e. to cause no transmission of pig diseases to other levels of the pig production chain. Once all actors have learnt and put in practice all the needed measures of disease control, pig production will increase, which will result in bigger sales and higher incomes, hence better socio-economic welfare of the communities engaged in pig production.

1.1 Objective of the integrated training manual

The objective of this integrated training manual is to help the trainer give the needed information or skills to the trainees in a simple manner, i.e. pass on skills to the different actors who participate in the pig production chain. This will make the trainees realize and carry out their responsibilities in the control of diseases in the pig production process. Each actor in the pig production will be made aware of what the actor must do and how to do it for a more profitable pig production system that takes into account the necessary animal welfare, infectious disease control and environmental protection.

1.2 Expected users of the integrated training manual

In order to have efficient/effective use of the manual and to make the trainees understand the information, the trainers must have at least obtained an animal health worker certificate or be veterinarians, animal husbandry officers, animal health officers, meat facility inspectors and community hygiene officers.

Therefore, the manual will be used by the following;

- Veterinarians: these are expected to be the most knowledgeable in animal health industry.
- Animal husbandry officers: these are usually the animal extension officers in the communities.
- Animal health workers: these usually give animal health guidance to organized groups of farmers at the community level.
- Meat facility health inspectors who manage meat processing facilities/pig abattoirs.
- Health/hygiene officers who supervise meat selling facilities in the communities/butcheries/pork joints.

1.3 Expected persons to be trained using the integrated manual

The pig industry has many actors who constitute the pig value chain. Each actor has responsibilities for the efficient running of the pig production process. The actors listed below will be targeted for training.

- Pig farmers.
- Pig traders/transporters.
- Pig abattoir/butcher personnel.
- Pork point/joint personnel.
- Service providers such as veterinary drug dealers.
- Entrepreneurs involved in the sale of live animals, feeds, pork and other pork products.
- Policymakers responsible for diseases surveillance/control and market development in the pig sector.

1.4 Training methods

A participatory method will be adopted for the training. Participatory training has been successfully used to develop capacity of farmers in biosecurity in Uganda by Dione et al. (2020). In participatory training the trainer actively engages the trainees in a way that makes them feel ownership in solving their own problem and they feel the need (yearn) to learn how to do it. It is an interactive process enabling individuals or communities develop the skills, attitudes to acquire knowledge to solve the problems. When the trainer engages the trainees, the training is lively, the trainer shares only those points which they observes as the missing links in knowledge and trainees look forward to filling the knowledge gaps they have. The participants are made to understand the importance of the problem in relation to their activity and to what extent it can affect their livelihood if not addressed properly. The participants therefore feel the ownership of the whole process and feel the need to solve the problem.

The training will use participatory principles like encouraging sharing of experiences both good and bad, asking questions to get answers to what is not clear to the participants. The facilitator will make summaries of the experiences and will add missing information in the participants' knowledge. The facilitator will allow an inclusive summary to be developed by the participants after each engagement/session of training.

The training will include group discussions, brainstorming exercises, illustrations of still and moving imagery displays and hands-on field trips where demonstration of what has been talked about will be done for better understanding of the skills.

It has been observed in previous studies that for better uptake of good practices, it is critical to also incentivize uptake through enhancement of other value chain nodes such as marketing to allow farmers get better prices for the products from their pig enterprise, which stimulate investment in farm management. However, the trainers will link the training with other capacity building efforts, hence the need for collaboration.

2. Setting the scene for the participatory training

Each time a new set of trainees is to be handled; the scene will be set as below.

2.1 Preparing for the training

- Prayer: it is always important that we recognize that our presence is given to us by God. The facilitator allows opening prayer which should accommodate all faiths.
- The Uganda national anthem and the anthem of the traditional institution of the area will be played.
- Introductions: the facilitator asks each participant to state their name, address, occupation, years of experience in keeping pigs. This will enable the participants to know each other for better interaction during the training and also in the aftermath of the training. This is important for the development of farming cohorts for knowledge sharing about pig farming.
- Introduction of the project: the facilitator introduces the project which is funding the training.
- Introduction of importance of the training: the facilitator highlights the importance of the training so that the participants realize that their involvement will yield value for them. If trainees see value in what they are going to be trained in, they will be motivated and remain interested in learning more. This makes the participants get better understanding of the skills and of the knowledge.
- Expectation from the training: the facilitator will ask each participant to explain what each expects from the training. The facilitator guides the participants to make a summary of the expectations and write them on a flip chart or computer. The flip chart is displayed in the room until the end of the training.
- Ground rules: the facilitator will ask the participants what general behaviour they expect to guide them during the training in order to have a smooth and effective training sessions. All the agreed-upon suggestions will be written on a flip chart and pinned where they are visible throughout the training.
- The trainees will be of different categories: (a) members of pig farmers' groups, (b) farmers mobilized by the opinion leaders, (c) farmers mobilized by the veterinary authority in the area (e.g. community animal health workers [CAHW], animal husbandry officers and veterinary officers).
- The training will be carried out at any convenient place the mobilizer will identify while considering the facilities the location can offer for the adequate instruction of the participants especially where basic information and communication technology (ICT) services can be accessed easily, for example, administrative facilities (e.g. a sub-county hall where assembly of farmers is easy and farms where practical demonstrations can be carried out).

- For easy execution of the training, the number of participants per unit of trainees should not exceed 30. The participants can be divided into groups of six during the hands-on practical sessions, and each participant can be supervised adequately. And for efficient use of resources the unit of trainees should not be lower than 15 participants for the training to achieve the aim of knowledge transfer in the pig farming communities.
- The training duration will depend on the type of actors in the pig production chain. (a) Pig farmers will need two days of training. The first day will be for theory and afternoon of day two will be for hands-on practical training. (b) Other actors in the pig production chain will need one day of training. Morning hours will be used for theory instruction and the afternoon will be for practical demonstrations.
- In many communities, information is shared better in mixed gender groups as some women may trust men more than fellow women. If we allow gender mixture, the participants will sort themselves and align to members with whom they will feel comfortable to share knowledge in the aftermath of the training.

3. Pig keeping in smallholder production systems

Facilitator: A person who is very knowledgeable about pig farming practices in Uganda.

3.1 Types of pig farming systems

Objective: Make the participants appreciate the importance of good practices in pig keeping.

Facilitator: Set the scene as described in section 2.0 above.

Facilitator: Ask the participants to freely mention the pig farming system they use in their piggeries.

Facilitator: Task each participant to mention the advantages and disadvantages of each system.

One participant is allowed, in a tabular form, to list the pig farming systems they are aware of giving the advantages and disadvantages of each system.

Facilitator: Summarize and explain the results giving the advantages and disadvantages of each of the pig farming systems.

Facilitator: Emphasize the advantages and disadvantages of each system in a manner that fills the knowledge gaps observed from the answers given by the participants.

(Display photos/animations to illustrate the different farming systems).

Facilitator: Ask each participant to come out with the way forward about the pig farming systems to promote on their farm.

Free-range tethering type

Photo credit: Makerere University/Nsadha Zachary

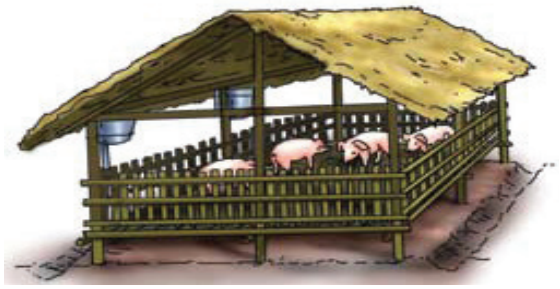
Semi-intensive tethering types; on the leg and around the chest

Photo credit: Makerere University/Nsadha Zachary

Intensive types: bare soil, concrete, raised platform of wood like slated floor

Intensive with roof and exercise area
(photo credit: Makerere University/Nsadha Zachary)

Intensive with bare soil and no roof covering
(photo credit: Agro4africa.com)



Grass roof
(source: FAO 2009)

Iron roof
(photo credit: ILRI/Michel Dione)

3.2 Factors to consider when constructing a pig unit

Site/location selection for piggeries

Objective: Make the participants appreciate the value of a good site for a piggery.

Facilitator: Ask the participants to name characteristics of a good site for a piggery.

One participant is tasked to list down the ideas given by the trainees.

Facilitator: Using proper illustrations/photos/animations discuss the responses, add needed qualities or subtract the improper qualities given by the participants using the list guide below for site location of piggery/sty (Mayega et al 2015).

- Site should be at elevated level for easy drainage and be flood free.
- If possible protected from direct sun (tree shades) for cooling.
- Have ample air for easy convectional ventilation.
- Away from residences (8–10 m) and must be down wind to the residences.
- Easily accessible by road for easy transportation of supplies to the piggery.
- Easily connected to reliable water.

Flooding areas like this one should be avoided

Photo credit: Makerere University/Nsadha Zachary

Low-cost housing structures for smallholder pig systems

Objective: To make participants appreciate the importance of housing in pig farming and make them understand that ordinary/local materials within their surroundings/vicinity can be used for effective pig housing in the smallholder pig farming systems.

Facilitator: Ask the participants to freely name the house options that they use in their piggeries.

A participant is tasked to list down the housing types as mentioned by the trainee.

Facilitator: Summarize the types of low-cost pig housing structures into the categories below (Mayega et al 2015).

- Bare floor pig house with no roofing.
- Raised floor from ground with timber/slates with no roofing.

- Cemented floor with wooden walls with no roofing.
- Any of the above with roofing of local materials like grass.
- Cemented floor and walls with iron roof with specific pens for specific physiological phase of pig production.
- Any of the above with iron sheet roofing.

The facilitator encourages the participants to always improvise structures for the different phases of pig production.

Understanding the advantages and disadvantages of each housing structures

Objective: To make the participants judge the qualities of each for better decision making when to start or adopt particular housing structures for their pig farms.

Facilitator: Ask the participants to list the advantages and disadvantages of each of the housings above.

A participant is tasked to lay down the responses in a table form.

Facilitator: Summarize and explain the responses putting in consideration the points in the table below.

Table 1: Advantages and disadvantages of pig housing structures

Housing structure	Advantages	Disadvantages
Free range (no structure	No housing cost No feed cost Less labour Good animal welfare; the pig moves freely and does all it needs without restrictions	Pigs are affected by adverse climatic conditions Poor growth because pigs do not feed well Higher incidence of disease Damage to crop/community conflicts Prone to predation and theft Risk of contracting and transmitting diseases e.g. African Swine fever and Taenia solium eggs (cysticercosis)
Tethering	No housing cost Restricted movement of pigs Less damage to crops/conflict in community Low cost of feeding	Rope may cause injury to pigs Pigs affected by adverse climatic conditions Poor growth of pigs because feeding is restricted by the rope Prone to predation
No roof enclosure	Easy to construct Low cost of construction Can be shifted from one place to another Pigs do not damage crops hence less conflict in community Pigs are less prone to diseases	Pigs affected by adverse climatic conditions Pigs prone to predation Floor can remain dirty and muddy making pigs prone to infections Drainage system is always poor Higher incidence of diseases
Enclosure with roof (pen housing) with no concrete floor	Lower cost of construction if local material is used Some level of protection of pigs from hot, cold weather and rain Better growth of pigs Relatively lesser incidence of diseases Can easily prevent vermin and predators	Difficult to clean and disinfect in incidence of suspected disease Floor remains muddy and dirty Repairs are done after short time to limit injuries to pigs Not possible to remove parasite eggs

Housing structure	Advantages	Disadvantages
Enclosure with roof and concrete floor	Easy to clean/disinfect Protects pigs from adverse climatic conditions Protection from vermin Protection from predation Floor remains clean and less muddy	Relatively higher cost of construction Risk for skin and joint injuries from the rough flooring if no bedding is available
Cemented floor and walls with iron roof with specific pens for specific physiological phase of pig production	Well protected from adverse environmental conditions Easy enforcement of hygiene and sanitation Lower incidences of disease Higher growth performance	Higher cost of construction Higher labour intensity Risk for skin and joint injuries from the rough flooring if no bedding is available

Facilitator: Ask every participant to give the way forward on the type of housing they can adopt on their farm.

Dimensions for pig houses in different production or growth phases of pigs

Objective: To make the participants appreciate the importance of proper spacing and comfort for the health and welfare of pigs.

Setting the scene

Facilitator: Give analogies from the human living and growth needs of proper space and comfort for good health and welfare of human beings.

Facilitator: Ask participants to give reasons for the different spacing needed for the different phases of pig growth/physiological state.

One participant is tasked to list the responses in a tabular form corresponding to the different phases of pig growth/physiological state.

Facilitator: With justifications explains spacing for each pig growth phase/physiological state in reference to the table and diagrams below. A hands-on field practical, at a farm with the proper structures, will be conducted to make the participants practically appreciate the settings.

Table 2: Housing size considerations for different production phases of pigs

Phase of production	Space (sq. metres)	Remarks
Lactating sow	4.0–6.0/sow	Flat solid floor and in quiet place. Each sow should have individual pen, furrowing pen, heating or cooling system in the piglet nest/box, creep feeders
Pregnant sow	1.5–2.0/sow	Individual quiet pen where scares should not happen to the sow as it can result in stress which can lead to abortions/premature births
Breeding boar	6.0–8.0/boar	Strong and high partitions to prevent escape. Have enough space for good exercise as the boar has to have strong muscles to have good stamina for endurance during mating
Growers/weaners	0.3–0.5/grower	Strong and spacious enough where minimal stress can occur as it may retard growth
Fattening	0.5–1.0/fattener	Flat solid floor, slopping away to the rear for easy drainage and cleaning Drainage should not be towards walkway for the personnel
In each pen there should be dung area of 1.5 sq. metres width and feed and water trough area of 1.2 sq. m		

Source (FAO 2009)

4. Management of different growth phases and physiological states of pigs

Objective: To make participants appreciate the needs of each growth phase/physiological state of pigs and acquire skills for provision of needs for each pig growth phase/physiological state.

Setting the scene

Facilitator: Give detailed explanation of the needs of the different phases of growth for humans as an analogy for making the participants appreciate the need to provide for the need of growth phases of pigs.

Facilitator: Ask the participants to name the different growth phases/physiological states of pigs.

One participant, in a tabular form, lists the phases and their needs presented by participants.

4.1 Management of a pregnant sow

Objective: To make participant acquire skills of managing pregnant sows for healthy gestation/farrowing.

Facilitator: Ask the participants to list down the management requirements of a pregnant sow.

One participant is asked to list down the responses.

Facilitator: Discuss the responses filling the gaps in the knowledge using the list of information below (Mayega et al 2015; Britt 1986).

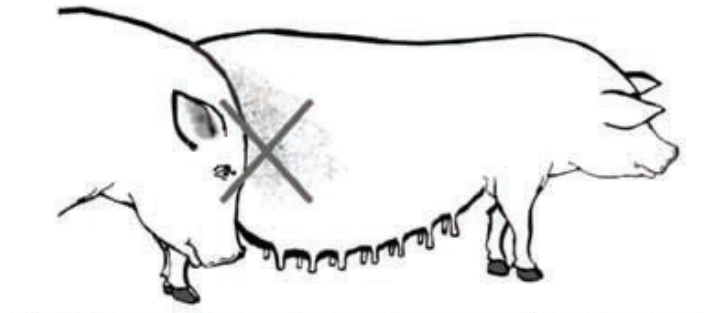
- Every pig farm must have a farrowing pen.
- Piglets should be provided with creep for feed and fenders for protection from crushing by lying sow.
- Farrowing pens should have enough space to allow exercise of the sow before farrowing.
- Create a non-slippery floor in farrowing pen to avoid accidents which can cause injuries/abortions.
- Clean and disinfect the furrowing pen before putting a sow.
- Guided by the sow calendar, transfer the sow to the farrowing pen seven days before date of farrowing.
- Supply the sow with ample nesting material at least three days before farrowing.

An individual pregnant sow pen

Photo credit: Makerere University/Nsadha Zachary

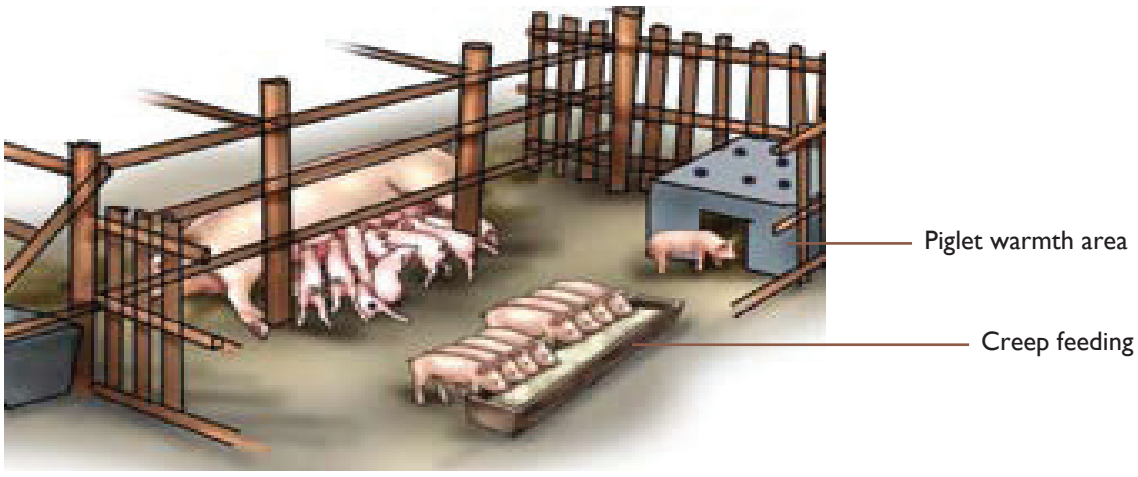
A pregnant sow should not share a pen with another pig. It can be injured by fellow pigs in the pen which may result in injuries/abortion.

Aggressive pigs can injure pregnant sow leading to abortion



Source: Rameshwar Deka

A farrowing pen/lactating sow pen



Source: FAO 2009

Sow calendar

Objective: Help the participants learn how to apply a sow calendar to properly feed pregnant sows.

Setting the scene

Facilitator: Engage the participants in describing an ordinary wall calendar in relation to daily lives. By show of hands, the responses to questions below are listed down by one of the participants.

- How many of the participants have a wall calendar in their homes?
- How do you use the wall calendar at home?
- What are the key holidays marked on the calendar?
- Who missed some event because of not following the wall calendar?

Facilitator: Discuss the responses and stress the importance of the sow calendar to the participants giving the ideas below.

- A sow calendar has a set of activities and the temporal arrangement of when they have to be done for effective sow performance (Mayega et al 2015).
- The sow calendar is the driver of record-keeping in pig farming.
- Sow records and management activities rotate around the sow calendar.
- Sow calendar are used in small and large farms.

Facilitator: Distribute the sow calendar and ask the participants to draw similarities and differences between the household wall calendar and the sow calendar.

One participant lists the similarities and differences in a table.

Facilitator: Explain to the participants the key similarities and differences emphasizing the ideas below.

- A household wall calendar starts on 1 January and ends 31 December, while the sow calendar starts on conception day (day 1) and ends on farrowing day (day 114).
- The household calendar is 365 days, while the sow calendar is 114 days +/- 3 days.
- We use the household wall calendar to prepare many different activities like marriages, graduations, celebrations. But a sow calendar is used only to manage and monitor the gestation of the sow.
- The household calendar has some days marked in red for emphasis.
- A sow calendar can be marked to indicate when a particular activity should be carried out, e.g. when, after mating/ service, one expects a sow to come into heat if conception failed, when to move sow to farrowing pen, when to start steaming of the sow, and worm control before farrowing etc.

Facilitator: Electronically or otherwise, display the sow calendar and explain all the ingredients in the sow calendar to make the participants understand the justification for using it on a pig farm.

Practical exercise on how to use a sow calendar, sow card and calculation table

Facilitator:

- Distributes the sow calendar, sow card and calculation table to each participant.
- Explains the two faces of the sow card (back and front of the page).
- Allows questions from the participants to explain what is not clear to participants.

Facilitator: Ask the participants to use an imaginary date (service date) to calculate the information in the bulletins below.

- Expected date of service of a service of sow if conception did not take place.
- Expected date of farrowing and take record of it (114 days after service/conception).
- Expected date of steaming (85 days after service/conception).
- Date of deworming (107–110 days after service/conception).

Facilitator: Congratulate the participants and ask them for any issues they need to be cleared.

Facilitator: Explain the queries and emphasize the key messages below.

- Good identification of pigs is much needed for proper recording in any pig farm record system.
- Good records are the basis of pig farming development as they guide on the performance of whole herd and individual pigs.
- Good records are important tools for market visibility of the farm because good performing pigs can be traced to your farm.

Use of a sow calendar to develop a feeding chart for a pregnant sow

Objective: Participants learn to use the sow calendar to come up with a feed management chart of a sow.

Facilitator: Engage the participants in an exercise by asking them how they feed their pregnant sows.

One participant writes the responses.

Facilitator: Divide the participants into groups and task each group to develop a feeding chart for an imaginary pregnant sow.

Discuss the participants feeding charts in comparison with a known chart displayed on a screen.

Facilitator: Summarize the management of a proven pregnant sow using the points below.

- Give enough food to a pregnant sow as nutrients are needed for the development of the fetuses
- Feed just enough to avoid overweight/weak sows at farrowing which can cause injuries to piglets.
- Give normal feeding regime for the first three months.
- Put sow in farrowing pen, feed *ad libitum* for adequate nutrients for the rapidly growing fetuses.
- Three days pre-farrowing decrease the feed allowance to limit constipation and the development of post-parturient

diseases.

- Feed bulky feeds 4–5 days pre- and post-farrowing to prevent constipation
- Avoid constipation to limit poor farrowing process and mastitis which can result in poor milk production (agalactia).
- Avoid moldy feeds as some of the molds can cause abortions.
- Wash the sow before moving to farrowing pen to remove any parasite eggs on the sow skin.
- Treat the sow with Ivermectin for both endo/ectoparasites one day before moving to farrowing pen.
- Prepare warm beddings in nests in the farrowing pen to keep piglets warm.
- Prepare creep feeding box for the piglets.
- Stimulate the sow to stand up at least two to three times a day for some exercise while in the farrowing pen.
- Carefully observe the sow two times a day for appetite, listlessness to determine its health state.
- Help the farrowed piglets; free membranes, revive weak piglets, assist weak piglets to suckle.
- Assist difficult birth by use of cleaned and disinfected hands.
- Remove piglets from nervous, vicious/hysterical mother as it may injure them.
- Return the piglets after mother has recovered from the hysteria.
- Check by placing one piglet to observe sow's behaviour (usually a hysterical sow recovers after two hours).

Table 3: Sow calendar

Sow calendar	
Date	**Management activity**
Starting date	For first time gilts, skip the first 2–3 heats and serve when they attain good body weight (8–9 months old) For old sows, give little feed on weaning day and place them in a group with other dry sows. The next day after weaning, feed 2 kg per day of normal feed for up to 5 days
Day 6–10	Increase feed allowance to 3.5 kg day of normal feed. This is called 'flushing' and is intended to mobilize enough body resources for breeding
Day 10	Reduce feed allowance from 3.5 kg/day to 2.3 kg/day of normal feed until after the six-week pregnancy
Day 21	Three week pregnancy check. Sow will return to heat if there was no conception on Day 1
Day 42	Six weeks pregnancy check. If positive, increase feed allowance from 2.3 kg/day to 2.5 kg/day
Day 85	Increase feed allowance from 2.5 kg/day to 3.5 kg/day of normal feed. This is called 'steaming up.' This caters for the increased body demands, rapid embryo growth and sow milk formation Remember an individual sow can bear up to 16 piglets in one litter
Day 101	Reminder: It is 14 days before farrowing. Acaricide application for ectoparasites to be done. Farmers should use area veterinarian or community animal health worker for guidance and administration of Ivermectin injection. Disinfect the farrowing pen planned for the sow
Day 107	Reminder: It is seven days before farrowing. Second wash and second mange treatment and second deworming to be done. Farmers should always use the area animal health worker to give Ivermectin injection Transfer sow to farrowing pen

Day 112	Reminder: It is three days before farrowing day. Reduce feed to 2 kg/day. Small feed amounts reduce the size of the abdomen and reduce soiling of baby piglets. Check that the farrowing pen is in order, prepare creep area and have bedding well-arranged using saw dust or dry grass. Stockman should be in position to check every hour
Day 114	On farrowing day be at hand to assist all piglets to access colostrum, bearing in mind the activities to be done on the baby piglets: Help very weak piglets Trim umbilical cord and dip in iodine Provide sufficient warmth Prevent crushing of young ones by the sow that may be very tired at this time Establishing a creep area is of paramount importance in a farrowing pen

Management of a sow in lactation

Objective: To equip the participants with skills of managing a lactating sow for good lactation.

Facilitator: Ask the participants to mention treatments they give to lactating sows from birth to weaning.

One participant lists down the responses.

Facilitator: Summarize/explain what they have listed down while considering the points below.

- Feed 12 hours after furrowing when the sow has recovered from the effects of labour.
- Water must be given continuously even when food is restrained.
- Laxative feed be the first meal post farrowing to avoid constipation.
- Increase feed ration to high level to cater for the nutritional needs during lactation.
- Carefully watch sow to see if it is properly nursing the baby piglets, has appetite, and is not listless.
- Palpate and check the mammary nipples for openness and see if they are lactating.
- If the sow shows signs of confusion or hysteria, remove the piglets until it recovers.

4.2 Management of newborn piglets

Objective: To equip the participants with skills needed to look after newborn piglets for their survival and growth.

Setting the scene

Facilitator: Ask the participants to mention the characteristics of newborn piglets. They are tasked to mention what they know can happen to piglets relative to the characteristics of the piglets if they are poorly managed.

One participant lists down the responses.

Facilitator: Ask the participants what they do to the new piglets to help them not suffer from negative impact of the environment starting at birth up to the weaning period.

One participant, in tabular form, lists down what they do immediately after birth, days postnatal and at weaning.

Facilitator: Discuss the responses. Explain the points in the sections below for the participants to learn how to handle newborn piglets.

Managing piglets immediately after farrowing

- Cut umbilical cord off at 5 cm from the navel.
- Put iodine on the navel when bleeding has stopped in not more than 20 minutes after birth to prevent inflammation and infections.
- Immediately put piglets in warm place as the young do not regulate temperature.
- Rub each piglet to stimulate the nervous system and dry liquids which take away heat from the newborn.
- Make sure the piglet sucks the sow's teats at the soonest to stimulate milk let down of the sow.
- Piglets must feed on the first milk (colostrum) within 12 hours after birth. It protects against disease.
- Monitor to see if the sow has milk by trying to milk the sow's teats.
- Monitor to see if the sow is not hysterical hence can injure baby pigs.
- Evaluate the size of the litter for the prospective feeding of the litter from the mother.
- Evaluate if litter is too weak. If some are weak, assist them to recover.
- In cases where the sow has little milk, bottle-feed milk/colostrum from another sow to piglets.
- Foster-mothering where the upper limit is three days, spray foster piglets and the original piglets to look the same so that the foster sow does not reject the foster piglets.
- Use another animal's milk such as from cow or goat is needed/possible.

Managing piglets in the early days of postnatal life

- At 3–4 days give iron to piglets to prevent piglet anaemia since iron does not come into the pig's milk.
- At 3–4 days castrate the male piglets which are destined for fattening when they still have strong maternal immunity from the colostrum.
- At seven (7) days start feeding pig starter feeds to train the piglets to learn feeding.
- When they can feed, give dry feeds.
- If the litter is big, give additional feed like goat/cow milk or porridge to which a little sugar has been added.
- Foster some piglets to sows with less litter but with viable teats and good milk let down.
- Trim off the milk teeth to limit injury to the mother teats which can cause less milk production.
- At 20 days of life, creep feed the piglets on high protein feed in containers in the creep area.
- At 35 days after birth, wean off the piglets by transferring the mother to the dry sow pen.
- Identify the piglets for easy management and veterinary clinical identification.

Pig castration practices

Objective: To equip the participants with skills of castration for management of male pigs for fattening.

Note: This is a practical exercise where hands-on instruction is needed.

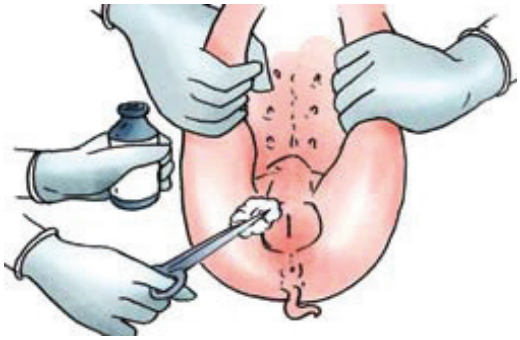
Facilitator: Ask the participants why castration is important.

One participant lists down the responses.

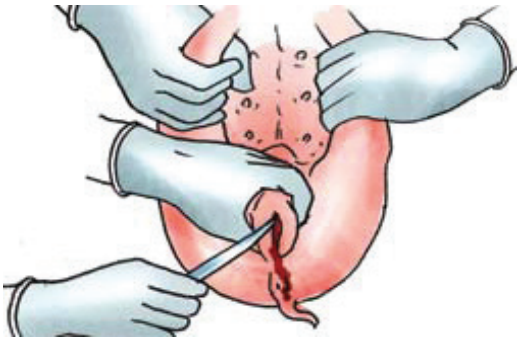
Facilitator: Inform the participants of the need to remove the testis of the male piglets as the hormones from the testis impart bad smell to pork which renders meat to be of poor quality which can lead pork to attract low demand and can be of poor sales at lower price (Mayega et al 2015; Lundstrom et al 2009; Thun et al 2006).

Facilitator: With the aid of moving instruction material/photos that illustrate the order of steps of castration, trained the participants in the aseptic process of piglet castration and wound management.

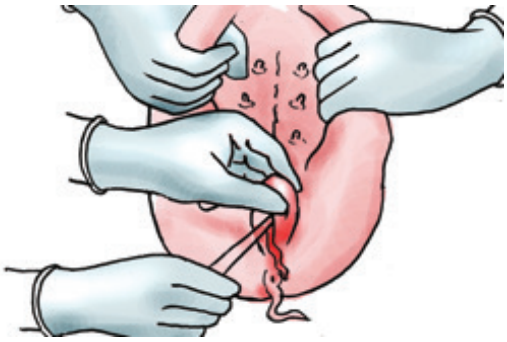
Step 1: Wash and disinfect the scrotum



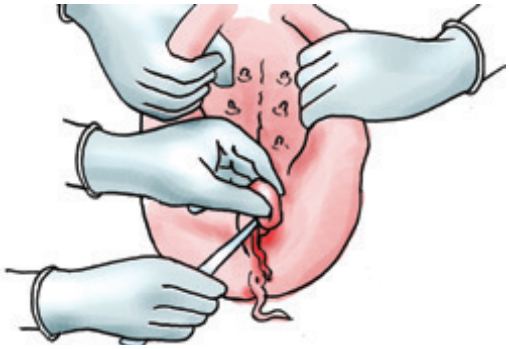
Step 2: handle one testis, press it on to the skin, with septic knife cut the skin making a large enough hole to allow coming out of the testis



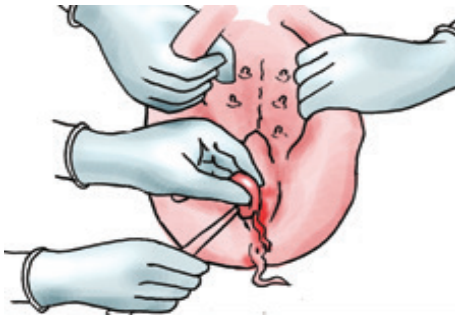
Step 3: gently pull the testis to expose the cord of the testis



Step 4: gently pull the testis to expose the cord of the testis



Step 5: With the edge of the knife scrape against the twisted cord until it is cut through



Step 6: Manage the wound with iodine to prevent infection

4.3 Management of a boar

Objective: To equip participants with skills of managing a serving boar.

Setting the scene

Importance of a boar

Facilitator: Ask the participants to mention the importance of a boar in a pig production.

One participant lists the ideas mentioned by the participants.

Facilitator: Discuss and explain the ideas given by the participants.

Facilitator: Ask the participants to mention and explain the qualities of a good breeding boar that meet the requirements of a boar in pig production.

One participant makes a list of the qualities mentioned.

Facilitator: With aid of illustrations/photos/video, summarize the list explaining each quality putting in consideration the points below (Mayega et al 2015; Linda and Carr 2019).

- Must have well-built legs and athletic ability to perform multiple matings.
- Should have straight legs and avoid those with knock-knee legs (angled legs).
- Should exhibit sexuality by often opening the mouth and making a chopping noise and producing foam around the lips. This is attractive to the female pigs.
- Properly shaped testis which are not too small, which can be underdevelopment, or too large testis, which can be due pathologies like scrotal hernias.
- Sheath over the penis must be trim. Hanging sheaths predispose a boar to infections.
- Must be aggressive and show desire to mate (libido).
- Must be able to have entry into the vagina (during mating). Boars with deformities should be rejected as these are heritable traits.

Management of a breeding boar

Facilitator: Ask the participants to mention how they manage the boar on their farm. For each idea given the respondent gives reason why.

One participant lists down the ideas given by participants.

Facilitator: With the aid of illustrations/photos and animations, discuss the ideas from participants, while considering the points below.

- There should be no sharp objects like wires, nails in the boar area which can cause injury.
- Avoid wet surfaces where boars are kept, which cause slippery surfaces resulting in fractures/sprains in the boar.
- Improve a boar's grip by using woven wires, woven rubber, sand or wood shavings on the floor.

- Do not put a boar near gilts as it will be stimulated all the time. The gilts are more prone to demonstrate standing oestrus if the boar is not available all the time.
- Give enough exercise area. Put more than one feed point to promote movement of the boar within the area.
- Feed should not encourage too much fat deposition which limits physical adeptness and sexual activity. Fat males become docile and tire easily and do not maintain the energy needed during mating.
- Maintain the boar without injury, lameness and joint inflammations so that it be able to support its weight upwards during mating (mounting).
- Test the boar for fertility by giving 3–4 gilts ready for service and see if they do not come back to heat which is indicative of a fertile boar.
- Maximum active sexual life of a boar is (18–24 months). Therefore, at the age of 30–36 months, the boar must be changed or limited to large sows as it may be too large for the small starting gilts.

Housing for breeding boar

Source: FAO 2009

Management of a communal or village boar

Objective: To make the participants appreciate the advantages and disadvantages of a communal or village boar.

Facilitator: Ask the participants to give the advantages and disadvantages of having one boar for a given group of pig farmers or village.

One participant lists down the responses in a tabular form.

Facilitator: Summarize and explains the responses while integrating the points below.

Table 4: Advantages and disadvantages of a communal or village boar

Advantages	Disadvantages
Shared cost of procurement and maintenance of the boar	All village or group will have the same genetic pool from the sire in a short time. If not properly handled, it can lead to concentrated inbreeding.
Easier change of the boar as the cost is shared by the group members hence control of genetic pool of the village	In instances of exchange of the boar with another village or group, chances are high that the boar will find its daughters or relatives hence inter-village inbreeding.
Cheaper maintenance of the boar as contributions from members are small and affordable for the smallholder pig farmers	In cases of many sows to be served, sexual fatigue and inadequate sperm release may happen when the boar is not given enough time to rest. This will lead to improper sperm formation resulting in infertile ejaculations. This can lead to poor conception of sows and may be small litter sizes.
	It can be a channel of poor biosecurity to the boar or to the sow and in the end to the whole pig farm where the sow came from. If the boar is incubating a contagious disease, it can infect the sow and vice versa. In case of many sows served by the boar, wide spread of the disease occurs. It is a very fertile channel of transmission of sexually transmitted diseases from boar to sows or from sow to boar.

Facilitator: Ask the participants to explain how they restrain pigs of different ages and physiological states.

One participant lists the responses.

Facilitator: With the aid of illustrations, photos, and animations, explain the restraint methods for each age/ physiological state of the pig. This is a fully hand-on exercise where the training must have physical handling of the pigs.

4.4 Restraint of pigs for examinations

Restraint of piglets

- Put piglet in a room.
- Use cardboard to drive piglet into a corner.
- Grasp the hind leg and lift piglet off the ground with its head down.
- With one hand holding the rear legs, put one hand under the chest and lift the piglet.
- Put the piglet on the floor and use your knee to cause moderate pressure on the lumber region to limit struggling of the piglet.

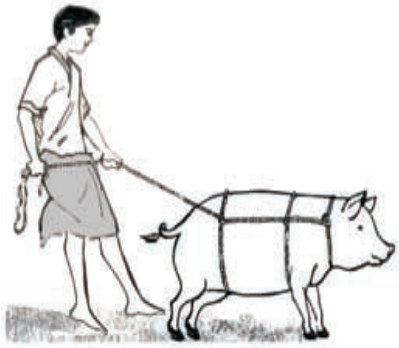
Restraint of adult pigs

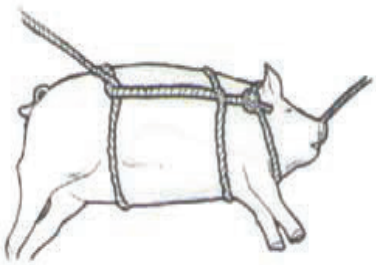
- Use boards to drive the pig into a corner of the pen.
- Use a looped rope or snare. Guide the loop into the mouth over the upper jaw/nose making sure the snare loop is above the tongue. Tighten the snare loop over the upper jaw behind the canine teeth.
- Pull the pig forward. It will pull back to try to pull away.
- After need for restraint is over, loosen the rope and with draw the snare and move way very quickly.

Use of nose snare to restrain adult/big pigs

Photo credit: Makerere University/Nsadha Zachary

Use of a rope to restrain large pigs





Source: Rameshwar Deka

General caution:

- Where it is not absolutely needed, avoid restraint of pregnant sows.
- Avoid over-exercising pregnant sow.
- Avoid scaring a pregnant sow.

5. Keeping records on a pig farm

Objective: To equip the participants with skills in writing/recording information about their pig farms.

Facilitator: Ask the participants what they understand by records.

One participant lists down the responses.

Facilitator: Discuss the responses and summarize the exercise as follows.

Pig records are comprised of detailed information, written clearly about a certain pig and/or activities on a pig farm.

5.1 Identification system for pigs

Objective: To make the participants acquire the skills of identifying their pigs for easier recording of information about the pigs.

Facilitator: Ask the participants what the meaning of identification is.

One participant lists down the responses.

Facilitator: Discuss the responses and summarize the exercise as follows.

Identification of pigs enables a farmer to recognize a particular pig on the farm.

5.2 Types of identification of pigs

Facilitator: Ask the participants to name the identification methods they know.

One participant lists down the responses.

Facilitator: Discuss the responses and integrate the points below giving the advantages and disadvantages of each type of identification method (use illustrations, pictures, photos, animations).

- Ear notching: interpretation of the notches to get the ID number is difficult especially when quick work being done).
- Tattooing: the ink used may fade as the pig gets in contact with organic matter. It works well in white skinned pigs but not so well in black pigs).
- Ear tagging: very easy to use and read. It can be used for customized identification where the farmer chooses ID on their farm because the impregnating ink can be used for special recording suiting the farmer's desires.

- Names: work very well in small numbers in the herd. It is sentimental where the farmer gives the name in remembrance of something.
- Colour of skin: works in small herds. It is prone to confusion if the pig escapes from the farm. It will be hard to convince the community that the white pig is yours if many pigs in the community are white.
- Ear shape: it works when the pig is healthy. Some diseases cause failure of pig to maintain the sharp pointing of the ears hence it can brood confusion.
- Design of the colour patches: works well in small herds. It can lead to confusion if pig escapes into the community where similar patterned pigs are found.

5.3 Types of records on a pig farm

Objective: To make the participants know the important records they need on their pig farms.

Facilitator: Ask the participants to name the records needed on a pig farm.

One participant lists down the responses.

Facilitator: Discuss the responses together with the list below, giving the major contents of each record (use illustrations, photos, animations).

- Health records (disease, medicine, who treated, recovery or death of pig).
- Litter records (number, born alive, weak, dead, weaned).
- Dam records (age, services to conceive, litter per farrowing, litter alive, dead, weaned, diseases suffered).
- Breeding records (boar used, services to conceive).
- Boar records (age, conception rate to serviced sows, breed, source of the boar, litter).
- Vaccination records (diseases, when last vaccinated and prospective vaccination).
- Parasite treatment records (last deworming and prospective treatments).
- Purchase of feed records (source, cost per unit).
- Sale of pigs records (who bought, how many and how much).
- Death records (identification of dead pig, disease, treatment used prior to death).
- Visits by technical persons like the veterinarian, animal husbandry officers (when, who, what was done, and record of advice and treatment carried out).
- Financial records (cost of inputs, sales, constructions, welfare, and wages).
- Marketing records (where market is, costs of marketing).

Table 5: Stock record form

Month	No. of boars	No. of sows	No. of growers	No. of male piglets	No. of female piglets	Pig died	Total number of stock

6. Animal welfare in pig farming

Objective: To make the participants appreciate the importance of good handling and good management of pigs for better growth and productivity of the pig industry.

Facilitator: Ask the participants to mention what they understand by the term 'animal welfare.'

One participant is tasked to write down all the responses.

Facilitator: Discuss the responses and give the summarized definition below.

Animal (pig) welfare is the physical, physiological and mental needs of a particular pig depending on the production phase and physiological state of the pig. The physical needs come from the environment, physiological needs come from the nutrition, and mental needs come from the handling drastic change in the factors around the pig.

6.1 Good practices in animal welfare in pig husbandry

Facilitator: Ask the participants to name what would make a good welfare system on a pig farm.

One participant is tasked to write down the responses.

Facilitator: Discuss the responses. Explain the points below on animal welfare practices in pig farming.

- Pigs must be free from hunger and thirst. Pigs should have enough feeds and free access to water.
- Provide an appropriate environment of good shelter and resting area that also protects the pigs from bad weather and injuries.
- Avoid actions that cause pain, or injury, to the pig. Have good disease prevention, early disease diagnosis and early treatment of sick pigs.
- Pig must be allowed to freely express normal behaviour.. Give enough space, company of animals of its kind or those that naturally do not scare the pigs.
- Pig should not be exposed to instances that cause fear and distress. Drastic change in the ambience (e.g. loud unfamiliar noise and light, very quick movements by persons).
- Avoid hard hits on a pig.
- Avoid hard slaps on a pig. Scratch on its skin and it will respond.
- Never kick a pig as it causes pain and fear.
- Do not shout when in the piggery. Adopt talking to the pigs softly and they will learn to trust you.

6.2 Good practices for welfare of pigs during transport

Objective: To make the participants understand that good management is needed for the well-being of the pigs in transit to avoid stress in the pigs. Stressed pigs have poor-quality meat.

Facilitator: Ask the participants to mention how they handle the pigs for transportation.

One participant is tasked to list down the responses

Facilitator: Discuss the responses and incorporate the points below.

- Load ramps should be of non-slip flooring for easy feet-grip of the pigs during movement to the load truck.
- The load ramp should be at good slope angle of not more than 20°.
- Allow the pigs to move while in their comfort zone and not while frightened.
- Move pigs in small groups (3–5) pigs per group.
- Allow the pigs to lead movement and not the persons to the load ramp.
- Prior exposure of the pigs to the movement trail will make them familiar with the area and will make loading easy and comfortable for the pigs.
- Avoid over loading of the pigs. Pigs of market size should have space of approximately 0.462 sq. feet.
- Use wet shavings or wet sand and bedding.
- Sprinkle water on to the pigs just as the truck is about to start moving. The vehicle's movement creates good evaporation of the water from the pigs hence heat loss. Avoid sprinkling water on them when the vehicle is not moving as this creates a sauna state which is bad as the pigs do not have the cooling effect they needed.

7. Heat stress in pigs

Objective: To make the participants get skills to mitigate the negative impact of heat on the performance of pigs on their farms.

Facilitator: Ask the participants what they understand by heat stress.

One participant lists down the responses.

Facilitator: Discuss the responses and conclude as below.

Heat stress in pigs is where the pig is under stress/discomfort and can develop illness or underperformance due to overheating of the body due to heat coming from within the pig or from outside the pig. Pigs are very sensitive to overheating because pigs hardly sweat, have an insulating fat layer under the skin and have small lungs compared to the body size. The heat loss through respiration/panting is small. In Uganda, which is in the tropics, under-heating in pigs is important especially in the piglets before weaning (this topic should be handled when training about care for newborn piglets).

7.1 Signs of heat stress in pigs

Objectives: To make the participants learn how to detect heat stress in pigs on their farms.

Facilitator: Ask the participants to name the signs they know of a heat-stressed pig.

One participant lists down the responses.

Facilitator: Discuss and explain the responses and integrate the points below (use illustrations, pictures, photos, and animations where possible).

- Increased respiration rate.
- Loss of appetite.
- Restlessness.
- Drinking excessive water.
- Open-mouth breathing.
- Blotchy skin.
- Stiffness and tremor of muscles.

Prostrate lying piglets

Source: National hogfarmer.com

Heat stressed pigs. Open-mouth panting

Source: Southafrica.co.za

7.2 Impact of heat stress on pigs

Objective: To make the participants know the negative impacts of, and create need to mitigate, heat stress on pigs in their farms.

Facilitator: Ask the participants to name the likely negative impact to the pigs due to heat stress.

One participant lists down all the responses.

Facilitator: Discuss the responses and include the points below (use illustrations, pictures, photos, and animations where possible).

- Lower sperm concentration and quality in a boar.
- Change in the hormonal status of a pig, which can result in poor performance.
- Poor development of fetuses resulting in weak litter.
- Decreases farrowing rates.
- Decreased litter born alive.
- Embryonic death during gestation hence small size litter.
- Abortions.
- Temporal infertility of the boar.
- High stillborn rate.
- Reduced body weight in growers.
- Reduced carcass quality.

7.3 Management of heat stress in pigs

Objective: To make the participants acquire skills of controlling heat stress in pigs in a farm.

Facilitator: Ask the participants what they do if they notice that the pigs are overheated.

One participant lists down the responses.

Facilitator: Discuss and explain the responses and consider the points below (use illustrations, pictures, photos, and animations where possible).

- Increase ventilation of the pig pens. This should be considered during construction of the pens.
- Reduce stocking rate so that pigs are not overcrowded during the hot weather.
- Maintain enough clean drinking water at very low temperature.
- Avoid feeding the pigs during the hottest time of the day.
- Give a good cool shade for the pigs. This is best achieved if considered during construction of pig housing.
- Do not induce muscle activity of the pig during the hot time of the day.
- Provide wallowing/swimming facility in the piggery where pigs cool their bodies.

Pig in water

Source: pork.ahdb.org.uk

Pigs under a shade

Source: Nsadha Zachry, Makerere University

8. Reporting disease outbreak and control of movement of diseased pigs

Objective: To make the participants know channels of information flow and responsibilities of the different actors in the pig production chain during disease outbreaks and how to control movement of diseased pigs.

8.1 Responsibility of the pig farmer in disease reporting and control

Facilitator: Ask the participants to mention what they do if a pig is suspected to be having a disease.

One participant lists down the responses.

Facilitator: Discuss the responses and summarize the actions of farmers in disease reporting (use illustrations, pictures, photos, animations).

- Separate the sick pig from the rest of the herd.
- Keep the sick pig in the quarantine unit of the farm.
- Notify the nearest administrative/veterinary authority in the area.

8.2 Responsibilities of the administrative/veterinary authority in disease reporting and control

Facilitator: Ask the participants what they think are the obligations of the veterinary authorities.

One participant lists down the responses.

Facilitator: Summarize and explain their responses together with the points below (Ilukor et al 2012).

- Directs the farmer how to manage the sick animal and the farm.
- Local veterinary authority visits the farm and carries out assessment of the disease and makes professional/ informed decision.
- Local veterinary officer can order destruction of the infected animals under their supervision.
- Local veterinary officer reports to higher authorities (district veterinary officer).
- District veterinary officer informs all the local veterinary officers instructing them to notify all pig farmers in their localities of disease incidence.

- District veterinary officer reports to the Commissioner of Animal Services for action.
- Commissioner can institute an area quarantine which prohibits movement of pigs and their products into or out of the demarcated area.
- Commissioner can order restricted slaughter in the area.
- Commissioner orders the veterinary department to have unlimited entry into the affected farm.

9. Common diseases of pigs and their preventive and control measures

9.1 Monitoring the health of a pig herd

Objective: To equip the participants with skills to detect ill/compromised health of pigs in a herd so that veterinary attention is sought before great damage by the ill-health is done on the herd.

Setting the scene

Facilitator: Give an analogy in form of a story of how a family guardian detects ill/compromised health of family members.

Facilitator: Ask the participants to tell what, and why, they do to detect an ill/compromised health of pigs in their pig herds.

One participant lists down the responses.

Facilitator: Emphasize to the participants the importance of daily observation of the pig herd.

Daily or periodical observations during the day will enable the farmer to identify a sick or compromised pig early enough before the disease causes irreversible damage to the health of the pig. Detection of a sick pig can be achieved if the farmer knows the normal characteristics of a pig or group of pigs at every age bracket.

9.2 Detection of good health in pigs

Facilitator: Asks the participants to list the characteristics of a healthy pig.

One participant lists down the responses.

Facilitator: Discuss the list in consideration with the points below (section 8.2.1)

General features of a healthy pig

- Spine, ribs and hips are not visible and are full of flesh. Only shoulder blades are visible.
- Top line must be level not arched. Arched back is a sign of pain or skeletal deformity.
- Joints must have the normal contours and be symmetrical. Identical joints on either limbs must be the same size and contoured.

- The belly must look well filled and with no swellings.
- No ulcers/wounds on legs or the body.
- Bright pink coloured eyelids.
- Piglets (<5 weeks of age) of white breeds have pink ears and a pink stripe along the spine.
- Straight nose, cool and moist and no blisters.
- Clean smooth and uniform hair.
- When approached the tail is alert and upright, puts nose in air and looks curious produces a 'woof' noise and moves away when you reach its flight zone, comes back in an investigative manner (lack of such behaviour warrants vet attention).

Healthy pig which is very alert (photo credit: Makerere University/Nsadha Zachary)

Observation of pigs for detection of ill-health

Facilitator: Emphasize the power of clinical observation in detecting ill/compromised health of pigs following the guidelines below.

Observe pigs from distance before you disturb them to note the abnormal behaviour in some of the pigs.

- Listen to sounds of restlessness, coughing and sneezing
- Enter pens in slow motion and observe for:
- Lame animals or those lying down.
- Huddling.
- The lying behaviour – piled-up, on the belly, or lying outstretched.
- Increased activity or inactivity at water points and feeders.
- Ventilation concerns as seen in panting pigs.
- Clean rump.

Observation from the outside the pen for ill health in pigs

Photo credit: Makerere University/Nsadha Zachary

9.3 Critical examination of suspect sick pigs (characteristics of a sick pig)

Objective: To equip the participants with key skills of detecting ill/compromised health of pigs in a herd.

Facilitator: Ask the participants to each mention how they detect a sick pig.

One participant lists down the responses.

Facilitator: Discuss the responses together with the points below (Masters et al 1992).

- Sunken belly/flunks indicative of malnutrition or parasitism.
- Shortened strides of some legs of the pig indicative of pain in the leg.
- Dull, sunken eyes, cloudy eyes, twitching irritated, discharge, loss of hair around the eye, running fluids from the eye.
- Crusts on skin, raised areas on skin greasy patches on skin, bruises.
- Rough hair-coat.
- Pale skin.
- Blue-greyish skin colour particularly on the ears and snout.
- Swollen ears (haematomas due to fighting in pen).
- Ears not pointed or alert except in Landrace breed where the ears are never pointed in healthy pigs.
- Unwillingness to rise up/weakness/staggering/trembling.
- Scours/faeces at the rump.
- Poor response to environmental stimuli (e.g. an approaching person).
- Wounds at the tail indicative of tail biting among the pigs.
- Dog-sitting of the pig.
- Breathing through the mouth.

- Reduced weight bearing on some legs. The pig quickly shifts weight from the affected leg.
- No interest in feeding/not eating/drinking water/rapid breathing.
- Dull skin which turns reddish in white coloured pigs and pig with dull eyes.
- Diarrhoea and tail become limp.
- Droopy ears/ears pointing downwards.
- Separates from the rest of the herd in the pen.
- Swellings/abscesses.
- Abnormal rectal temperature.
- Lying down all the time when other pigs are active.
- Temperamental animal.
- Wounds on the; tail, ear,belly and nose

Critical/detailed clinical examination of sick pig

Photo credit: Makerere University/Nsadha Zachary

9.4 Common infectious diseases of pigs in Uganda

Objective: To make the participants able to observe/identify/notice the common diseases and learn their mode of transmission and the preventative measures needed.

Facilitator: Emphasize the information highlighted below to make the participants appreciate the rationale of putting in place effective biosecurity programs on their farms.

For a good biosecurity plan, farmers needs to know the following:

a) Prevalent pig diseases in the area.

b) Transmission cycles of the diseases.

c) Prevention and control measures of the pig diseases.

d) Potential cost of an outbreak of the disease on the farm, community and economy of the country.

Important infectious diseases of pigs in Uganda

Facilitator: Ask the participants to name the diseases of pigs and to give the transmission cycles, identification signs and prevention measures they know.

One participant lists down the responses.

Facilitator: Guide discussions on the summary of the responses in a tabular form as below.

Table 6: Pig diseases in Uganda, their causes, mode of transmission, symptoms and preventative measures

Name of disease	**Cause**	**Mode of transmission**	**Symptoms**	**Preventive measures**
African swine fever	Virus	Direct contact with infected pig Contaminated utensils/ implements. Visitors Contaminated vehicles Vermin, birds Survives for long in moist environments and very resistant to many inactivators Soft ticks Uncooked swill	High temperature Vomiting Diarrhoea which can be mucoid or bloody Conjunctivitis Nasal discharge Red discolouration of skin on snout, ears, under belly, groin area Increased respiratory rates Lack of appetite Quick death Pig weakness/lying down all the time	No vaccine No treatment Feed only cooked swill Do not allow contact of your pigs with pigs from outside by having double perimeter around the pig sty Have proper disinfection system on the farm Have strict biosecurity measures in farm
Foot-and-mouth disease	Virus	Direct contact Contaminated feed, water, garbage Infected animal products e.g. milk Air-borne. Mechanical transmitters, e.g. visitors. Birds Flies	High temperature Vesicles, ulcerations in mouth and feet Lameness Difficult eating Profuse sticky and foamy salivations	Vaccinate Separate infected pigs Clean and disinfect premises, utensils Clean the wounds and apply potassium permanganate
Swine dysentery	Bacteria	Contaminated water and feed Contaminated soil	Bloody diarrhoea/dysentery, particularly in fattening pigs Yellow to grey soft faeces Mucoid diarrhoea.	Treat pig with antibiotics Clean and disinfect premises Keep premises dry for some time

Name of disease	Cause	Mode of transmission	Symptoms	Preventive measures
Piglet anaemia	Iron deficiency	Non-contagious	Dull weak anemic animal Pale pigs Shallow, laboured breathing in severely affected piglets especially upon excitement Common in intensively kept piglets	Injection against anaemia on fourth and fourteenth day of age
Parasitic infection	Internal parasites like the roundworms	Contaminated feed, water, soil, bedding etc.	Rough hair coat Stunted growth Pot-bellied pigs Weight loss Diarrhoea Constipation in serious cases	Strategic deworming Clean and disinfect premises and allow to dry Restrain your pigs from scavenging in dirty places
	External parasites	Direct contact Close contact of pigs in contaminated environments	Itching Irritation Restlessness Rubbing on objects/walls. Scabs Hair loss Abrasions	Treat all pigs with Ivermectin and also spray the pigs with acaricide
Salmonellosis	Bacteria	Faeces Rodents Contaminated water and feeds	Some pigs may have fever Huddling in corner Watery yellow faeces sometimes blood in faeces	Isolate sick pigs Clean and disinfect the premises
Pneumonia	Bacteria Virus (PMWS, PRRS, influenza, PRCV) Parasites (lung worms, ascaris)	Orally Nasal droplets or aerosols from sick pigs Contaminated fomites	Laboured breathing (thumping) Cough Weight loss Swelling of neck lymph nodes Fever	Good sanitation Vaccination Antibiotics Anthelminthic treatment.
Agalactia	Hormonal imbalance	Stress Bad feeding	Low or no milk production	Treat with oxytocin with antibiotics (avoid penicillin)

Name of disease	Cause	Mode of transmission	Symptoms	Preventive measures
Mastitis	Bacteria Trauma by canine teeth of piglets		Lack of milk in mammary glands	Sanitation in pen Dry beddings for lactating sow Treatment with antibiotics Removal of canine teeth in piglets
Erysipelas	Bacteria	Faeces, urine, saliva Contaminated water, feed, and soil Run-off water transports bacteria for distances Rodents Sewage from meat processing and slaughter places Other pigs (30% carry it asymptomatically in their tonsils)	Diamond patches or red-bluish, discoloured skin in acute cases In acute cases – high fever >40°C. Lack of appetite. Sometimes abortion Sometimes short-term infertility in boars. Arthritis, and acute deaths caused by inflammation of the heart valves in chronic cases	Good sanitation Disinfection Vaccination Change paddock –infection will remain in the soil
Porcine epidemic diarrhoea	Coronavirus	Virus shed in faeces and can easily contaminate feeds of water in pen ,	<u>Piglets</u> Watery faeces No blood is seen in the faeces Faeces are yellow to green in colour Vomiting Pigs go off feed Very high pig mortality Recovered pigs have stunted growth <u>Breeding pigs</u> Increased return to heat in sows Abortions in sows Poor milk production in sows Decreased libido in boars	<u>Prevention</u> Strict sanitation and biosecurity, control of vermin on farm <u>Treatment:</u> No specific treatment Keep pigs in very warm place Hydrate the pigs using electrolyte supplements Give antibiotics to control secondary bacterial infections

Name of disease	Cause	Mode of transmission	Symptoms	Preventive measures
Leptospirosis	Bacteria	Shed in urine of infected pig A pig which has recovered can shed the bacteria for three months. The bacteria can stay in water and damp soil The bacteria can penetrate the mucous membranes, eyes and wet skin	Fever Loss of appetite Anaemia Red coloured urine Yellowing of mucous membranes Convulsions in very serious infections Mummified fetuses Abortions in late gestation Dead or weak piglets at birth	Vaccinations Treatment with antibiotics Vector control Improve sanitation

Clinical presentation of African swine fever in pigs

Objective: To make the participants learn how to detect African swine fever (ASF) infection in the domestic pig.

Facilitator: Ask the participants to name clinical signs of ASF.

One participant lists down the responses.

Facilitator: Summarize and explain the responses referring to the photo below.

Clinically African swine fever infected pig

Photo credit: agriculture vic.gov.au

Control and prevention of African swine fever

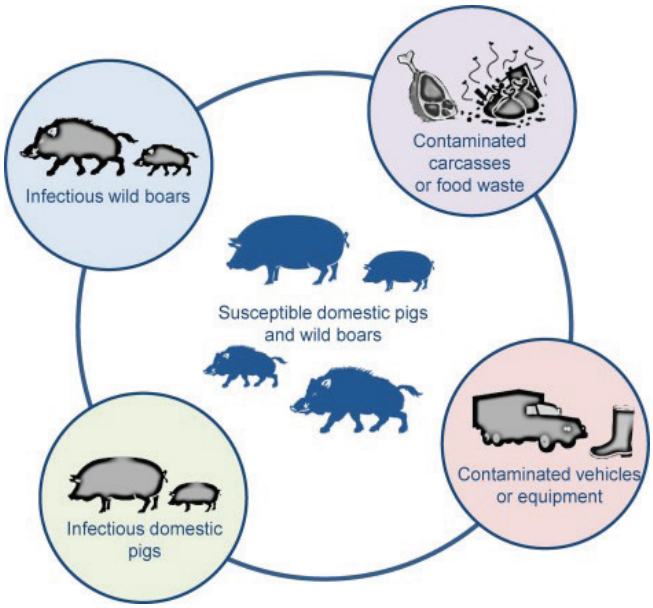
Objective: To make the participants acquire skills for preventing ASF, which is the most devastating disease of pigs, through knowing its mode of transmission, clinical signs and prevention.

Facilitator: Ask the participants to name the modes of transmission of ASF.

One participant lists down the responses.

Facilitator: Summarize and explain the responses while referring to the information displayed in the diagram below.

The transmission cycles of African swine fever



Credit: sciencedirect.com

Daily farm practices for preventing and controlling African swine fever

Objective: To make the participants learn how to keep their farms safe from African swine fever or how to minimize its spread from infected farm to other farms and from infected pen to other pens.

Facilitator: Inform the participants and stress the points below.

- There is no vaccine for ASF.
- There is no treatment for ASF.
- The disease can kill very many pigs in a very short time.
- It is advisable for the farmers to work hard towards having no entry of the disease in their pig farms.

Facilitator: Ask the participants to name what they do to prevent and control ASF on their farms.

One participant lists down the responses.

Facilitator: Summarize and explain the responses while emphasizing the information in the bullets below.

- Avoid the free-range system of keeping pigs as they can get into contact with infected pigs, feral pigs, and contaminated materials like dumped beddings from infected farms, can ingest uncooked infected swill and also can get in contact with infected ticks.
- Avoid the use of community or village boars – if these are to be used, they should always be used by the same farmers, and not have any contact whatsoever with 'foreign' sows.
- Have a proper biosecure barrier constructed for holding pigs in the piggery.
- Do not allow growth of grass around and close to the piggery as the infected ticks can crawl from the grass into the pig pens.

- Have a perimeter of bare ground around the piggery swept at least two times per week to limit accumulation of grass which can allow the ticks to enter the piggery.
- Never allow penned pigs to share food with free range pigs.
- Drainage from one pen should not enter another pen.
- Drainage from a pen should drain directly to the outside of the house not into the central walkway of the house as this can cause easy contamination of personnel working in the piggery.
- Therefore, during construction, all water and fluids from one pen should flow through a drainage out of the pen to the main drainage of the piggery system.
- In case of any disease on the farm, the animal attendant should attend to the normal pens first and works in the infected pen last with special implements for that infected pen.
- Disinfect the implements used in the infected pen with chemicals that kill viruses (virucidals).
- Disinfect farm footwear, after it has been cleaned of the organic matter, in a footbath for at least 20 minutes
- If there is an outbreak of ASF on the farm, clean and disinfect the footwear after working in a pen.
- Disinfect all the implements as you move from pen to pen.
- Use dedicated footwear and, if needed, protective clothing for all visitors.
- Do not allow un-disinfected persons to access the piggery (whatever caliber or status the person is in society or how clean looking they may appear to be, viruses are not visible with the naked eye and can be even on very clean-looking items).
- Properly dispose carcasses on the farm. This should be by total burning or very deep lime treated burying of carcass. Even where slaughter has been carried out all the blood and items like banana leaves should be buried/ burned.
- All feed should be cooked before giving it to the pigs even if it comes as already cooked food from human food points.
- Practice strict quarantine for the new stock and all pigs that escaped from the farm. Keep them in the quarantine unit for not less than 30 days as observations for signs of ASF are carried out.
- Do not sell or eat the ASF sick or dead pigs as this can encourage spread of the disease.
- Alert the local veterinary person or the local authority in the area so that they can institute control measures over a wide area.

Facilitator: Conclude the session by repeating.

African swine fever has no vaccine or treatment. African swine fever is a killer disease. Carry out strict biosecurity measures to stop African swine fever from entering your farm. Prevent African swine fever from affecting pigs on your farm.

9.5 Internal and external parasites of pigs

Objective: To make participants learn skills of parasite control in pigs.

Facilitator: Ask the participants to describe what is a parasite.

One participant lists down the responses.

Facilitator: Discuss and explain the responses and conclude as given in the bullet below.

- A parasite is an organism that lives in or on another organism (host) and gets its nourishment from it and at the expense of the host. The relationship is one-sided as the host does not benefit from the relationship. The host just gets weaker in the presence of the parasite. Therefore, parasites weaken the pigs and must be prevented from infecting the pigs.

Facilitator: Ask the participants to name any parasites of pigs they know and how pigs get internal parasites.

One participant records the responses in a table listing the external and internal parasites.

Facilitator: Discusses and explain the responses and name the main parasites giving the sites of infection in the pigs using the list below.

Internal parasites

- Large roundworm *(Ascaris*).
- Threadworm (*Strongyoides*).
- Lungworm (*Metastrongylus.).*
- Whipworm (*Trichuris*).
- Tapeworm (*larvae/cysticerci in pork*).
- Muscleworm (*Trichinella*).
- Muscle protozoa (*Toxoplasma*).
- Intestinal protozoa (*coccidia, e.g. Isospora*).
- Blood parasites (*e.g. Trypanosoma*).

External parasites

- Stable flies
- Fleas
- Jiggers
- Lice
- Mange (scabies) mites (*Sarcoptes*).
- Ticks

Facilitator: Conclude by informing the trainees that pigs get infected by eggs of parasites that are shed in the environment where the pigs stay.

Clinical signs of parasites in pigs

Objective: To make the participants learn how to detect parasite infection in their pigs.

Facilitator: Ask the participants to give the clinical signs of internal and external parasites. Where possible relate each parasite to a clinical sign.

One participant lists down the responses in tabular form.

Facilitator: Discuss the responses with reference to the points in the table below (Lagu et al 2017).

Table 7: Internal and external parasites of pigs

No.	Parasite	Clinical sign
1	Coccidia	Diarrhoea that can last about 10 days. It is common in piglets
2	Ascaris	Liver damage, poor performance of the pig, weight loss, slow growth in young growing pigs and coughing
3	Threadworm	Diarrhoea
4	Whipworm	Diarrhoea, vomiting, dehydration. Common in growers
5	Trypanosoma	In acute disease death is rapid. In chronic cases pig emaciates
6	Tapeworm (larvae)	Usually seen at slaughter, nodules under the tongue and in other muscular tissues
7	Muscleworm (Trichinella)	Minute nodules in skeletal muscles
8	Lungworm	Coughing, poor growth, loss of weight

Clinical signs of external parasites

Table 8: Clinical signs of external parasites in pigs

No.	Parasite	Clinical sign
1	Mange mites (*Sarcoptes*)	Itching and pig rubs on walls and objects, scaled skin, crusts on skin, black cerumen and crusts in the ears, hyperkeratosis.
2	Lice	Seen on skin, eggs on hairs, particularly behind the ears
3	Ticks	Can be seen on skin (great concern due to ASF)
4	Fleas	Skin lesions like small wounds which can be entry for myiasis
5	Biting flies	Skin lesions, wounds, myiasis
6	Jiggers	Lesions in the feet and at times on the elbow areas

Control and prevention of internal parasites

Objective: To make the participants acquire skills of parasite prevention and control in pigs.

Facilitator: Ask the participants to mention how they control and prevent parasites in pigs.

One participant lists down the responses.

Facilitator: Discuss and explain the responses and add any of the points below that may be missing in the responses of the participants.

Internal parasites:

- Clean the pig pens of all the excreta and feed wastes every day.
- Clean pens depopulated of pigs just after removal of pigs.
- Disinfect pens before introducing new pigs.
- Allow all surfaces to dry.
- Avoid humidity in piggery by providing good ventilation.
- Good nutrition for increased resistance against parasites.
- Have strong walls where pigs cannot feed on earth worms which are intermediate hosts of some worms like the lungworms.
- Wash pregnant sows before the farrowing (look at the section on management of pregnant sow).
- Use treated bedding for pigs to avoid introduction of infections of parasites.
- Treat sow with antiparasitic drugs (e.g. Ivermectin) to clear it of worms before farrowing to reduced chances of infection of piglets.

External parasites

- Strategic treatment with Ivermectin is the most effective intervention.
- Clean the pigs especially when a parasite is seen on a pig.
- Spray with appropriate insecticide/acaricide.
- Avoid overcrowding of pigs which can cause bad habits in pigs like regular fights which can result in injuries and open wounds which are attractive to flies.
- Cull pigs with chronic mange.
- Treat gilts against external parasites before first service.

All the above will be demonstrated to the participants during hands-on practical sessions.

10. Manure and effluent management and disposal on a pig farm

Objective: To make the participants acquire skills of manure management for proper hygiene/sanitation on pig farm.

Facilitator: Ask the participants to mention what they do to the manure right from the smallest pig herd (one pig) to a large commercial facility.

One participant lists down the responses.

Facilitator: Discuss the responses and include the ideas below (use illustrations, pictures, photos, and animations where possible).

- Direct use of manure/effluent on crop farmyard.
- Add ash and dry as is done in EcoSan systems formation of the 'black soil's' from human excreta. This can be stored and used as fertilizer for many crops, flowers gardens etc.
- Direct use into fish ponds.
- Make compost manure.
- Make biogas.

10.1 Comparison of good manure-handling and bad manure-handling practices in a farm

Objective: To instill comprehension of the advantages a farm gets from good handling of pig manure and the likely dangers a farm faces if it has poor management of pig manure.

Facilitator: Ask the participants to name the undesired things that happen if manure is poorly handled and the desired things if manure is properly handled on a pig farm.

One participant lists down the responses in a tabular form.

Facilitator: Discuss and explain the responses and include the points in the table below (use illustrations, pictures, photos, and animations where possible)

Table 9: Comparison of good manure-handling and poor manure handling practices in a pig farm

Desired things on a farm due to proper manure handling	**Undesired things from poor handling of manure on a farm**
Better sanitation/hygiene	Poor sanitation/hygiene
Less flies and vermin are attracted to the farm premises	A lot of flies and vermin are attracted to the premises
Less awful odour on the farm premises	Decomposition of the manure gives an awful smell
Less sanitation related diseases	Decomposing manure is good medium of development of many disease germs
Less contamination of surrounding area by run-off water (like streams, rivers, water wells farmland)	Run-off water drains the manure to other areas, which can lead to contamination of soils and other facilities
Less spread of disease on the farm and out of the farm	If there is disease on the farm, vermin, persons, flies, and rodents, can easily spread the manure to many points on the farm and out of the farm
Easier to enforce a disease quarantine on the farm where manure would be the medium of spread	Quarantine on farm is hard to enforce as the vermin can vector the germs to would-be safe pens
Easy to direct the nutrients in the manure to the desired use on the farm like fertilizing crops	Waste of the nutrients as the drainage and spillage of the manure is not controlled.

Facilitator: Conclude by emphasizing:

Manure is a good medium of growth of disease-causing organisms. Avoid accumulation of manure on your farm. Better learn and train yourself to collect the manure twice a day.

11. Maintenance of health of pigs and treatment of diseases on a pig farm

Objective: To make the participants aware of the role of animal health professionals and learn when to seek their services for the development of their pig farms.

11.1 Roles of different animal health service providers

Facilitator: Ask the participants to name various animal health service providers/workers and their roles on pig farms.

One participant lists down the responses.

Facilitator: Summarize and explain the responses in a table aligning the level of the profession and what they can do on a farm together with the points in the table below.

Table 10: Animal health workers and their roles

Level of training animal health worker	**Possible roles as per level of training**
Community animal health worker (CAHW)	Hygiene, non-invasive operations like deworming, surface surgical operations like castrations Reports to the area husbandry offer or veterinary officer
Animal husbandry officer/veterinary assistants.	Farm design, animal husbandry, advise on feeding, disease diagnosis and treatment of disease Reports to area veterinary officer
Veterinary officer	Farm design, husbandry, disease diagnosis, disease treatment, can institute disease control measures in the area Reports to the local administrative authorities like the district veterinary officer
District veterinary officer (DVO)	Carries out confirmation studies of disease outbreaks Reports to commissioner of animal health for effective control of disease Institutes quarantine in affected areas

11.2 Finding and identifying qualified veterinarians

Objective: To make the participants learn how to get the proper veterinary services.

Facilitator: Ask the participants to mention how they know where to seek veterinary services from.

One participant lists down the responses.

Facilitator: Discuss the responses in integral with the points below (use illustrations, pictures, photos, and animations where possible).

- Ask a friend already in pig farming to direct you to the veterinarian they use who is of proven service and trusted.
- If in a pig farming group, let the group look for one veterinarian from the veterinary offices.
- Visit the physical address of the veterinarian to ascertain the authenticity of their veterinary practice.
- Ask for their certificate of practice and qualifications. These are supposed to be visible on the walls of the offices of the veterinarian.
- Ask for the range of services they can offer. Usually veterinarians specialize and refer what they cannot handle well to their friends who are specialized.
- Ask for educational materials from their practice.
- Ask if they are a member of any professional body (e.g. the Uganda Veterinary Association).

11.3 Identifying fake animal health workers

Objective: To make participants able to identify untrained persons who try to do what they are not trained to do and end up giving wrong services to the pig enterprises.

Facilitator: Ask the participants to name how they can identify a fake animal health worker/veterinarian.

One participant lists down the responses.

Facilitator: Discuss their responses and emphasize the points below (use illustrations, pictures, photos, and animations where possible)

- Usually does not have a physical address.
- Very quick to give discounts and makes the prices low and attractive.
- Never leaves a record of service, no receipts for services paid for.
- Does not have a legal registration.
- Services in all parts of the veterinary field with no speciality. Whatever service is needed; they are ready to offer, which indicates likelihood of gambling in offering treatment/services.
- Does not display registration certificates.
- The person is not member to any professional organization.

12. Drug management and drug resistance in pig production

Objective: To help participants know where to get drugs, how to manage drugs on their farms, and how to avoid practices that can lead to drug resistance on the farm.

12.1 Where to get good drugs

Facilitator: Ask the participants to name where they get veterinary drugs, and how they use them on their pig farms.

One participant lists down the responses.

Facilitator: Discuss the responses and explain why you encourage or discourage any of the sources. Conclude by emphasizing the points below (use illustrations, pictures, photos, and animations where possible)

- Use only points of sale approved by the drug authorities, including the following:
    - Registered drug shops/pharmacies.
    - Veterinary offices.
    - Registered non-governmental organizations.
    - Registered community animal health workers.
    - Registered stockists.

12.2 Preventing drug resistance in a pig farm

Objective: To make participants become aware that improper handling/use of drugs can result in infectious agents becoming resistant to the drugs and disease may linger on a farm leading to debility of pigs which results in poor performance of the pig farm.

Facilitator: Asks the participants who treats their animals.

One participant lists down all the responses.

Facilitator: Discuss the responses indicating what can lead to drug resistance and how to avoid it. Put emphasis on the points below (use illustrations, pictures, photos, and animations where possible).

- Giving insufficient doses of drugs. Underdosing does not kill the disease-causing germs in pigs but can change the germs' metabolism to resist the drug. Use appropriate weight estimating tools such as weight-band to calculate the right dosage during treatment.

- Wrong diagnosis. Will lead to giving wrong drugs hence the disease will intensify in the animal. Viral diseases cannot be cured with antibiotic drugs. Allow trained veterinary persons to carry out disease diagnosis and treatment.
- Poor storage of the drugs. This can lead to deterioration of the drug and by the time it is used, it has lost the effective power to kill the germs. Buy only the drug you need as some drugs need special conditions of storage which may not be available on the farm.
- If you have a farm store, stock only those drugs that are stable at room temperature. Avoid those that need strict stable refrigeration temperatures.

13. Biosecurity in pig production and trade

13.1 Biosecurity for disease prevention in a farm

Objective: To give participants the skills needed to practice measures that are used to prevent diseases from entering or leaving a farm.

Facilitator: Ask the participants to share their understanding of 'biosecurity'.

One participant lists down the responses.

Facilitator: Summarize and explain the responses. Conclude by emphasizing the paragraph below.

Biosecurity is a set of rules (policies) and actions that are put in place in a farm to prevent entry of infection and in the event that a disease outbreak occurs at the farm, the disease is contained to deter its spread to other farms. Proper biosecurity limits dissemination of diseases between pig units and pig farms, and between different geographical areas.

Biosecurity minimizes the occurrence of disease in pig herds, and when properly done biosecurity dramatically increases reproductive rates, growth rates, reduces loss due to deaths, reduces costs of pig farming hence increases the profitability of a pig enterprise.

13.2 Forms of biosecurity

Objective: To make the participants understand the responsibilities of the different actors in the pig production chain for proper/total achievement of biosecurity in the pig industry. To make the participants appreciate their wider responsibility/contribution in controlling and preventing pig diseases.

Facilitator: Give an exercise to demonstrate the movement of infection:

- From pig to pig in the same unit.
- From unit to unit within the same farm.
- From farm to farm within the same locality.
- From one geographical area to another.

Using an inert powder representing infection. The spread of infection can be demonstrated as follows.

a) In-pen infections; some participants in a group put the powder on their hands. They shake hands with members who have no powder. The powder stains the hands of all who shake hands.

b) Between pen infections; one member moves from one group and stains the hand of a member of another group.

c) Between farms; one member moves out of the training room and stains any object the find outside the room.

Facilitator: Summarize the contamination types using drawings, animations or video to illustrate and give the categories of biosecurity below.

- **Bioexclusion** is the total prevention of entry of disease to a farm. It also involves total prevention of entry of disease into a given geographical area.
- **Biocontainment** is where disease has happened on a farm and action is taken to prevent spread of the disease to other farms. It also involves prevention of long-distance transfer of disease from infected geographical area to other localities. It is achieved by involving the participation of the consumers.
- **Biomanagement** is the combined effort at the farm-level to control endemic diseases on the farm to avoid negative impact which can affect the farm's economic viability.

13.3 Entry of disease in an area, farm, or pen

Objective: To make the participants understand the factors that can introduce infectious diseases in pig herd, pens, farms and geographical areas. To make the participants learn to avoid these entry point for the execution of proper biosecurity.

Facilitator: Ask the participants to name the possible factors/entry points for disease into their farms.

One participant lists down the responses.

Facilitator: Discuss the responses and explain each of the points given below (use illustrations, pictures, animations, or videos, where possible).

Factors that easily aid disease outbreak on a pig farm.

- Village/community boars that may be subclinically infected and may act as effective transmitters of diseases. If village boars are to be used, regard a village/group of farmers as one multi-site-production farm, and allow only the same group of farms to use a particular boar, and allow no entry of other sows.
- An infected pig meeting/mixing with healthy pigs.
- Illegal importation of infected pigs or products like meat into the pig facility.
- Improper disposal of infected animal products such as excreta, meat, and faeces.
- Improper screening of semen for infectious disease before use for insemination on a farm.
- Contaminated persons and their clothing let into the pig facility without disinfection/sterilization or without protective clothing.
- Irresponsible veterinary personnel using non-disinfected equipment from farm to farm.
- Allowing transport vehicles from other farms into pig facility without proper disinfections.
- Contaminated feed and water.
- Adding new pigs to farm without proper quarantine to ensure that the new entrants are disease free.
- Failing to quarantine for adequate time. It is proper to quarantine (for between 30–60 days).
- Failure to test for certain diseases prior to addition of new stock to the farm or unit (where possible tests should be carried out to exclude disease-carrier pigs).

- Failing to vaccinate prior to addition of the new stock.
- Allowing pigs to return from trade points where they had contact with other pigs after failure to sell and letting them mix with farm pigs without quarantine.
- Feeding untreated swill/human kitchen refuse to pigs.
- Poor vermin (insects and wildlife) control on the farm as these are vectors of many disease agents.

13.4 Practical biosecurity measures to limit spread of diseases

Quarantine

Objective: To make participants appreciate the importance of isolation of suspect and sick pigs in the prevention/ control of infectious diseases in pigs.

Facilitator: Ask the participants what they do in their farms if they suspect a certain pig or new entrant pig is sick.

One participant lists down the responses.

Facilitator: Summarize the responses and allows discussion of each response. Facilitator introduces the idea of quarantine.

Facilitator: Ask the participants to mention factors to consider when a farmer is to construct a quarantine unit on a farm.

One participant lists down the responses.

Facilitator: Summarize and discuss the responses. Explain the points below using illustrations, pictures, or animations, where possible.

- Quarantine unit should be far from the normal/daily access route to the farm.
- Quarantine unit should be separated from the rest of the units, to limit disease spread, and separate equipment, feed, protective workwear should be used in the unit.
- It should be placed at the animal loading point located away from daily access route of the farm.

Facilitator: Inform the participants of pigs that are candidates for quarantine and those to come out of the quarantine. (Use illustrations, picture/photo or animations/videos where possible).

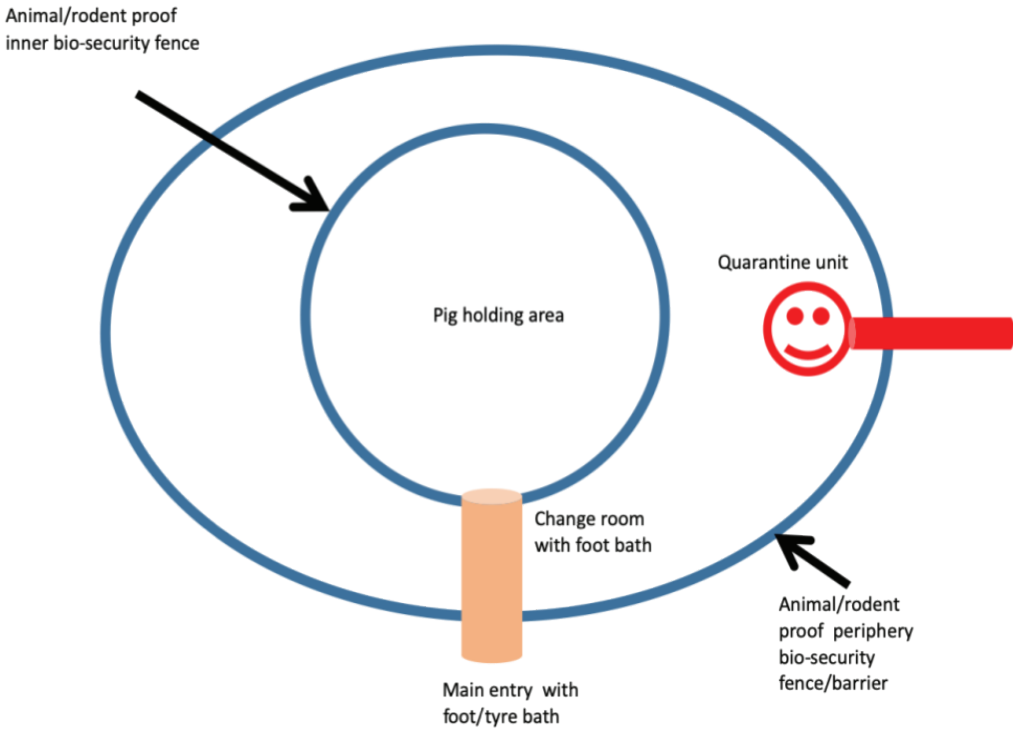
1) Pigs which are candidates for quarantine:

- New pigs procured from other farmers.
- Pigs that have been taken to market but were not sold.
- Pigs that escape from the units, once recovered, should be treated as the new entrants.

2) Pigs that come out of quarantine:

- If found to have no threat; allow them into the main herd.
- If found with treatable disease; refer them for veterinary attention.
- If found with a sickness that not easy to treat; reject and condemn them.

Sketch plan of a biosecure pig farm



Credit: Nsadha Zachary, Makerere University

Structures for enhancing biosecurity in a pig farm

Objective: To equip the participants with knowledge on proper structures for execution of biosecurity on a farm.

Exclusion structures on a farm

Facilitator: Ask the participants to list the measures they use to prevent pigs from outside from coming into contact with their pigs.

One participant lists down the responses.

Facilitator: Discuss the responses and explain the points below (use illustrations pictures and animations were possible).

- A secure pig-proof fence should be erected around the piggery to prevent feral animals and roaming pigs from getting into contact with the farm pigs.
- Have a pig-proof gate for easy closure on farm entry and exist.
- Limit cattle and other ruminants from feed near piggery as these share pathogens with pigs (e.g. foot-and-mouth disease).
- Put in place a good rodent control/prevention plan. Improper carcass disposal and spillage of feeds attract vermin.
- Have a well-designed quarantine unit.

13.5 Controlled human access to the farm units

Objective: To make the participant learn to set rules/policies that prevent introduction of infectious diseases into a farm by human beings.

Facilitator: Ask the participants to list the controlled access practices they have on their farms.

One participant lists down the responses.

Facilitator: Discuss the responses. Explain the points below for clarification (with the aid of pictures, animations, videos, etc. where possible).

- Preschedule farm visitors for good preparations/proper handling to enforce biosecurity.
- All visitors and farm workers should enter the pig farm at one point; this is where visitors/workers get protection wear to be used in the piggery only.
- Have areas well demarcated 'clean' and 'dirty' so that persons moving in the farm know when and where to change into protective wear.
- Set up a proper footbath for disinfection of human feet/footwear before entry into the farm premises.

Foot bath at the entry of farm premises (credit: FAO.org)

- Put up handwashing points with human skin friendly disinfectant.
- A sign with 'restricted entry' may be placed at the entry gate. Gate control system be put in place.
- Load area must be at the perimeter of the farm and access should not be the normal/ regular access route.
- Trust no vehicle as they pick germs as they traverse the roads and pick up aerosols from the pigs which may have pathogens.
- All vehicles that enter the farm should be cleaned to remove all organic matter and then driven through a disinfection bath where the diameter of the tyres depth goes through the bath in two revolutions of the tire before existing the tire bath. Where possible all loading, and offloading should be carried outside the premises of the pig farm.
- Properly clean and disinfect vehicles before loading pigs and at offloading of pigs.
- Practice a 'no return policy' once the pig has been loaded onto a vehicle.

13.6 Measures by staff for proper biosecurity in a pig farm

Objective: To make the participants realize that biosecurity is achieved if the staff mindset is oriented toward the practices that constitute biosecurity measures.

Activities of pig farm staff

Facilitator: Ask the participants to list the measures put in place for the farm staff to enforce biosecurity on their farms.

One participant lists down the responses.

Facilitator: Discuss the responses. In detail, explain the points below (using illustrations pictures, photos, and animations where possible).

- Regular education of staff about the risk of 'offsite contact' with infected pigs or materials.
- Discourage staff from attending to other pigs outside the piggery.
- Any staff who has moved out of the piggery should be treated as the policy treats visitors.
- Staff should adhere to wearing the right attire at the right place and right time in the piggery.
- Proper movement of staff between units to be planned in respect to the health of units.
- The affected unit is attended to last and all disinfection must be done on the attire before the staff leaves the unit.
- In multi-stage piggeries, staff move from the young pigs to the old.
- Staff wash/disinfect hands between units and after handling sick pig.
- In case of contamination of clothing, staff should change to clean clothing before going to another unit.
- Management to train personnel to detect sick pigs by observing unusual signs/behaviour.
- Staff to be given obligation (it should be mandatory for them) to report any undesired or unexpected things happening to the pigs/in piggery (e.g. finding pieces of food/meat).
- Proper identification of all the units/pens in the piggery.
- Identification of all the pigs for easy health recording.
- Maintain mortality records and ensure conclusive diagnosis is carried out to establish cause of death.
- Seek veterinary guidance early in event of suspicion of bad health in the herd.

13.7 Daily management activities on the farm for biosecurity

Management of equipment/utensils

Objective: To equip the participants with skills of managing equipment on pig farm for proper biosecurity.

- All the items used in the piggery should be identified and where possible each unit assigned its items that are used only in that unit.
- Cleaning and disinfection must be mandatory before and after use of any equipment.

- Post-mortem equipment remains off-farm before it is properly cleaned and disinfected.
- Employ the approved disposal methods for the all effluent, carcasses, excreta and other biological materials on the farm.

General security management

Facilitator: Ask the participants to come up with rules or policies for biosecurity on their farms.

One participant lists down the responses.

Facilitator: Engage the participants to summarize their responses and integrate with the rules below.

- Restricted entry to all visitors, family and record of visitors taken.
- Put up posters/signposts for different areas (e.g. 'no entry,' 'staff only,' 'wait here').
- Never allow non-disinfected persons/vehicles entry into the farm.
- Disinfection foot/tire baths be placed where there occurs movement from one unit to another or from farm or into the farm. Where possible, vehicles should not be allowed into the premises. Loading and offloading to be carried just outside the piggery premises.
- Isolation of new pigs and pigs recovered after escape.
- Control traders. No vehicles should be allowed into the piggery premises. They should only access the loading area which is usually at the periphery of the farm away from the daily access road.
- Daily cleaning of the piggery.
- Use only equipment belonging to the farm, do not use equipment from other farms.
- Have disinfection footbath points for all workers and visitors where changing of wear is carried out.
- Never give uncooked swill feed to pigs. Boil it on the farm before using it.

Facilitator: Make concluding remarks by reading the information below as a sum up of the session.

> Biosecurity on a farm is embedded in all players in the pig farm right from the proprietor to all staff who must clearly understand the total collection of the possible dangers that can happen to the pigs if care is ignored.
>
> *Biosecurity is a mindset. The more developed the mindset in all the players in the farm about risk of infection, the less the risk to the pig farming and the more profitable it will be* (Delabbio 2006).

14. Biosecurity measures when transporting pigs

Objective: To equip the participants/transporters with the skill/knowledge of biosecurity and make them know the role they can play in controlling spread of diseases when transporting pigs.

Facilitator: Ask the participants to share their understanding of biosecurity measures during transport of pigs.

One participant lists down the responses.

Facilitator: Discuss the responses.

14.1 Points/areas of contamination when transporting pigs

Facilitator: Ask participants to tell the importance of biosecurity to pig transporters.

One participant lists down the responses.

Facilitator: Discuss the responses and conclude with the statements below.

- Biosecurity during transport of pigs is a set of rules and policies which spell the practical measures carried out to prevent spread of infectious disease from farm to farm and from one geographical area to another by the transporters of pigs.
- Biosecurity minimizes the disease occurrence in pig herds which dramatically increases the pig population, which is a stimulus for better pig trade resulting in more pig-transport business for the transporters hence better profits for the whole pig industry.

Facilitator: Ask the participants how transporters can get the infectious agents to spread.

One participant lists down the responses.

Facilitator: Discuss the responses given by the participants. Explain the points below to the participants for clarification (use illustrations e.g. photos, pictures and animations where possible).

Possible points of disease contamination for disease spread during transport.

- Exposure to other pigs/animals.
- Exposure to carcasses.
- Exposure to rodents.

- Contact with contaminated manure, body fluids or aerosols.
- Contact with contaminated trucks, equipment or people.

14.2 Biosecurity measures when transporting pigs

Objective: To make the pig transporters understand the measures and practices carried out for effective biosecurity during transport of the pigs.

Facilitator: Ask the participants to mention the major focal operational activities during their business of pig transportation to prevent contamination of truck/animals on truck.

One participant lists down the responses.

Facilitator: Discuss the responses. Explain the points below for clarification about contamination during transport of pigs (Beltran-Alcrudo et al 2019). Use illustrations (e.g. pictures, photos, and animations).

Contamination of trucks and animals on truck can occur during:

- Loading
- Transit
- Offloading
- Carcass handling

14.3 Preventing spread of diseases during transport of pigs

Facilitator: Ask the participants what they perceive can be done to stop spread of diseases during transportation of pigs.

One participant lists down the responses.

Facilitator: Discuss the responses. Explain the points below for better clarification of effective biosecurity during transport of pigs. Use illustrations (e.g. pictures, photos, and animations).

- Clean and disinfect truck with compatible effective agents to kill pathogens and remove all organic matter before and after loading pigs.
- Avoid contact of the truck/pigs on the truck with other trucks/animals not destined for transportation.
- Transport pigs of equal health status.
- At rest stops in transit, park far away from other trucks and animals.
- Designate to a truck easy-to-clean equipment for use in the loading and offloading of pigs.
- Always clean and disinfect hands after handling pigs, equipment or other animals.
- Personnel in handling should put on designated wear, which should be easy-to-clean and disinfect.
- Persons not directly involved in handling pigs should not come into contact with the truck, pigs and equipment.
- Use bedding which is clean and free from contaminants only once in transportation.

- Clean and disinfect yourselves before you enter the truck after loading or offloading pigs.
- Respect all the biosecurity signs at point of travel or entry.
- Follow all the farm biosecurity protocols for the departure and arrival at the loading and at offloading sites. Do not cross any biosecurity barrier without following the prescribed protocols.
- If there is an identified disease along a certain route of movement, avoid such routes.
- Transporter should be aware of the signs of disease for them to be able to detect disease during transit.

14.4 Handling of dead animals during transit

Objective: To make the transporters understand the risk posed by the dead animal to the pigs on truck, the environment, the persons, driver on the truck, and farms etc. To equip the transporters with skills of handling a dead pig in transit.

Facilitator: Ask the participants what the impact of a dead animal on the truck is.

One participant lists down the responses.

Facilitator: Discuss the responses. Inform the participants that what has killed a pig can spread to other pigs on the truck, humans, and environment around pig farms (using illustrations, photos or animations)

Facilitator: Ask the participants to mention what they do to dead animals in transit.

One participant lists down the responses.

Facilitator: Discuss the responses. Explain the points below for clarification about handling of dead pigs during transport (use illustrations pictures, photos, and animations).

- Put the dead animal in water-tight container which does not allow dripping/seeping of any fluids onto the truck and from the truck onto the road.
- Do not remove such animals from the container until the place of disposal.
- Properly clean and disinfect the container.

15. Biosecurity at pig slaughter places

Objective: To equip the slaughter staff and management with skills of biosecurity and to make them comprehend the role and potential the slaughter area and its staff have in aiding or stopping spread of diseases to pigs, the environment and humans.

15.1 Awareness about diseases of pigs among the slaughter place staff

Facilitator: Ask the participants to name any diseases of pigs they know.

One participant lists down the responses.

Facilitator: Discuss the responses and emphasize the important diseases of pigs.

Facilitator: Ask the participants what they understand by zoonotic, contagious and non-contagious diseases.

One participant lists down the responses in tabular form.

Facilitator: Discusses the responses.

(With the aid of illustrations/pictures, photos, and animations etc.)

Facilitator: Explain the meaning of the terms 'zoonotic,' 'contagious' and 'non-contagious' diseases giving examples of each. Conclude by informing the participants to cultivate/develop a mindset that emphasizes proper care during handling of pigs, pork, and effluent. This is because slaughter-place staff are potential carriers of disease agents. Where need arises, the management need to enforce rules for biosecurity.

15.2 Areas of contamination of pigs/pork and their elimination from the slaughter place

Objective: To make the slaughter-place staff know possible areas of disease contamination and how to eliminate them for enhancement of biosecurity at the slaughter place.

Facilitator: Ask the participants to name factors/activities of possible contamination.

One participant lists down the responses.

Facilitator: Discuss the responses. Explain the points below for better understanding of contamination at slaughter place (using illustrations pictures, photos, and animations etc.).

- The slaughter place must be able to drain properly to limit dampness of the area.
- Adequate water supply is needed for easy cleaning of the facility.
- It should have adequate separation of live animals and slaughtered pigs.
- Slaughter-places should be free of rodents, carnivores, birds, pests, and free-range poultry.
- Have a closed/covered soak pit for drainage of all effluent from the slaughter facility. All solid materials like the offal should be destroyed in incinerator or buried under lime.
- Cleaning and disinfection at the dirty points before moving to clean change points for the staff to put on protective wear.
- Cleaning and disinfection of vehicles at the particular barrier points.
- Sterilization point for all equipment used.

15.3 Handling pigs at slaughter place before slaughter

Objective: To make the participants learn skills of handling pigs for proper biosecurity and decent animal welfare at a slaughter place.

Facilitator: Ask the participants to mention what they do to the pigs on arrival (ante-mortem).

One participant lists down the responses.

Facilitator: Allow discussion of the responses by the participants.

Facilitator: Explain the handling of pigs especially where the idea has not been mentioned or explained well by the participants by using the points below (use illustrations, pictures, photos, and animations etc.).

- All pigs must be clearly identified right at entry and clearly traced to places of origin by use of the transport permits submitted to the slaughter facility authorities. Identifications be maintained on all carcasses and other parts from the pig from slaughter to end of all meat inspections.
- Pigs are sensitive creatures and should be handled in a decent way at all occasions, in connection with slaughter.
- All pigs must be allowed to rest on arrival in an area with good spacing and well protected from bad weather.
- Clearly use the same identification for all the parts removed from the pigs (head, offal).
- Ante-mortem inspection for each pig be carried out by a person with adequate knowledge of the physiological, clinical and pathological presentations of a pig.
- Clean pigs before slaughter to reduce potential danger to the hygiene of the place, the animals, and microbial contamination of the meat at slaughter.
- Pigs showing ill-health be separated immediately from the rest and handled in a special hygiene compartment. Slaughter of such a pig should be under the supervision of a trained veterinary person.

Facilitator: Ask the participants to develop a data capture form to be used as checklist in ante-mortem inspection.

Facilitator: Display a sample of data capture form used in other animal slaughter places.

Facilitator: Train participants on how to categorize the pigs ante-mortem using the data captured on the form.

15.4 Ante-mortem card will be developed for the indicators of ill health the inspector will look for

Table 11: Ante-mortem inspection card

Ante-mortem inspection card					
ID no.	**Indicator(parameter of interest among which are the ones below)**	**Ante-mortem findings**	**Differential diagnosis**	**Suspect (to be diseases)**	**Opinion (what action)**
	Breathing				
	Behaviour				
	Posture				
	Abnormal secretions, swellings, inflammations				

15.5 Categories of pigs before slaughter

Objective: To equip the participants with the skills of putting pigs in the right groups ante-mortem for specific actions.

Direct to slaughter

- Emergency slaughter (injured pigs)
- Suspect cases (put in special hygiene area)
- Rejected pigs (public health risk is high)
- Disease need immediate reporting to the authorities (notifiable diseases)

15.6 Practices of handling pigs during slaughter

Objective: To make the participants learn skills of good and humane handling of pigs during slaughter to produce safe/ clean pork that is acceptable in the human food chain.

Facilitator: Ask the participants to mention how pigs are handled right from isolating it from the rest of the herd to the point of having pork ready for dispatch to butcheries.

One participant lists down the responses and discussion is allowed.

Facilitator: With the aid of illustrations (e.g. pictures, photos, animations etc.) explain the responses. Explain the points below as a sum up of the ideas of handling pigs at slaughter facility.

- Only clean pigs should be allowed for slaughter as skin and hair carry a lot of organic matter which contains microbes capable of compromising biosecurity (never slaughter/open a dirty pig).
- Handle the pigs with care and respect at stunning. Keep live pigs away from the stunning/slaughter place.
- Digestive system contents should not be allowed to spill onto the meat as many microbes are found in the gastrointestinal tract of pigs. Tie off the esophagus and the rectum.

- Care must be taken not to allow urine and milk to spill on meat.
- Infected tissue or pus must not be allowed to spill on or touch meat.
- Do not scrape or wipe away pus or dead tissue with knife. Cut the part off from the unaffected area.
- Avoid putting together carcasses before all are passed fit for human consumption.
- There should be uniform identification for all parts removed from the same pig.
- Clean and sterilize all equipment used at every station between each pig/carcass.
- Suspected sick pigs should be handled in a special hygiene area of the slaughter facility.
- Never allow any pork out of slaughter place without certification by meat inspectors.
- Report any disease observed at slaughter to the relevant authorities.

15.7 Slaughter waste handling

Objective: To make participants learn the skills of refuse/effluent handling and appreciate the dangers of poor effluent/ condemned meat disposal in the slaughter place.

Facilitator: Ask about the negative impact of improper disposal of slaughter waste and condemned pig materials.

One participant lists the responses.

Facilitator: Allow the list to be discussed by the participants guided by the facilitator (use illustration; pictures, and animations).

15.8 Management of slaughter place effluent and condemned parts

Facilitator: Ask the participants to mention what can be done to manage slaughter place effluent and condemned pig materials.

One participant lists down the responses.

Facilitator: Discuss the responses. Explain the points below for clarification of management of effluent and condemned parts in a slaughter place.

- The slaughter place should be free of birds, rodents, poultry, dogs, cats and other vermin.
- All condemned parts should be put in a well secured container and the slaughter facility supervisor should make sure the contents of the container are denatured.
- Container must be easy to clean, made from crack-resistant material, and labeled with red block letters ‘condemned’ and have a firm lock structure on it.
- Train staff about application of layered chemicals to neutralize the pathogens.
- Burn if the slaughter place has incinerator (very difficult for water-laden offal).
- Burry condemned parts deep (if when shallow, scavengers can dig it up).
- Make compost (very labour intensive).

16. Biosecurity in pork butcheries and pork joints

Objective: To make butchery staff acquire skills of biosecurity to enable them protect butchery/pork joint personnel, consumers and environment by avoiding contamination of pork, implements and surfaces in the butchery.

Facilitator: Ask the participants the bad things that can happen to handlers, consumers and environment from meat.

One participant lists down the responses and facilitator allows discussion and explanation of the points developed.

Facilitator: Conclude the exercise by giving the statements below and explaining each with the aid of illustrations (pictures, photos and animations etc.).

- You cannot see harmful bacteria and viruses with the naked eye.
- At any time, handle everything in the butchery cautiously as if it contains/has harmful organisms.
- Some of the organisms can cause disease to the pork handlers (occupational hazards).
- Poorly handled and inadequately cooked pork can make consumers sick.
- Poor handling of pork can lead to contamination of the environment.

16.1 Biosecurity practices in a butchery and pork joint

Objective: To make the participants learn skills for ensuring biosecurity in the butchery.

Facilitator: Ask the participants to give the biosecurity measures that are carried out at butcheries.

One participant lists down the responses developed.

Facilitator: Discuss the responses. Using illustrations (pictures, photos, animations), explain the points below.

Cleanliness

The entire butchery environment must be kept clean as below:

- Wash hands before and after handling pork.
- Clean the knives, cutting boards, utensils with hot soapy water after exposure to raw pork.
- Items used for raw pork should not be put to any other use before proper cleaning and disinfection to avoid cross-contamination.

- Segregate utensils for pork from other foods, especially those that are eaten uncooked.

Handling of pork

Pork must be handled with care as follows:

- Do not overexpose pork out of storage facility to unstable temperatures for long, which lead to spoilage and possibilities of contamination.
- Put pork in fluid-proof containers/bags so that drips or leakages do not contaminate other items/surfaces/food.
- Pork that is not ready for use should be refrigerated.
- At no time should uncooked pork come into contact with cooked pork or other cooked or uncooked foods.

Cooking of pork

Follow the following guidelines when cooking pork:

- Make small cuts/pieces that can be cooked thoroughly and in a relatively short time.
- Meat should be cooked long enough to have no redness in the centre of the pieces of pork.
- If using temperature-controlled cooking device, cook to no less than 145–165°F (65–75°C) for minimum of 45 minutes and not more than 50 minutes

Storage of pork

To keep pork free of contaminants and prevent it contaminating the environment:

- Keep the pork in leak-proof containers.
- Keep at temperature that does not allow bacterial growth <40°F (4°C).
- Do not keep pork at room temperature for more than two hours.
- Wrap up the pork to prevent drying.
- Wrap and store in small sizes to be used once to minimize multiple handling.

Sanitation

To keep the butchery free of pathogens

- Clean the processing surfaces and sanitize them.
- Ensure surfaces are dry with no sanitizer residues.
- Cutting board should be cleaned and allowed to air-dry after each use.

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