



RESEARCH
PROGRAM ON
Livestock and Fish

Parasite control in pigs: Uganda smallholder pig value chain capacity development training manual



European Union



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Investing in rural people

Parasite control in pigs:

Uganda smallholder pig value chain capacity development training manual

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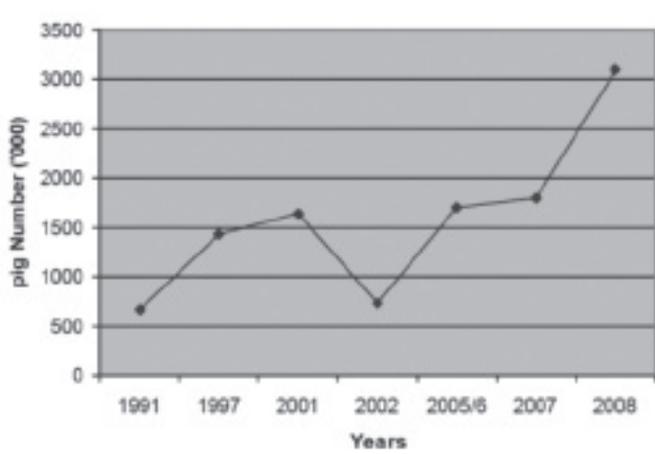
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Introduction

Pork production and consumption have risen rapidly in Uganda over the past decade, driven by population growth, urbanization, increasing incomes, and changing tastes. In 2011, Uganda had the highest per capita consumption of pork in East Africa (3.4 kg/person per year).

The number of pigs has increased more than tenfold from less than 200,000 three decades ago to roughly 2.3 million. More than 1 million households in Uganda raise those pigs. The majority of the pigs are kept by women in rural areas, with limited access to technology, services and markets.¹

Figure 1. Trends (000) in the number of pigs in Uganda, 1991–2008.



Source: National Livestock Census Report (2008).

The CGIAR Research Program on Livestock and Fish,² led by the International Livestock Research Institute, started the Smallholder Pig Value Chain Development Project to improve the livelihoods of smallholder pig producers, particularly women, through increased productivity, reduced risk from disease, and improved market access.

A key activity of the project is to enhance the capacity of women and men pig producers, and help them transform subsistence-level pig-keeping into viable, profitable businesses. A companion project, 'Safe Food, Fair Food', under the CGIAR Research Program on Agriculture for Nutrition and Health,³ is working to improve pork safety and market access. These efforts, in turn, should enhance food security, help preserve natural resources and reduce poverty. Poverty in Uganda currently stands at 37.8% (people living on less than USD 1.25/day).

This training modules are targeted to extension workers, veterinarians and para-veterinarians, and policy makers responsible for animal disease surveillance and control and for livestock market development and regulation. Improved knowledge should help provide incentive for decision-makers to help poor pig farmers, and promote the sector.

1. Find ILRI pig value chain assessment slide share presentations here: <http://slidesha.re/11oJJPX>

2. CGIAR Research Program on Livestock and Fish, <http://livestockfish.cgiar.org/>

3. Learn more about the program here: <http://www.ilri.org/crp4>

Others who may benefit from the training modular content include suppliers, pig producer organizations, transporters, and entrepreneurs involved in the sale of live animals, pork and other pork products.

Project partners involved in the design and review of the modules included the National Livestock Resources Research Institute, Uganda's Ministry of Agriculture Animal Industry and Fisheries, the National Agricultural Advisory Services, Kamuli, Masaka and Mukono districts government officials, Makerere University, NGOs such as Volunteer Efforts for Development Concern and Veterinarians Without Borders USA, BRAC, SNV and representatives of the private sector.

ILRI has also developed training modules on pig management, control of African swine fever, feeding strategies, business planning, and marketing to help develop the capacity of farmers.

While designing the modules a process has been facilitated with research and development partners to practice the delivery of the packages.⁴

4. Learn more here: <http://www.slideshare.net/ILRI/capacity-development-in-the-uganda-smallholder-pig-value-chain-development>

Expected outcomes

This module is designed to enhance farmers' knowledge and skills to effectively control parasites to improve productivity of their farm. It is envisaged that the knowledge and skills gained will foster a commitment by farmers to control the parasites in their herds effectively. For example, the module includes activities to learn such preventive measures as washing, spraying and sanitation. The training course is expected to help mitigate the effects of parasites on herd health and hence improve the income of the farmers, including women involved in smallholder pig rearing.

Upon successful completion of the module, the farmers should be able to:

- Understand how parasites are transmitted to pigs;
- Identify sick pigs due to parasite infestations;
- Apply preventive measures to reduce parasite levels;
- Understand treatment regimes for common parasite infestation cases in Uganda.

Training methods

The module includes group discussions, exercises, practical demonstrations, illustrations (such as life cycles of parasites), specimens and multimedia presentations. It is geared to all farm production systems: extensive, semi-extensive and intensive systems.

Proposed training schedule

Opening

Session 1: Pig parasites (about two hours)

- Introductions: name game
- Objectives
- Case story
- Pig parasites
- Internal and external parasites
- Location of parasites
- Exercise 1: how to identify parasites
- Effect of parasites on the pig
- Discussion and analysis

Session 2: How parasites are transmitted to pigs (40 minutes)

- Objectives
- Overview of parasite development
- Exercise 2: current farmer practices
- Recommended management practices
- Discussion and analysis

Session 3: Parasite management (1 hour, 20 minutes)

- Objectives
- Parasite control measures

- Practical demonstration (3 stations)
- Discussion and analysis

Closing

Tools and materials (prepare in advance)

Ring binder for each participant containing a hard copy of the following:

- Outline of the training program
- Training handouts (see below)

Pig sty with mature pigs for practical exercise

Protective gear and equipment for practical exercises:

- Gloves
- Gum boots
- Overalls
- Scrubbing brushes
- Soap
- Water

Training aids/handouts

- Training Aid 1.1: Name game
- Training Aid 1.2: Case story
- Training Aid 1.3: Objectives of the training
- Training Aid 1.4: Video clip of worms in faeces
- Training Aid 1.5: Video clip of lice on pig skin
- Training Aid 1.6: Picture of parasite location
- Training Aid 2.1: Poster, charts or PowerPoint slides of life cycle of roundworms
- Training Aid 2.2: Poster, charts or PowerPoint slides of life cycle of pork tapeworm
- Training Aid 2.3: Poster, charts or PowerPoint slides of life cycle of ticks
- Training Aid 3.1: Pig sty with live animals: Protective gear (gloves, gum boots, overalls), drenching equipment, syringes, dewormers and acaricides.
- Training Aid 3.2: Pig sty with five mature pigs. Scrubbing brushes, soap, water.
- Training Aid 3.3: Poster on tapeworm control.
- Training Aid 3.4: Picture of cysts in live pigs and pork.

Background

Parasites are considered endemic in the pigs in Uganda, resulting in low pig productivity and profitability among smallholder systems, according to an ILRI assessment⁵ in 2013. A more indepth assessment using laboratory methods indicated the existence of worms and external parasites including mites, lice, ticks and biting flies in pigs. Insufficient knowledge, low health-management skills and poor husbandry practices have been identified as the principal factors contributing to the problem.

5. Ouma et al. (2014).

Session 1: Pig parasites

Objective: Help farmers learn how to identify pig parasites and understand their effects

Tools and materials:

- Ring binder for each participant containing a hard copy of the following:
- Outline of the training program
- Training handouts

Training Aids:

- Training Aid 1.1: Name game
- Training Aid 1.2: Case story
- Training Aid 1.3: Objectives of the training
- Training Aid 1.4: Video clip of worms in faeces
- Training Aid 1.5: Video clip of lice on pig's skin
- Training Aid 1.6: Picture of parasite location
- Training Aid 1.7: Slides of pig parasites

Introduction: name game (20 minutes)

Invite each participant to introduce themselves for 1–2 minutes each in the following way:

- Name game: each participant gives her/his name and what s/he would like to be called during the training.
- Pig enterprise: each participant mentions the type of pigs kept, how he or she keeps them and two major expectations from the training.
- Group the expectations, write them on cards and pin them in the room for a group analysis and discussion about the objectives of the training.

When all the participants have had their turn, complete the exercise as follows:

- Thank the participants for their personal introduction to the group.
- Speak positively about their experiences in pig farming.

- Indicate that there are differences in levels of knowledge and that is why the training is being done.
- Tell them that the training is relevant to men, women and the youth involved in pig farming.

Case story: what makes pig farming more profitable (20 minutes)

Tell the story of Farmer A and Farmer B, who went for training in pig management. Farmer A was attentive and participated in all activities during the training. Farmer B was always leaving the room, attending to telephone calls and didn't participate in some of the training activities. After the training, they went back home. I visited them six months later. I found Farmer A very happy. She told me that because of the training she had changed the way she looked after her pig. She cleaned the pig house daily, gave the pig good feed and kept the pig in a clean place. She had sold the pig and made money. She was going to buy another pig of a better breed. I found that Farmer B hadn't sold his pig. His pig was small and in poor condition.

Ask the farmers what they have learnt from this story.

Pig parasites (20 minutes)

Objective: to help the participant understand what a parasite is by giving examples of how they live with their hosts.

Explain to the group:

There are different ways living creatures exist together. In some cases, they stay together for their mutual benefit, like a guard dog that watches over the farmers' animal flock and in return gets food from the farmer. Another example is the ox pecker that feeds exclusively on the back of big mammals like the buffalo. It eats ticks and other insects and helps the buffalo reduce the number of external parasites. None of the two has a disadvantage in the relationship.

A parasite on the other hand is an organism that lives in or on another organism (called the host) and gets its food from or at the expense of its host. The host could be an animal but also can be humans. This relation is one-sided because only the parasite benefits while the host gets weaker. Normally, the parasite doesn't want to kill the host because it depends on it for survival, but it can cause disease in its host.

Some parasites live inside the host's body such as in the intestines; they are called internal parasites. Others live outside the host's body; they are called external parasites.

Discuss and show some of the common pig parasites found in Uganda:

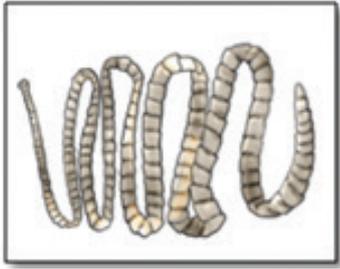
Emphasis that some worms cannot be seen by the naked eye, and that parasites depend on the host for their survival and they cause harm to the host (pig)

Internal parasites:

- Threadworms (*Strongyloides*)
- Large roundworms (*Ascarides*)
- Lungworms (*Metastrongylus*)
- Whipworms (*Trichuris*)
- Tapeworms (*Taenia* cysts in meat)
- Muscle worms (*Trichinella*)
- Trypanosomes (*Trypanosoma* sp.)
- Stable flies

Show some pictures of worms

Use the example of the tapeworm



Tapeworms are flat and long, ribbon-like creatures without a digestive system. They absorb food through their skin. The adult worms are found in humans, the final host.



This is how tapeworm cysts look in pigs:

Credit: A. Lee Willingham III, WHO/FAO Collaborating Center for Neglected Parasitic Zoonoses, University of Copenhagen, Denmark.

The cysts are easy to see in pigs (they are about 1 cm in diameter); they are abnormal changes with white colour, located in the animal tissue (meat, organs and other body parts). They are usually seen at slaughtering. Cysts are a stage in the life cycle of a parasite.

External parasites

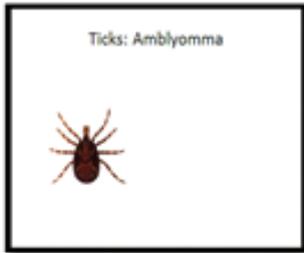
- Mites
- Lice
- Ticks
- Fleas
- Flies

Figure 2. Engorged (after feeding on pig) tick (3–4.5 mm).



Credit: ILRI/K. Roesel.

Figure 3. Adult tick may cause severe irritation and paralysis in pigs (2–5 mm).



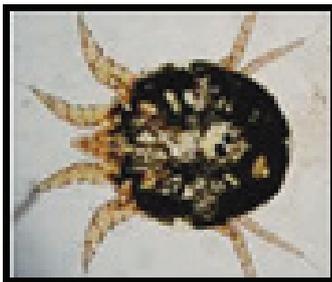
Credit: ILRI/K. Roesel.

Figure 4. Stable fly (*Stomoxys calcitrans*), 2–3.3 mm long.



Credit: Johannes Kaufmann.

Figure 5. Mite (*Sarcoptes* spp.), 0.3–0.5 mm.



Credit: Johannes Kaufmann.

Figure 6. Jigger (*Tunga penetrans*), 2–4 mm long.



Credit: Johannes Kaufmann.

Figure 7. Swine louse (*Haematopinus suis*), 5–6 mm long.



Credit: Johannes Kaufmann.

Explain the location of the parasites in or on the pig

Time: 10 minutes

Parasite	Site
Coccidia	Small intestines
Large round worms	Small intestines
Threadworm	Small intestines
Whipworm	Large intestines
Trypanosomes	Blood
Mites	Skin
Lice	Skin
Ticks	Skin
Fleas	Skin
Stable flies (kawawa)	Skin

Exercise 1: Identifying parasites

Show pictures and videos of the parasites and ask each participant to name them, and describe their locations in or outside the body of the pig.

Time: 20 minutes

Effects of pig parasites

Parasites have different effects in pigs depending on the type and the location on and in the pig's body.

Parasite	Clinical signs
Coccidia	Diarrhoea that can last for 10 days, mostly in suckling piglets
Large roundworms (<i>Ascarides</i>)	Liver damage, reduced performance
Threadworm (<i>Strongyloides</i> spp)	Diarrhoea
Whipworm (<i>Trichuris suis</i>)	Diarrhoea, vomiting, dehydration, mostly in piglets
Trypanosomiasis (<i>Nagana</i>)	In acute disease, after a short incubation period death occurs very rapidly. In chronic disease, the carcass is emaciated and often dehydrated (Causes sleeping sickness in human)
Mange	Itching rash, hair loss, thickened skin
Lice	Evident on the skin especially behind the ears, but no lesions
Ticks	Evident but no lesions (vector of African swine fever)
Fleas (jiggers)	Skin lesions
Biting flies (<i>Kawawa</i>)	Skin lesions, papules/wounds

Discussion and analysis

Time: 20 minutes

Ask the farmers how they can apply what they have learnt about parasites and their locations in/on the pig. How will this knowledge benefit pig farming?

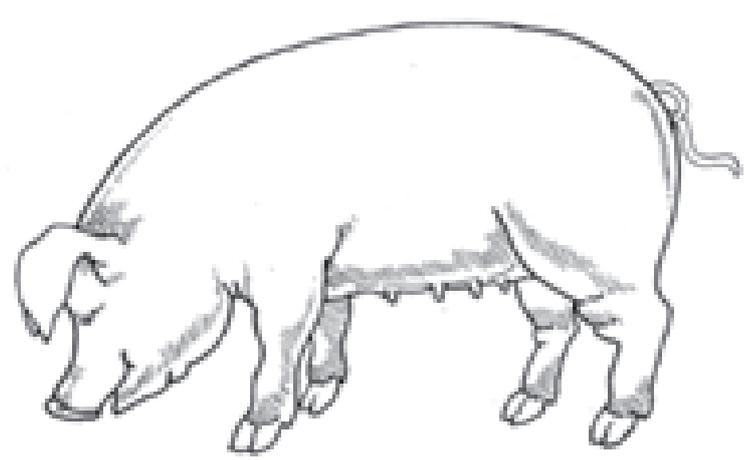
Tell the group that the damage caused by the parasites can be minimised if their numbers are reduced. The farmers have the task of eliminating the parasites, thereby reducing their effects. This increases the productivity of the enterprise.

Clinical signs: Emphasise that these clinical signs are not only seen when the pigs are infested by parasites, unless the parasites are physically seen. There are other pathogens which are not parasites that can lead to the same clinical signs. So the best is to always call a vet to help you take decision.

How to identify pigs infested by parasites

Objective: this section is designed to explain the physical effect caused by parasites through pictures and illustrations:

Figure 8. Appearance of a healthy pig.



Credit: NAADS manual, pig health and disease control.

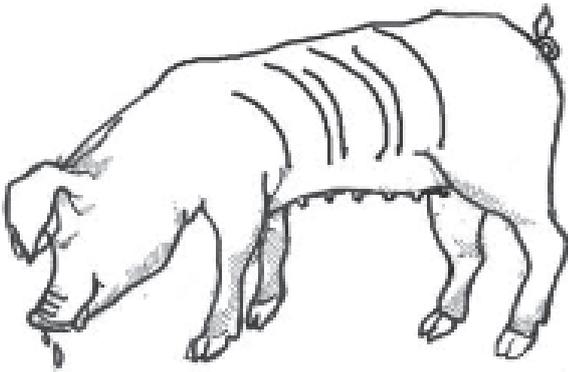
What does a healthy pig look like?

- Body isn't bony.
- Moves about steadily.
- Breathes steadily and easily.
- Eats well (good appetite).
- Bright eyes and moist nose.
- Has smooth and unbroken skin, and normal hair distribution (many pig breeds don't have much hair).
- Passes dung without blood and diarrhoea.

What does a sick pig look like?

- Doesn't eat well.
- Breathing becomes difficult and abnormal.
- Animal appears dull.
- Pig passes excessively hard or watery faeces.
- Faeces may be bloodstained or contaminated with worms.
- High temperature (fever) and abnormal heart beat.
- Bony and rough hair coat.
- Coughing, lameness, diarrhoea, nasal discharge, abortion and skin discoloration.

Figure 9. Appearance of a sick pig.



Credit: NAADS manual, pig health and disease control.

How to identify pigs affected with internal parasites

There is no strict clinical sign of internal parasite infection in pigs. However, some worms can be seen in the faeces. Clinical signs of parasite infection also exist when pigs are infected with other pathogens such as bacteria and viruses. Common clinical symptoms during worm infestation include:

- Erratic appetite
- Weight loss and slow growth
- Diarrhoea
- Coughing in the case of lungworms
- Rough coat and pot-belly

How to identify pigs with external parasites, and their economic and public health impact

A number of external parasites can be seen with naked eyes, other cannot be seen.

Examples effect of parasites that can be seen on the pig's skin are given below:

Mange mite

They are located on the skin of the head, ears, shoulders, neck, legs and tail. Infected pigs scratch and rub against walls and other objects, and large pustules may occur. Loss of hair, thickened and wrinkled skin also can occur.

Figure 10. Pig with mange mites.



Credit: <http://www.nadis.org.uk/bulletins/sarcoptic-mange.aspx>

Lice

Lice may be found all over the body especially on the skin in folds around the neck and below the ear base. They cause irritation, itching and discomfort. Skin may be thick, and show red spots or bite wounds. Hair coat may be rough. Anaemia can occur in piglets in severe cases of infestation.

Figure 11. A boar with hog lice.



Credit: ILRI/Michel Dione.

Jiggers

Jiggers mainly live in a dirty, dusty environment. Bites are inflicted on all parts of the body. Infested pigs are restless due to irritation and debilitation. Pigs can also have red, itchy, scaly skin which is a sign of dermatitis.

Figure 12. Pig infested by jiggers.



Credit: Zachary Nsadha.

Public health impact

Some parasites are vectors of disease to humans that is they transmit the disease. For example, tsetse flies transmit trypanosomiasis (sleeping sickness), flies transmit bacteria that cause diarrhoea, and other parasites can infect humans when humans eat tainted pork meat.

Economic impact

The effect of parasite on the pig's body can translate into economic losses. The following can arise:

- Reduced market value of the pig due to poor growth with low weight gain.
- Large losses due to pig mortality, with piglets especially affected.
- Wasted feed investment due to poor feed conversion efficiency.

- Increased costs for veterinarian treatment and medicines.
- Loss of income due to carcass condemnation and poor quality of meat (such as a cyst in meat).
- Contaminated meat resulting in human diseases such as diarrhoea.

When the parasite burden is high on the farm, the pig enterprise isn't profitable, and pork consumers can get sick from eating meat infested by parasites.

Session 2: How parasites are transmitted

Objective: to explain the different modes of parasite transmission and describe the life cycle of pig parasites of economic and public health importance.

- Describe the different ways pigs contract parasites.
- Discuss how the different management systems affect parasite transmission.
- Make decisions on control of the parasites.

Tools and materials:

- Training Aid 2.1: Poster, charts or PowerPoint slides of life cycle of roundworms
- Training Aid 2.2: Poster, charts or PowerPoint slides of life cycle of pork tapeworm
- Training Aid 2.3: Poster, charts or PowerPoint slides of life cycle of ticks

Instructions:

Give an overview of how parasites develop from an egg to adult and how they move from one pig to another.

The process of development from the egg through larval stages and finally to the adult is called the life cycle of the parasite. Some parasites require an intermediate host, for example the earthworm is the intermediate host in the life cycle of the lungworm. This type of cycle is called an indirect one.

Basic knowledge of the life cycle is important in preventing diseases and in order to know the ideal period for intervention e.g. deworming the pigs. Parasites can be transmitted to pigs in several ways: orally through ingestion of faeces /animal excreta, physical contact/skin penetration, vector (flea, tsetse flies, and house flies) and through inhaling. The most effective and lowest-cost way of controlling parasites is to break the cycle either by good hygiene or by removing the intermediate host if there is one.

Explain the life cycle of the different parasites, using the illustration below, emphasizing how and when the pigs get infections. Emphasize those parasites that affect humans (jiggers, mites, tapeworms, trypanosomes). This will foster commitment by farmers to control parasites. Emphasize to the farmers that the way they manage the pigs increases or decreases the likelihood of a parasite problem.

The cycle of worms in pigs follows several stages:

Stage 1: The pig ingests the eggs and larvae from contaminated feeds or pastures.

Stage 2: The larvae migrate from the gut to several organs including:

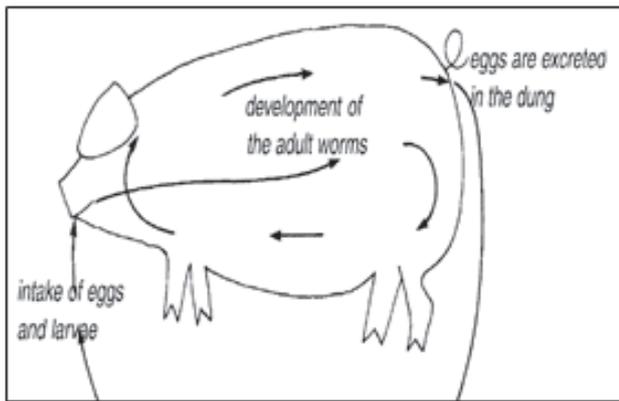
- Muscles (muscle worm)

- Lungs (lungworms or *metastrongyles*)
- Small intestines (*round worms, whipworms*)
- Large intestines (threadworms)

Stage 3: Worms develop in the organs.

Stage 4: Eggs are passed in dung to the environment, feed or pastures.

Figure 13. Developmental cycle of a roundworm.



Credit: www.pigsite.com

The eggs of parasites such as roundworms once ingested hatch into larvae which migrate through many parts in the body before settling in the intestine where they develop into adult worms. The migration causes damage to the pig's organs and makes the pig feel sick and lose its appetite. Pork presenting such lesions is subject to carcass condemnation on inspection.

Examples of lesions in organs

Figure 14. 'Milk spots' in a pig liver caused by migrating worms.



Credit: A. Vallant 2003. Color atlas of Schlachttierkörper pathology in cattle and swine.

Life cycle of external parasites

This will be illustrated using Training Aid 2.3. The life cycle of the tick will be used as example. The life cycle of external parasites involves several stages.

Stage 1: Engorged adult female tick lays eggs on the ground.

Stage 2: Eggs hatch and develop into nymphs which attach on the pig.

Stage 3: Nymphs develop into young adults on same animal.

Stage 4: Nymph feeds and develops into an adult tick.

The way pigs are managed increases or reduces the chances of contracting parasites. Therefore an effective way of controlling the parasites is to break the cycle. The practices that break the cycle should be carried out by the farmers. The parasite burden can be reduced greatly by using good management practices, which are not expensive. Good management, in turn, results in increased productivity and profitability. The parasites can be eliminated by some of the following recommended practices. These practices are preventive and include using drugs such as dewormers.

Common bad practices by farmers in Uganda

- Free ranging, which can result in the ingestion of eggs, infective larvae or intermediate hosts (earthworms) of lung worms since the pig has a large area to collect parasites from.
- Tethering the pig in one place increases the probability of infection since over time parasites multiply in the same place.
- Pigs confined but interfacing with free range pigs isn't recommended because the free range pigs may transport parasites to the confined ones.
- Open defecation by humans infected with the pork tapeworm leads to contamination of the environment and infection of the pig with worm eggs.
- Unhygienic pig houses breed conditions favourable for the build-up of parasites.
- Feeding soapy water or urine to treat worms is not effective. The parasites will continue to multiply.
- Use of euphorbia and castor oil seed to treat worms hasn't been proven to be effective.
- Perception of farmers that black coloured pigs do not carry worms on their body is false. It is that the parasites are difficult to see because of the colour.

Good management practices to reduce pig parasite burden:

- Clean indoor facilities to remove faeces, urine and feed waste. Also do a cleaning after the sale of a pig, leaving the pig house empty until a new pig arrives.
- Disinfect prior to the introduction of new pigs.
- Ventilate the pig sty to avoid high humidity which attracts flies.
- Feed a balanced diet to build a pig's immune response and maintain a good condition.
- Build proper housing to reduce the likelihood of pigs ingesting earthworms which are intermediate hosts of kidney worm and lungworm larvae.
- Move sites especially tethering systems from contaminated areas.
- Wash expectant sows with soap or appropriate detergent before farrowing to avoid transmission of worms to new born piglets.
- Take sows that are to farrow to clean rooms or places where parasite levels are low.
- Wash all pigs at the beginning of fattening.
- Wash breeding boars periodically to eliminate the parasites on their bodies.
- Keep weaned pigs away from older breeding stock to avoid transmitting the parasites to them.
- Keep gilts away from contaminated lots to prevent them from getting infected and infecting new born piglets.
- Treat dry lots, pastures and wooded areas used for pig production to prevent the transfer of parasites.
- Treat sows with Ivermectin seven days before farrowing to clear the sows of worms, which reduces infection to the new born piglet.

Session 3: How to control parasites

Objective: to acquire parasite-control skills to reduce parasites on the farm, such as through washing and spraying techniques

Tools and materials

- Training Aid 3.1: pig sty with live animals: Protective gear (gloves, gum boots, overalls), drenching equipment, syringes, dewormers and acaricides.
- Training Aid 3.2: pig sty with five mature pigs. Scrubbing brushes, soap, water.
- Training Aid 3.3: Poster on tapeworm control.

Controlling worms

- Build proper housing to avoid pigs picking up parasite eggs from infested fields.
- Wash pregnant sows 14 days and seven days before farrowing and transfer them to clean farrowing pens to remove worm eggs from the skin, thus avoiding infecting the new born piglets.
- Clean pig sty daily to avoid build-up of eggs and larvae on the premises.
- Avoid contamination of feed with faeces which may have worm eggs.
- Deworm at the beginning of the dry season to clear the parasites from the pigs (the eggs passed at this time have a reduced chance of surviving).
- Deworm regularly following the schedule below:

Example of a deworming schedule:

- Piglets: one week after weaning.
- Fatteners: one week after weaning and three months later.
- Gilts: one week after weaning, at three months of age and at seven months of age (at least two weeks before service).
- Sows: two weeks before farrowing and after weaning (or two months after farrowing).
- Boars: every two months.

Time: 20 minutes

Exercise 2: Identifying farmer practices

Instruct farmers to brainstorm on management practices that reduce the parasite burden and practices that increase internal and external parasites.

Time: 20 minutes

Most common dewormers used in Ugandan pigs

There are a range of known anti-parasitic drugs for both internal and external of pigs. However, the following dewormers are the most commonly used drugs by pig farmers in Uganda.

Dewormers	Targeted parasites
Albendazole (wormicide)	Gastrointestinal roundworms , lungworms, tapeworms and liver flukes
Ivermectin	Gastrointestinal roundworms, kidney worms, lungworms, as well as external parasites such as lice, ticks and mange mites
Levamisole	Mature roundworms, but only moderately effective against nodular worms, lung worms, and intestinal threadworms
Praziquantel	Tapeworm and liver flukes
Piperazine	Good efficacy against roundworms and moderate efficacy against nodular worms, but is ineffective against other types of pig worms

Because parasite eggs can survive for a long time outside of the pig's body—up to five years in the case of roundworms—regular cleaning and disinfection of the pig's sty is critical.

Good hygiene combined with approved drug treatment (dewormers and coccidiostats) will help prevent the transfer of parasites to pigs.

How to make the best results of drugs

- Consult a qualified veterinarian for advice on the type of dewormer to use and the proper deworming regime to apply.
- Use approved drugs for the target parasite species and stage (this can be addressed by strictly consulting veterinarians and by following a deworming schedule).
- Use only label-approved drugs and label-approved routes of administration.
- Make sure the administration protocol of the drug is followed.
- Avoid under-dosage; parasite may not die and can then become resistant to the drug.
- Administer the drug at the appropriate time to ensure that pigs have taken it. For example, oral drugs can be given when the pigs are hungry.
- Make sure that the boosting dosage is given at the right date.
- Arrange with the veterinarian or village animal workers strategic schedules.
- Ask your veterinarian which drugs you are using so you can keep records.

Controlling external parasites

Since most external parasites can be seen on the pig, treating the pig should be done when they are infested.

Preventing the spread of parasites is critical and can be achieved by carrying out the following management practices:

- Clean the pigs well to kill and to avoid transmitting parasites.
- Spray with appropriate pesticides or acaricides (benzene hexachloride kills adult parasites but not the eggs).
- Avoid overcrowding the pens to reduce fighting, which may result in wounds that attract flies. Wash the sow with soap and water before farrowing at least twice at a one-week interval to clear all the stages of the parasite.
- Wash the boars every two months.
- Correctly apply chemicals as spray or dust; apply them all over the pig's body, including the ear canals and under the body's surface.
- Cull the pigs with chronic mange.
- Treat gilts before first service to maintain a clean breeding stock. Ivermectin is an effective treatment against all external parasites.
- Treat new stock on arrival and repeat seven days later to kill off the larvae.
- Remove scales and dirt from pigs by washing with soap and water using a stiff brush. Spraying the animals with acaricides kills many parasites on the skin.

Instructions: This is a practical training exercise with three stations as follows

- Station 1: A room or pig sty with two grower pigs for spraying and to demonstrate handling drugs, drug safety and drug residues in the food chain.
- Station 2: A room to wash mature pigs.
- Station 3: An area with a poster on controlling tapeworm.

Activity: External parasite control (sprays)

Treatment and control of external parasites can be readily achieved because the parasites live on the skin surface and cannot survive a long distance from their host. Registered therapeutic agents may be applied to the pig in the form of sprays or pour-ons. All acaricides are ineffective against eggs hence the need to treat twice. The following exercise is to describe how to spray to control parasites.

Instructions: Divide the participants randomly into three groups (maximum 10 members a group). Each group moves to a station with each participant carrying out the activity at that station. The groups rotate, until each participant has done the activities at each of the three stations.

Time: 60 minutes (20 minutes at each station)

Station 1: Spraying

- Fill the spray pump with water.

- Add and mix the chemicals (e.g. Amitraz).
- Restrain the pigs.
- Spray the pig (body, in the ears, under the arms and legs).

Safety notes:

Acaricides can be harmful when inhaled or in contact with the skin. The product also may be mildly irritating, although unlikely to cause anything more than temporary discomfort.

Inhalation: First aid is not generally required. If in doubt, contact a doctor.

Skin contact: Gently blot away excess liquid. Irritation is unlikely. However, if irritation does occur, flush with lukewarm, gently flowing water for 5 minutes or until chemical is removed.

Eye contact: Quickly and gently blot material from eyes. No effects are expected. If irritation does occur, flush contaminated eye(s) with lukewarm, gently flowing water for 5 minutes or until the product is removed.

Obtain medical advice if irritation becomes painful or lasts more than a few minutes. Take special care if exposed person is wearing contact lenses.

Ingestion: If product is swallowed or gets in mouth, do NOT induce vomiting; wash mouth with water and give some water to drink. If symptoms develop, or if in doubt contact a doctor.

Station 2: Washing pigs

- Restraining the pig.
- Scrubbing the pig using soap and water with a scrubbing brush.

Station 3: Poster on controlling tapeworm

- Group discussion on controlling tapeworm transmission.

Give recommendations on how the parasites are eliminated by applying good management practices and drugs.

Time: 20 minutes

Module summary

Discussion and analysis

Review the module, and the practical exercise. The farmers should now know that they have to carry out some of these preventive activities daily and others regularly. The farmers should be able to understand the safe use of deworming drugs.

Tell the farmers that if they carry out what they have learnt today they will not only have happy pigs but they also will have profitable enterprises.

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