Training Manual for smallholder Pig Farmers

Prepared under the

Assam Agribusiness & Rural Transformation Project (APART)

ARIAS Society, Khanapara, Guwahati-22

For

Animal Husbandry & Veterinary Department
Govt. of Assam

by

International Livestock Research Institute (ILRI)

ARIAS Society
GOVERNMENT OF ASSAM
Assam Rural Infrastructure and Agricultural Services Society

ANIMAL HUSBANDRY & VETERINARY DEPARTMENT
Government of Assam

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

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Foreword

Pig farming plays an important role in supporting livelihood of majority of tribal households and some Other Backward Class (OBC) households residing in rural areas of Assam. Pig farming also helps in socio-economic empowerment of women members of pig rearing households as pigs are largely managed by women and income generated out of it is mostly controlled by them. Because of growing demand for pigs/pork, the price is ever increasing and the state is still facing shortfall in its production to meet the demand. Despite the fact, smallholders are yet to fully exploit the opportunities of market demand because of some of their inherent problems. The Animal Husbandry and Veterinary Department (AHVD), Govt. of Assam is making sincere effort to improve the pig system in the state under several schemes including the one under the World Bank aided Assam Agribusiness and Rural Transformation Project (APART). The interventions plan in piggery subcomponent through APART project of the government of Assam is very much timely and engaging. International Livestock Research Institute (ILRI) as knowledge partner of the project has made it possible to prepare this training manual of such higher standards. The training manual has covered all important aspects that a pig farmer is required to learn for transforming the backyard farming system to a more commercial one. The broad topics included in the manual are various breed and breeding method, selection of animals for different purposes, construction of suitable housing for pigs, feeding and nutrition, care and management of different categories of pigs, record keeping, prevalent diseases of pigs and their control options, measures to improve pork quality and safety, farming operations and business management, and welfare of animal and environment.

I am sure that the learning outcome would be significant for the growth of pig farming and this training document would remain as an asset for the Department of Animals Husbandry &Veterinary, Govt. of Assam for imparting training to pig producers under APART and all similar schemes in future. I am highly satisfied with the effort put by ILRI in developing the manual with support from the concerned officials of AHVD and ARIAS society who took active part in preparing this manual. With various topics explained in short and simple language with the help of several photographs, illustrations, demonstrations, practical exercise, videos etc. for ease of learning by poorly literate/semi-literate farmers, I am confident that this manual will be an important guiding documents for the farmers to transform their prevailing production system to more commercial, efficient and remunerative system.

(Rajesh Prasad)

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Preface

Pig farming is an important source of livelihood, income and employment among the tribal and some other communities in Assam. This has gradually become popular among a section of general community people as well. Despite higher demand of pigs and pork in the market the farming system has not been transformed to more scientific and commercial system. One of the reason for this is inadequate knowledge among the farming community to transform the system. To address the issue, the Animal Husbandry and Veterinary Department (AHVD), Govt. of Assam has taken up a massive programme of capacity building of pig producers and other actors in pork value chain under the World Bank Assam Agribusiness and Rural Transformation Project (APART). To make the programme a success, AHVD has sought technical support from the International Livestock Research Institute (ILRI), a global research institute for livestock sector in the World.

ILRI initially conducted Training Need Assessment (TNA) among the pig farmers and other pork value chain actors and based on the assessed knowledge gap, they have developed a customised training course for the pig farmers of the state which is very much need based. In developing the course ILRI had lot of interactions with the concerned officials of AHVD, ARIAS Society and the farming community.

I am sure this training manual will successfully change the knowledge, attitude and practices of the farming community and immensely help in transforming the system. I appreciate sincere efforts of ILRI, the concerned officials of AHVD, Assam and ARIAS Society for developing the pig farmers training manual in its present form.

26/09/19

Commissioner & Secretary
A.H. & Veterinary Department, Govt. of Assam

Acknowledgment

We are immensely grateful for the guidance and support that we have received from the Agriculture Production Commissioner (APC) to the Govt. of Assam; Commissioner and the Secretary to the Govt. of Assam, Animal Husbandry and Veterinary Department (AHVD); State Project Director, ARIAS Society; Director, Nodal Officer (APART) and other officials of AHVD and concerned officials of the ARIAS Society without which this training module would not have been possible to complete.

We also owe our deep sense of gratitude to the Veterinary Officers (VOs) and other concerned officials who gave important feedback during content development and content finalization of this training manual.

Our sincere thanks also goes to the pig farmers who helped us by supplying the necessary information during Training Need Assessment (TNA) and content development and supported in collecting images of specific pig farming activities needed to incorporate in the manual.

At last but not the least we express our sincere thanks to all the ILRI's colleagues who drafted the earlier version of this training manual based on which this revised and most comprehensive version has been developed to meet the current need of the farming communities.

Team Leader & Resident Consultant, ILRI-APART
International Livestock Research Institute (ILRI)

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Abbreviation

AHVD	:	Animal Husbandry and Veterinary Department
AI	:	Artificial Insemination
APART	:	Assam Agribusiness and Rural Transformation Project
ARIAS	:	Assam Rural Infrastructure & Agricultural Services
ASF	:	African Swine Fever
CSF	:	Classical Swine Fever
DVO	:	District Veterinary Officer
FMD	:	Foot and Mouth Disease
GNC	:	Ground Nut Cake
ILRI	:	International Livestock Research Institute
IMO	:	Indigenous Micro Organisms
JCMC	:	Joint Coordination and Monitoring Committee
KII	:	Key Informants Interview
MOC	:	Mustard Oil Cake
NRCP	:	National Research Centre on Pig
PRRS	:	Porcine Reproductive and Respiratory Syndrome
RRR	:	Reduce Reuse or Recycle
TNA	:	Training Need Assessment
TOC	:	Til Oil Cake
ToT	:	Training of Trainers

Proposed training schedule

Day	Session	Topic	Time
1st Day		**Registration**	**10.30-11.00am**
	Session 1	**Introduction to the training, its importance, relevance and expected outcome**	**11:00 am-11.45 pm**
		Pre-training evaluation	**11.45 am- 12.00 pm**
	Session 2	**Housing of pigs**	**12.00-2.00 pm**
2nd Day		**Participants' reflection of Day 1**	
	Session 3	**Breeds and breeding of pigs**	**11.00 am-12.30 pm**
	Session 4	**Pregnancy and farrowing, and care and management of different categories of pigs**	**12.31-2.00 pm**
3rd Day		**Participants' reflection on Day 2**	
	Session 5	**Better nutrition for improved productivity**	**11:00 am-12.30 pm**
	Session 6	**Most prevalent diseases of pigs and their control options**	**12.31-2.00pm**
4th Day	**Session 7**	**Human health risk posed by pigs/pork and risk reducing measures**	**11:00 am-12.30 pm**
	Session 8	**Restraining/handling and transportation of live pigs**	**12.31-2.00pm**
5th Day		**Participants' reflection on Day 4**	
	Session 9	**Welfare of animals and care for environment**	**11.00 am-12.00 pm**
	Session 10	**Entrepreneurship development in pig farming**	**12.00-1.15 pm**
		Post training evaluation	**1.15- 1.30 pm**
		Formation of peer monitoring committee	**1.30- 2.00 pm**

Note: The suggested training schedule is only indicative and the facilitator may modify the training schedule as deemed fit locally. High tea may be provided at the end of the 2nd session on each day

Training duration: 5 days

Total time: 15 hours

SESSION 1: Introduction to the Training, Its Importance, Relevance and Expected Outcome

Introduction to the training The training facilitator will introduce the training by following the sequence as stated below-
Welcome address: Facilitator will welcome the participants and explain the objectives of the training.
Self-introduction: Facilitator will ask the participants to state their name, address, primary occupation, years of experience on pig rearing, etc.
Expectation from the training: Facilitator will ask the participants to explain their expectations from the training. Facilitator will write down the key points on a flipchart/whiteboard/black board in order to revisit the same at the end of the training.
Pre-training status evaluation: Facilitator will distribute the pre-training evaluation form among the participants. Facilitator will ask them to put tick marks in the appropriate boxes(Agree/ Disagree/Don't know). After the evaluation, he/she will collect the forms and use the same at the end of the training to compare the differences before and after the training.
Ground rules: Facilitator will ask the participants about what general behavior (e.g. switching off the mobile during training, coming to the training on time, leaving the training after completion, no involvement on side discussion during the time of training delivery etc.) they expects to experience in order to run the training smoothly and effectively. The facilitator will list all suggestions in a flip chart and post the flipcharts in the places inside training hall/venue that will remain visible to participants throughout the training.
Content: Importance of the pig farmer, changing consumers' behavior and relevance of the training and benefits of the training

Training materials • Laptop, LCD projector and screen • White board and marker (different colours) • Flip charts • Pre-training evaluation form • Manual and handouts

1.1 Importance of a pig farmer

A pig farmer-

- Supports nutritional security to pork consumers;
- Generates income and employment for self;
- Directly/indirectly supports livelihood of other value chain actors (input suppliers, service providers, pigs/piglets traders, butchers, pork retailers, etc.) through linkage effect;
- Helps in economic empowerment of the women folks, more particularly of the tribal population of the state;
- Contributes in State's total income (GDP).

1.2 Objectives of the training

- To increase productive and reproductive performance of smallholder pig farms
- To increase feeding efficiency by improved feeding and proper utilization of available feed resources.
- To increase economic efficiency for improving return on investment
- To transform smallholder backyard farm to small scale market oriented farm
- To improve pig production by taking care of welfare of animals and environment
- To produce pig to meet consumers' satisfaction and demand of pork quality and safety.

1.3 How does this training benefit pig farmers?

The training will help pig farmers in improving their knowledge, understanding and skill to improve production and productivity of their farm and to reduce prevalence of diseases and negative effects of farming on environment.

By participating in the course a pig farmer will learn about-

- Various breeds and breed characteristics available in Assam, selection of suitable breeds, breeding methods and selection of breeding animals.
- Different housing systems and their advantages and disadvantages, suggestions for improved housing, bio-security measures and manure management.
- Different nutritional requirements of pigs, different feed ingredients (conventional and non-conventional) used for feeding pigs, preparations of rations, cultivation of food-feed crops and storage of feeds and fodder.
- Care and management of different categories of pigs (boars, sows, pregnant sows, piglets and growers) and record keeping.
- Most prevalent diseases of pigs and their causative agents, main symptoms and control options.
- Importance of pork safety, germs that cause pork spoilage, diseases transmitted from pigs to human, measures to improve pork quality and safety etc.
- Improved farming operations and business management, qualities to be acquired to be a successful entrepreneur and requirements for institutional linkages.
- Ensuring welfare to animals and reducing pig farm's negative effect on environment.

1.4 Changing consumers' behaviour and relevance of the training

- With increased income, urbanization and population growth, the demand for pork is constantly increasing.
- Consumers are also increasingly becoming cautious about the pork quality and safety and they are ready to pay premium price for better quality pork.
- Various food safety regulations and adverse publicity in print and electronic media about food quality and safety are reminding consumers to buy food items from safer sources that ensure better cleanliness and hygiene.
- If consumers are not confident on quality and safety of food items they may move to other sources, more particularly traded by big corporate houses. This may mean local small farmers may fail to take the advantage of increased local demand.
- Training and certification and adoption of clean and hygienic pig production practices will potentially increase production and productivity of pigs and attract more number of

consumers to eat pork.

- Increased demand will stimulate better price and profit which may attract more people to start farming operations resulting in overall growth of the sector.

Summary

- A pig farmer plays an important role in the society through supplying pork to the large pork consuming population.
- The changing consumers' preference and behavior and their awareness towards food safety raise the demand for better quality and safer pork for consumption.
- Increased demand in the market calls for increased productivity and market efficiency of the production system.
- This training will benefit the farmers by improving knowledge and skill on breeding, feeding, housing, management and disease control and entrepreneurship development.

SESSION 2: Housing of Pigs

Session objectives
• To explain the participants on the different housing systems and their advantages and disadvantages • To make the participants know about the requirements and precautions to be taken for construction of different parts of the pig sty (walls, drains, floor, feeding troughs, roof etc.) • To make participants understand the importance and practices for livestock farm bio-security.
Training methods to be followed
• Participatory discussion • Distributing manuals and relevant handouts • Experience sharing • Group discussion • Field visit
Training materials
• Laptop, LCD projector and screen • Whiteboard and markers (multiple color) • Manuals and handouts • Flip charts • Photos and illustrations

Experience sharing: Prevailing housing systems

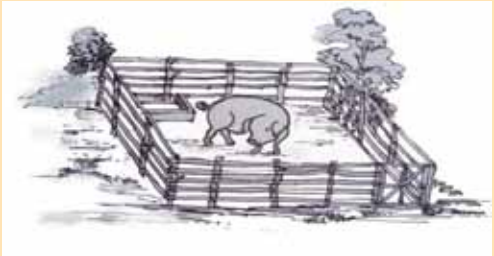
Instruction for the resource person: At the beginning of the session, ask participants to explain the prevailing housing system in the area and their advantages and disadvantages

The resource person will write down the points as stated by the farmers on a white board and keep these visible to participants throughout the session and refer to them while explaining the housing systems. He/she will try to suggest the best suitable housing systems based on their key considerations.

2.1 Prevailing housing systems of pigs in Assam

There are various types of housing systems in the state of Assam. The commonly adopted systems are outlined below along with their advantages and disadvantages:

Table 1: Advantages and disadvantages of different housing systems

Housing systems	Advantages	Disadvantages
Open range system  **A herd of pigs**	• No housing cost • No feed cost • Lesser requirement of labour	• Exposed to adverse climatic conditions (heat, cold, wind and rain) and wild predators • Poor growth • Higher incidence of diseases and mortality • Cause damage to crops and environment • Not suitable for management of good quality pigs
Tethering  **Pigs under tethering**	• No cost of housing other than a rope • Movement of pigs is restricted resulting little/ no damage to the crops	• Noise and odor may cause uncomfortable stay both for the owners and immediate neighbours • Rope may cause injury to the pigs • Pigs get exposed to adverse weather and they easily fall sick • Growth of pigs are poor.
Enclosure  **A pig housed in an enclosure**	• Easy to construct • Cost of construction is low • Can be shifted from one place to another • Pigs cannot damage the crops	• Pigs are not protected from adverse weather condition and predators • Floor remains quite muddy and dirty which make the animals more susceptible to diseases • Drainage system is poor • Noise and odor issue is not adressed • Higher incidence of diseases

Housing systems	Advantages	Disadvantages
Pen system  **A pig pen made of locally available materials**	• Construction cost is relatively lesser than scientific housing system • Pigs get some level of protection from hot, cold and rain • Relatively lesser incidence of diseases • Prevent entry of some predators like dog.	• Difficult to clean regularly because of smaller size of the pen • Floor remains quite dirty and muddy, if earthen • Pens constructed with locally available materials creates the issue of durability • In case of platform type, broken platform may cause injury to pigs
Bokashi system  **Pigs under Bokashi system**	• Lesser smell and less number of flies than conventional housing • Better digesting capacity	• Construction is laborious and time consuming
Scientific housing  **A scientific pig sty**	• Record keeping is easier • Well protected from extreme environmental condition and predators • Better hygiene and sanitation; • Lower incidence of diseases • Greater growth rate and better performance • Construction is durable	• Higher cost of construction; • More labour requirement

Housing systems	Advantages	Disadvantages
Modern scientific housing https://www.youtube.com/watch?v=J-WirXQnQ10  **Pigs under modern scientific housing**	• Lower floor space requirement • Managing larger herd size is easier because of automations of feeding, watering etc. • Farm waste disposal is easier • Proper breeding is possible • Record keeping is easier • Well protected from adverse weather condition; • Lower labour requirement • Better hygiene and sanitation • Lesser wastage of feed and water • Lower incidence of diseases • Higher growth performance	• Higher cost of construction • Construction materials are not readily available in the market • More useful mainly for bigger herd • Not suitable for less productive animals • Pigs do not get adequate space for movement • Pigs are normally kept away from natural environment of living.

2.2 Points to be considered in construction of pig sty (house)

2.2.1 Basic principles of constructing pig sty for smallholders

- The pig sty should protect pigs from adverse weather condition- hot, humid, rain, storm, cold etc.
- Floor space should be adequate for each pig kept;
- Cleaning of the floor should be easier and should have good drainage system;
- Feeding and water facilities should be fixed in such a way that wastage is minimum;
- Materials should be durable to reduce the cost of frequent repairing;
- Construction cost of the sty should not be too high to be unaffordable for a general farmer.

2.2.2 In constructing the pig sty following points should be considered

Location

- An open, elevated (to avoid water logging) space that is sufficiently exposed to sunlight should be selected for construction of pig sty.
- Should be reasonably away from residential areas.

- Should be nearer to drainage system or fish pond for easy disposal of farm waste.
- Should have approach road and power supply.

Orientation of the house

- The house should be well ventilated, and directed longitudinally in North- South direction**.**
- A pig sty with North-South direction allows sun light to fall in the morning as well as in the afternoon. Also, the floor remains dry and it helps in lowering the chances of diseases in the farm. `

Types of pig house

- Pig house may have single or double row of pens. In large commercial farm, double row of pens facing each other are constructed (with a corridor in between both the rows for movement of the attendants) while in small farms, single row of pen is constructed.

Floor

- The floor should be made of concrete, little rough to be non-slippery and it should be slightly slanting (sloping) towards the drain for easy drainage of urine and dung.
- Earthen floor should be avoided.
- In case of platform type, floor material should be strong and durable to avoid injury to pigs and reduce the cost of repairing.
- Floor space should be adequate as per the requirement of number of pigs to be kept.
- Under modern housing system ready-made slatted floor is used. Under this type of flooring system, all dung and urine materials go below the floor which is drained out to a manure pit automatically. Under this system, pigs are mainly kept in cages. `
- In flood prone areas, a platform type of concrete floor should be constructed. Height of the platform should depend on potential risk of inundation during flood.

Pig sty with concrete floor

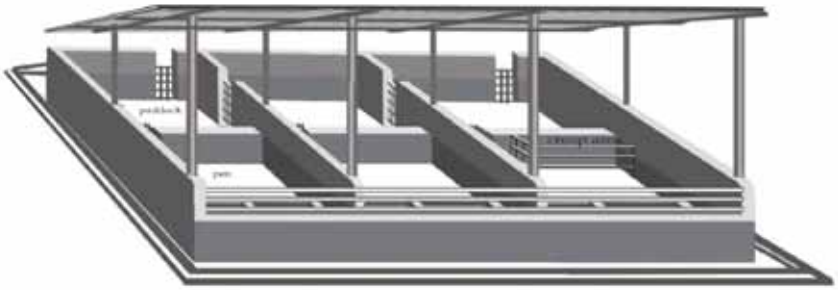
Drainage system

- There shall be manure pits to store the farm waste. Having two manure pits is better so that if one becomes full the other can be used alternately.
- A drain of about 8-10 inch width and 4-12 inch depth should be constructed around the shed and it should be gradually sloped towards the manure pit/s.
- One can use the farm manure as fertilizer in the garden.

Drainage system in a pig sty

Construction materials

- It depends on farm size and investment capacity of the farmer.
- Ideally, concrete material should be used for construction of pig sty. However, a resource poor smallholder farmer may opt for affordable low cost alternatives.
- To reduce the investment on housing, floor should be constructed with concrete, while wall and roof may be made of locally available housing materials.
- For a resource poor farmer, it is suggested to invest more on productive components such as purchasing piglets, feeds etc. and less on housing. He/she can gradually move towards an improved house out of the savings realized through accruing of farm profit.
- Commercial farmers should construct concrete shed with GC sheet/CI Sheet, iron rail etc.
- Industrial farmers can go for cage system of pig housing with slated floor and automatic drinker and waterer.



Three dimensional view of a pig sty (with pen and paddock)

Feeding and water troughs

- The feeding and water troughs should ideally be of one foot depth and 1.5 ft. width. Length of feeding trough should be relatively higher than water trough. Under scientific housing system, feeding and water troughs are part of the floor plan and these are constructed on the floor adjacent to a wall.

Concrete water trough in a pig sty

- Those who do not construct concrete floor may use aluminum bowl for feeding and watering. Some of the pig farmers construct feeding trough using tyre, wooden block, concrete bowl, etc.

Wall

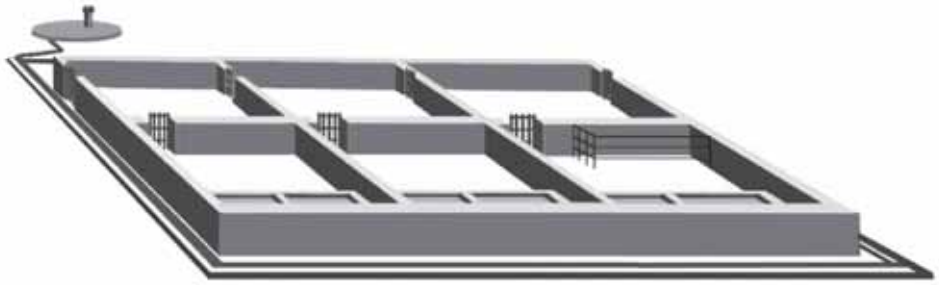
- Walls should be constructed up to 4 feet height above the plinth area. In the side wall there should be concrete ventilator at pigs' level. Above 4 feet, side wall should be covered with wire/ bamboo netting to prevent intrusion of crows and other predatory birds.
- Towards the middle passage (if two rows of pens are constructed), concrete wall should be of about 2.5-3 ft. height and the remaining 1 ft. should be covered by iron pipes (3 or 4 pipes may be required).
- Gate should be made of round iron pipes (a diameter of 20 mm) and placed vertically two pipes are not wider apart more than 3 inches. The height of the gate should be equal to that of the wall.

Provision for pregnant and lactating sow/diseased pig/ boar

- Separate provision should be made for farrowing pigs, boar and diseased pigs.
- Farrowing pens should have the provision for a creep area (protected space for feeding piglets) with guard rail in one side of the pen to protect piglets from their mother before weaning (to prevent trempling death).
- In the creep area there should be the provision of a bulb at low height to keep the piglets warm during winter and at night.
- Breeding boar should be kept in a single pen so that it cannot disturb other male/ female pigs.
- Diseased animal/ newly introduced animals should be kept in a quarantine shed (an isolated shed constructed in one corner of the farm premises).

2.3 Floor space requirement

Under scientific housing system, pig house should have two parts- pen (house with roof and side wall for feeding, watering, resting etc.) and paddock (adjacent space covered by half wall without roof mainly for exercise). Floor space requirement may be almost same in case of pen and paddock (as shown in the illustration). In modern housing system provision of paddock is not kept.



Floor plan of a smallholder pig sty with drainage system (both pen and paddock)

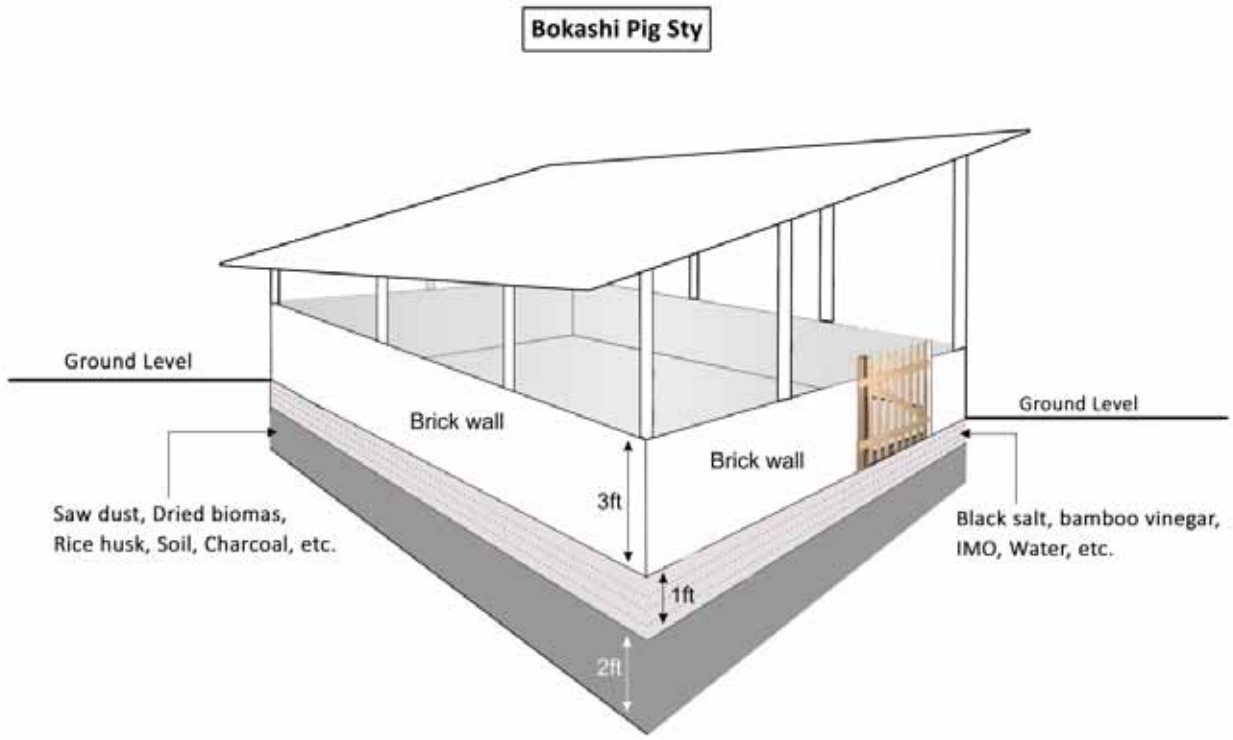
Table 2: Floor space requirement for different categories of pigs

Type of Pig	Pen Size	Number of Pigs per pen
Breeding Boar	10 ft X 8 ft (80 sq.ft.)	Single
Dry sows /gilts	10 ft X 10 ft (100 sq.ft)	In group of 3-4 Pigs
Pregnant sow (farrowing Pen)	10 ft X 8 ft (80 sq.ft)	Single
Weaner (1- 3 months)	10 ft X 10 ft (100 sq.ft)	8-10 piglets
Growers (3-7 months old)	10 ft X 10 ft(100 sq. ft.)	In group of 5 –7 pigs
Finishers (8-12 months)	10 ft X 10 ft (100 sq.ft)	In group of 3 –4 Pigs

Under modern housing system where pigs are kept in cages, floor space requirement for each pig is fixed and pre-fabricated cages are being built by the cage supplier.

2.4 Construction of Bokashi pig sty

- Bokashi is Japanese word meaning fermented organic matter.
- Under this system pigs are housed in a floor made up by mixing some locally available materials that include saw dust, dried biomass, rice bran/ rice husk, soil and rice husk charcoal/ other charcoal (mixture A) .
- To the above mixture black salt, bamboo vinegar, water and indigenous micro- organisms (IMO) are sprinkled (mixture B).
- To construct the floor, the surrounding wall of the plinth (foundation) should be constructed at 3 ft. below the ground level.



Schematic diagram of a Bokashi pig sty

- Inside of the plinth area the above mentioned mixture A and then the mixture B are filled with. After leveling, the IMO is allowed to multiply in the floor for a week.
- If pigs are found relaxed on the floor it is considered as ready for keeping pigs

Pit for Bokashi sty being filled with mixture A & B

2.5 Construction of modern scientific pig sty

It is a modern method of constructing pig sty with readymade and prefabricated materials. Under this system, different categories of pigs are kept in cages/ pens with specific area for each category.

- The floor is the combination of concrete drainage system below and slatted floor at some height.

- Slatted floor is made up of either rust proof metal or plastic. It contains plenty of pores for passing out the excreta (both solid and liquid) quickly down to the concrete structure/ drainage system below.
- The accumulated excreta at the concrete structure/ drainage system is flushed away to the manure pit through using running water pressure.
- Under this system piglets and growers are reared under groups in pens while breeding sows, boars and farrowing sows are kept in cages made up of rust proof steel or aluminum pipes.
- Size and design of cages is different for breeding sows, boar and farrowing pens. In farrowing pens, there is provision of creep area having facilities of feeding, watering and brooding for piglets.
- Feed and water are mainly provided through automatic drinker (nipple) and feeder resulting minimum wastage of feed and water. Running water, electricity, fans are the essential requirements under this system of housing.
- The slatted floor, cages, etc. are sold by some suppliers. They mainly import from outside the country. Local manufacturing is also possible following the design of imported structure. In constructing this type of modern housing system, farmers should consult with a supplier before starting to construct as construction depends on the specification of the prefabricated materials.
- This system is mostly used by large commercial farms for management of good quality breeding stock. However, smallholder could also use it with some modifications based on local context provided the construction materials are readily available in the market.
- Under this system, initial investment is higher but, in the long run, there will be a higher margin of profit as more pigs could be reared in smaller space, labour requirement is lesser and farm management is easier.
- Moreover, it is more durable. It provides a very hygienic environment to the pigs as well and thus helps in boosting the immunity profile.

A modern scientific pig sty

The different types of housing under modern housing system are as follows

- **Slated floor with breeding crate for breeder:** The breeding sows/gilts are kept here with their limited movement so that the energy is not wasted on unnecessary movements.
- **Farrowing crate:** The pregnant sows/gilts are shifted to this pen 7 days prior to farrowing. Here is provision for creeping so that trempling death can be prevented.

A farrowing crate

- **Weaners slate:** Piglets, after weaning are kept here till they become growers/fatteners.
- **Growers/ fatteners slate:** The fatteners/growers are kept here. There is no partition between one another and they are kept here within the specified range of required floor space.

Growers/ fatteners slate

2.6 Livestock farm bio-security

Farm bio-security is a set of measures designed to protect a farm from the entry and spread of pests and diseases.

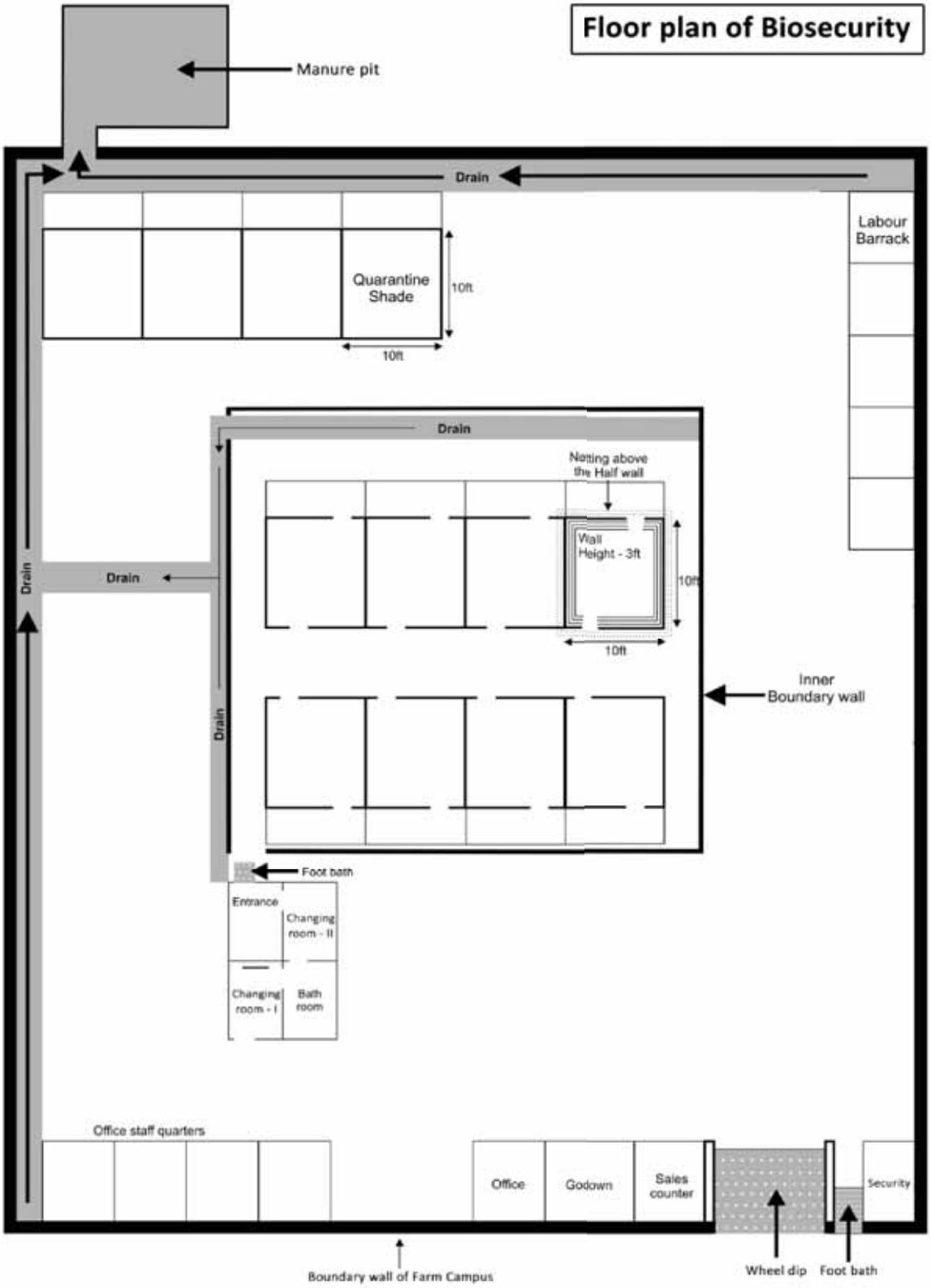
Bio-security in a pig farm: In making a housing plan for pigs required bio-security provision should be kept in mind. Proper bio-security infrastructure is more essential for large commercial farms while smallholder can use some of the principles of bio-security. The required bio-security infrastructures are as follows.

- There should be wire netting above the half wall of the sheds to prevent entry of any birds, monkeys, etc.
- Boundary wall around the farm campus should be constructed.
- One should erect fencing around the pigs sheds to prevent entry of the visitors to the actual farm site.
- There shall be a changing room and bathing facilities at the entrance gate of the fencing wall. This would require water supply at the changing room.
- No visitor should be allowed to enter the farm if he/ she has visited another farm in last 24 hours.
- Veterinarians coming for treatment should only be allowed to visit the diseased/ quarantine shed by taking bath before and after entry.
- Every farm should have their own costume for the visitors. Farm costume should be properly cleaned and disinfected after and stored in a fully covered shelf/wardrobe. Visitors should use only the farm costume inside the farm.
- Visitor should take bath at the changing room and should change his/her costume.

Taking bath before and after entering pig farm

- Sales outlet should be constructed at the entrance of the farm premises to prevent entry of individual/vehicle inside the farm premises that generally come for buying pigs/ piglets etc.
- Customers shall not be allowed to enter in the farm unless it is very essential.

- There should be foot bath at the entrance of every shed. The water of foot bath should be changed every day and fresh potassium permanganate solution should be added.
- Should place a bigger foot bath/ wheel deep at the entrance of the farm premises in order to disinfect the wheel of any vehicle entering inside the farm premises.
- Vehicle coming to drop feed, pigs etc. should pass through the wheel deep.
- In large farm, there should be a small vehicle that roam inside the farm to carry the materials/ pigs.
- The drainage system should be proper for easy flow of farm waste from the sheds to the manure pit.
- Manure pits should be constructed at some distance from the pig sty. Manure from the pit should be used for gardening at regular interval to prevent overflow.
- There should also be the provision for disposal of dead carcass/ aborted materials. Carcass should not be thrown outside the farm. This may transmit the disease through wind, dogs, cats etc.
- Overhead water tank should be cleaned at a regular interval and water filtering provision should be kept.
- Quarantine shed is an essential component of the housing system. This is used to separate and isolate (i) the diseased pigs until recovery and (ii) the newly introduced pigs/piglets for about 21 days for observation. One should essentially construct this and repair if exists already.
- Pigs newly introduced in a farm should first put in the quarantine shed. There should be separate arrangement of manpower and utensils for feeding, watering and managing the newly introduced animals in order to avoid any transmission of germs from the new stock to the old one or vice versa.
- In quarantine shed every care should be taken for the newly introduced animals to minimize the stress.
- Minor health care arrangement in the quarantine shed should be made available prior to stocking animals.



Schematic diagram of a pig farm with required bio-security infrastructure

Group discussion: Housing system

Instruction for the Resource Person: Ask the participants to form four groups and ask each group to choose any of the topics given below. One from each group will present the salient points on the selected topics that came out of their discussion to rest of the participants. The resource person will comment on their presentations and correct them wherever important *(the Resource Person shall complete the exercise within 15 minutes).*

Topics:

- Key takeaway from the session that the participants would like to use for improving their existing housing system
- Identify the most suitable housing system for pigs in the area
- Possibility of constructing modern scientific housing/ bokachi housing system
- Possibility of using bio-security measures

Field visit: Improved housing system

Instruction for the resource person: Ask the training facilitator to identify a pig farmer near the training venue which is having an improved housing system based on the local condition. Take the participants to this farm to have exposure of the housing system and initiate discussion on suitability of constructing such houses/pig sty in their own farm.

Key message of session 2

- Before constructing a pig sty one should consider issues related to location, orientation of the house, types of pig house, floor, drainage system, use of construction materials, feeding and water troughs, wall, separate provision for pregnant and lactating sows, diseased pig, boar etc.
- Pig sty should be such that it provides enough space for movement of animal, protect from adverse weather condition and easy to maintain clean and hygiene
- Type of housing depend on herd size, type/breed of animals reared, topography of the area, and investment capacity of the farmer.
- Should not make relatively higher investment on infrastructure and lower investment on animals and feed.
- A quarantine shed should be constructed.
- Every farm should have provision of drainage system, quarantine shed and bio-security measures

SESSION 3: Breeds and Breeding of Pigs

Session objectives
• To make participants understand about the available breeds of pigs and their breed characteristics. • To guide participants on selection of suitable breed of pigs • To enable participants explain the parameters for selection of piglets, breeding male (boar) and breeding female (sows/gilt) • Explain participants about the available systems of breeding and mating methods with their advantages and disadvantages. • To explain the importance of conserving the local germ plasm • To guide for a successful breeding in the farm context
Training methods to be followed
• Participatory discussion • Distributing manual and relevant handouts • Role play • Group discussion
Training materials
• Laptop, LCD projector and screen • Whiteboard and markers (multiple color • Manual and handouts • Flip chart • Photos and illustrations

There are different breeds of pigs in the World. Most of the good (high productive) breed of pigs are originated from developed countries like England, America, Denmark etc. In India, there is no recognized native breed of pigs that are high productive. The native breeds in Assam and rest of the states in North East India are smaller in size and have poor piglet production performances.

3.1 Available breeds of pigs in Assam

Table 3: Available pig breeds in Assam

Image of the breed	Name of the breed	Breed characteristics
  **Large Black pigs**	**Large Black**	This is one of the oldest breeds originated in England. **Breed characteristics-** • Longer body with black in colour • Less hairy body coat with glossy hair • Slightly tall with broad drooping ear (hanging forward and downward) • Long neck and face • Good milking and mothering ability • Good for cross breeding with local pigs • Aggressive in feeding and grows very fast.

Image of the breed	Name of the breed	Breed characteristics
  **Hampshire pigs**	**Hampshire**	The breed was originally developed in the U.S.A. **Breed characteristics-** • Generally black in colour with white belt encircling the shoulder and extended to the fore legs • Short and erect ear • Short legs • Not selective in feeding and thus grow very fast • Sows have good mothering ability and very docile • The breed is well adapted under Indian condition • Suitable for crossbreeding with indigenous pig.
 **Large White Yorkshire pig**	**Large White Yorkshire (LWY)**	A native breed of England **Breed characteristics-** • Large in size with a long and slightly dished face • Body covered with fine white hairs, free from curls • Skin is pink coloured • Ears are long and pointed forward • Good milking and mothering ability • Most popular breed in the world. The breed is gradually gaining popularity in Assam as well.
 **Landrace pig**	**Landrace**	A Native breed of Denmark **Breed characteristics-** • Highest quality of bacon is produced by this breed • Large and elongated body • Generally this breed is white in color, sometimes with black patches • Ears are drooping • Long snout (face) • White bristles are found across the body.

Image of the breed	Name of the breed	Breed characteristics
  **Ghungroo pigs**	**Ghungroo**	The breed is understood to have originated in Nepal and West Bengal border **Breed characteristics-** • Black in colour • Short and concave snout • Drooping ear • Medium size breed • Suitable for cross breeding with exotic breeds.
 **Doom pig**	**Doom**	Native to Assam (mostly in Dhubri, Bongaigaon and Kokrajhar districts of Assam). **Breed characteristics-** • Black in colour and have a short, concave snout • Small in size, adult pigs weight between 36- 50 kg • Erect ears • Hairs in the neckline are erect and brasslike.
 **Non descript indigenous pig**	**Nondescript (indigenous)**	**Breed characteristics-** • Smaller in size with shorter in length • Black in colour sometimes with white markings • Belly bulges downwards (pot bellied) • Long hairs • Elongated face, shorter and erect ears • Early sexual maturity (4 months and above) • Shorter inter farrowing interval • Poor production performance (body growth and piglet production)

3.2 Selection of suitable breed of pig

For selection of suitable breed of pig the following points should be taken into consideration-

- Try to select the breeds that are promoted /recommended by the govt.
- If the pigs are reared for breeding purpose, look for breeds that have higher litter size (no. of piglets produced in single farrowing), good mothering ability (mother that takes more care of piglets), lesser reproductive problems (still birth, abortion, agalactia, anestrus etc.), good feed habits, better weight gain and lesser body hair among the available breeds.

- Look for own preferred breed/ breed characteristics (colour, body size, type of ear, mouth etc.)
- Try to identify locally best suitable breed of pigs based on observations of experienced farmers.
- Explore the market demand and breed preference, if any, in the market. Try to rear the breed of pigs which have greater demand in the market.
- Farmers in urban/ peri-urban areas with easy access to good feed, veterinary care, market and with ability to invest on good housing may go for exotic pigs/ their crosses (e.g. Large White Yorkshire, Large Black, or Hampshire or their crosses).
- Farmers in rural areas who do not get easy access to farm inputs and markets and without having adequate financial resources to invest on feed, health care, housing and management can go for crosses of pigs with indigenous (e.g. Cross of Hampshire/ Large Black/ Large White Yorkshire)
- Farmers in remote rural areas who are not in a position to invest on feed, housing etc. may go for indigenous/poor quality cross-bred pigs conforming to low input-low output production system.
- Looks for availability of preferred breed in well managed farms nearby.
- If the piglets need to be bought from distant places, assess the climatic condition, feeding habits of pig, incidence of diseases, transportation mechanism, transportation cost etc. in addition to assessing the production performance at the source.
- Because of difficulty in reviewing the above characteristic in the live pig markets, one should prefer to buy piglets from the farm instead of buying from markets.

Recommended breeds under state pig breeding policy, Govt. of Assam

As per the state draft pig breeding policy the following breeds/crosses are recommended:

- Large white Yorkshire
- Hampshire
- Hampshire-Ghungroo cross
- Hampshire -local cross
- Doom/indigenous breed
- Conservation of local germ plasm

3.3 Points to be considered during selection of pigs/piglets

- One should first decide on his/her preferred breed/breed characteristics (colour, body size, type of ear, mouth/snout, etc.) based on rearing objectives (breeding/fattening).
- The farmers should observe the parents (boar and sow) to understand the pigs' breed characteristic, feed habits, health condition, mothering ability, weight gain etc.
- The availability of preferred breed at the preferred source of procurement has to be checked.
- One should select piglets from the herd that produce at-least 10 weaned piglets per litter and are known to be good mothers.
- The best quality piglets have to be selected from the litter for breeding. Better to buy lesser number of good quality piglets than buying more number of poor quality piglets.

- Piglets should be active, healthy, and free from external parasite and should be good at eating.
- Piglets below 5 weeks of age should not be procured. Older the piglets higher the chance of survivability.
- In case of male piglets, testicles should be well developed and should be equally placed on both sides.
- In case of female piglets, one should observe the available number and size of teats. There should be minimum 6 pairs (12 numbers) of active teats equally distributed on both sides.
- Piglets should have fine shiny hair coat (should not be too hairy). Body characteristic should have maximum match with the preferred breed characteristics.
- A pig farmer should not prefer to purchase piglets from diseased/weak/old parents.
- It would be better to observe the pig herd for two-three times at an interval of a few days for confirmation of health status, feed habits, etc.
- The climatic condition, feed habit, incidence of diseases, production performance, etc. in the area from where the piglets are decided to be imported should be reviewed.

3.4 Parameters for selection of breeding male (boar)

Farmers without keeping own boar for breeding purpose, may need to identify the best quality boar available in the locality. The following parameters for selection of boar should be kept in mind

- The boar should preferably have true breeding characteristics;
- Boar should be healthy and masculine;
- The body should be long and deep with strong legs, strong back and neck with smooth shoulders;
- Boar should be active and alert;
- Age of the boar should not be below 7 months at the time breeding. Preferably a boar of 1 to 2 years is selected for breeding purpose;
- The testicles should be well-positioned and its size should match with the body size and age of the boar;
- Additionally, both the testicles should be symmetrical in size and shape.

Both the testicles are symmetrical in size and shape

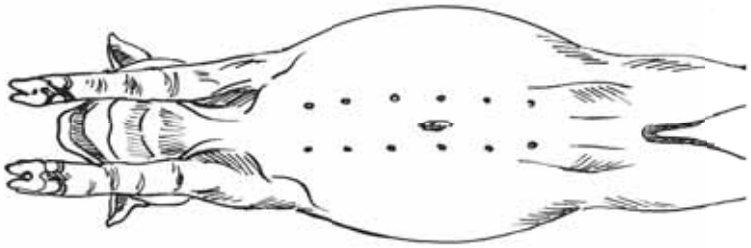
- The boar should not have any injury on the body or physical deformity.
- The boar should be free from any stress during the time of breeding.
- Boar should have good sex libido.

3.5 Parameters for selection of breeding female (sow/gilt)

- A healthy sow having a history of one delivery (farrowing) with a good litter size (10-15 piglets) is preferred for breeding.
- Age of the female pig should not be below 6 months.

Besides being active, the female pig should be feminine in appearance with small neck and with clear eyes without any discharge.

- The female pig should be free from any disease and deformities. The skin should be good and wrinkle-free.
- It should not be too fatty.
- Udder should be well-developed with minimum 12 functional teats, 6 in each row and the condition of the teats should be good.



A female piglet having 12 nos. of functional teats (6 in each row)

- On pressing over the teat, a hole (i.e. teat canal) should be visible. This indicates that the teat is functional.
- The female pig should have good mothering ability (taking good care of piglets).

3.6 Systems of breeding

Main objective of breeding is to produce superior quality piglets through mating between better productive male and female pigs (boar and sow). Different methods of breeding are practised.

3.6.1 Pure Breeding

Mating between boar and sow of the same breed

- The progeny has the same genetic makeup.
- This is done to identify and propagate superior genes for use in commercial production primarily in crossbreeding programs.
- To propagate and identify superior females for maintaining valuable genetic material.
- To conserve superior pure bred animals for crossbreeding.

3.6.2 Inbreeding (Mating of related pigs of same family)

It is the method of breeding between close relatives such as brother-sister, mother-son, father-daughter, cousin brother-sister, etc.

Advantages

- Inbreeding is used to produce distinct families within a breed.
- Inbreeding increases the ability of a pig to show its characteristics distinctly on the progeny (next generation).

Disadvantages

- Inbreeding may reduce the productive and reproductive performances of the animals in subsequent generations (called inbreeding depression).
- The animals may show abnormalities in due course of time.

3.6.3 Outbreeding

Mating male and female of the same breed but both are not closely related, means their ancestors are not the same

- Outbreeding helps to eliminate the negative effect of the same family and introduce better quality from the other breeds.
- Farmers should always try to look for different boar to mate a sow
- Mating between same boar and sow (or boar and sow from the same family) should not be done for breeding repeatedly.

3.6.4 Selective breeding

In this mating system, best male and female of the same breed is used for mating. This helps in continuous improvement of the progeny by eliminating the poor boar and sows from mating.

- Farmers should always look for the best quality breeding boar and sow for mating.
- Good progeny can only be obtained by mating between good sows and boars

Advantages

- Improvement of the quality of piglets than their parents
- Lesser production of poor quality/ undesired piglets

Disadvantages

- All boars and sows do not get a chance to breed
- Production of lesser number of total piglets

3.6.5 Crossbreeding

Cross breeding is important to introduce the good qualities of an improved/ exotic breed in to a local breed. This is obtained by crossing (mating) an indigenous sow (female) with a boar (male) of improved/ exotic breed or vice versa. For example, by crossbreeding an indigenous sow (e.g. Ghungroo) with an exotic boar (e.g. Hampshire); we can expect piglets that likely to inherit the body shape and good growth rate from its father and the adaptability/resilience to local climatic condition from its mother.

Advantages

- Good/superior qualities of the two breeds (that are crossed) appear at the progeny.
- Cross bred progeny is more productive than the indigenous mother (or father) and more disease resistant than the exotic father (or mother).

Disadvantages

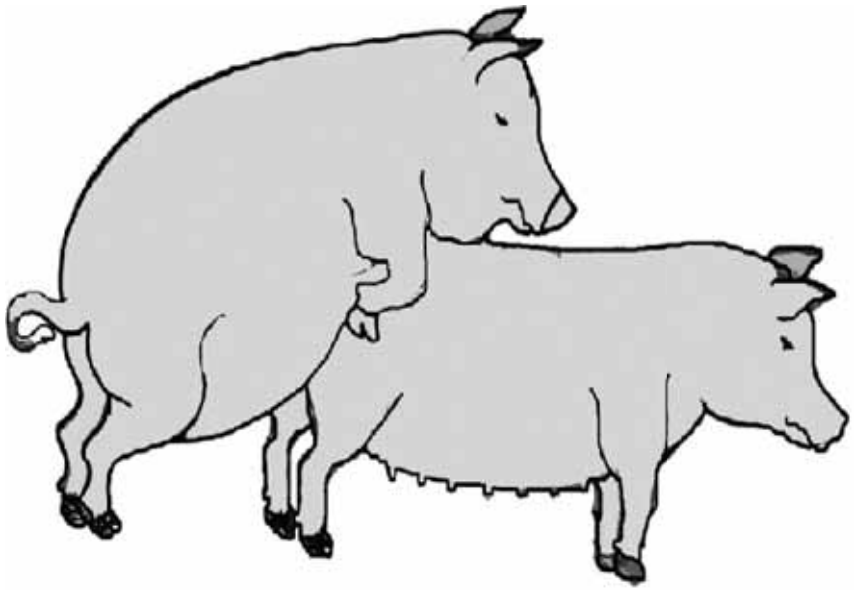
- Difficult to maintain two breeds or to get boar of different preferred breeds.
- The individual breed characteristics gradually disappear bringing to the fore the issue of conservation of germ plasm.

3.7 Methods of mating

Breeding is done either by natural mating or artificial insemination

3.7.1 Natural mating

Mating of boar and sows is also done naturally for producing progeny



Natural mating of boar and sow

3.7.2 Artificial Insemination

In this method, semen is collected from boar, processed and packaged in a laboratory and inseminated in sow's reproductive tract artificially. This eliminates the requirement of physical contact between boars and sows.

Collection of semen from a boar

Boar semen pouch and AI catheter

Artificial Insemination in a sow

Advantages of natural mating

- Can be performed anywhere, even in remote rural areas;
- No assistance is required from any service provider;
- If the farmer owns a boar, the mating is costless;
- Conception rate is better;
- Pigs get natural pleasure of mating;

Disadvantages

- Farmers need to rear good quality breeding boar;
- To bring improvement in genetic makeup of own stock by crossbreeding, farmers need to rear/ hire boar of desired breed which is a difficult task;
- Rearing of boar is a costlier job;
- Using the same boar for breeding repeatedly results in inbreeding depression;
- If boar is used or hired from others, this become more costly and time consuming.

Advantages of AI

- The cost of maintenance of breeding boar is saved;
- High quality breeding boar of desired breed can be used for inseminating a sow;
- Single boar can be used to serve several sows in his productive life time. One ejaculation of semen is good enough to inseminate 10-20 sows; while in natural mating only one sow could be served with the same volume of semen;
- Physical movement of boar or sow is not required leading to saving in time and labour;
- Brings improvement in genetic makeup of progenies quickly;
- It prevents the genetic transmission of certain diseases;
- Semen from a boar can be carried to distant places maintaining cold chain.

A

B

Thermos flask (A) and cool box (B) used for transportation of liquid semen maintaining cold chain

- Mating of animals with great differences in size is possible without any physical injury to either of the animals.
- Helpful to inseminate animals that refuse to stand or accept male at the time of estrus.
- Helps in maintaining accurate breeding and farrowing records.
- Semen from boar of good quality that cannot go for natural mating can also be used.

- Trained farmers can do the Artificial Insemination by themselves if they have access to semen.

Disadvantages of AI

- Requires a healthy breeding boar, well trained and skilled manpower for semen collection, laboratory for semen processing, packaging and transportation and insemination maintaining cold chain.
- In case of pigs, only liquid semen is used which remains in good condition only up to 7 days in a temperature between 12^0-17^0C.
- Difficult to transport to remote rural areas if the road condition is not good and maintenance of cold chain is difficult.
- The conception rate depends on subjective readiness of service provider for procurement and insemination of semen. Giving 2nd insemination after 12 hours of first insemination in single heat may be difficult if service provider does not find it convenient or unwilling to travel twice to rural areas.
- Conception rate greatly varies based on different factors.
- Farrowing difficulties (dystocia) may arise when crossing large breed sires with small breed dams and necessitating careful selection of animals/breeds.

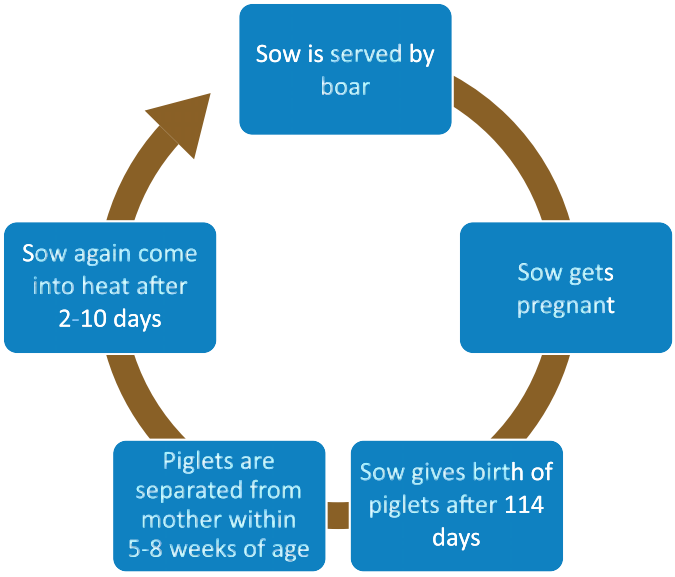
3.8 Conservation of local germ plasm

The indigenous pigs native to the state (e.g. Doom pig) are well adapted to the local climatic condition and resistant to various diseases in comparison to the exotic breeds and their crossbreds. Conservation of native breed is essential to preserve the good qualities of the breed. They thrive well under traditional scavenging mode of zero-input system although these pigs are very poor performer in terms weight gain and prolificacy. They should be preserved in their native breeding tract of the state (where they are normally habituating).

- Farmers should continue to rear indigenous pigs without crossing with any improved breed to avoid any dilution of the genetic make-up.
- Farmers can market these pigs at a premium price (as it tastes better) by stating that pork is from indigenous pig. (just as in case of broiler chicken and local chicken)
- Retailers also can display the head of the pig while selling to convince the customer that the pork was from a local breed.

3.9 Reproductive cycle of sows/ gilts (female that has not farrowed)

Every sow (female pig) follows a cycle for reproducing off springs (piglets) which starts with the onset of oestrus (heat) and terminates at farrowing (giving birth of piglets) and coming again into next heat. This cycle with several stages are stated in Figure below.



Reproductive cycle of sows/gilts

Specific details of the Reproductive cycle are stated at Table 4 given below

Table 4: Particulars of reproduction cycle of pigs

Particulars	Specification
Approximate weight of piglets at weaning	8-15 kg
Sexual maturity of male piglet	7-8 months
Sexual maturity of female piglet	6-8 months
Period of oestrous cycle	21 days with a range from 18-24 days
Length of heat period	2-3 days
No. of services/ insemination required in each heat	2 services at an interval of 12-14 hours
Length of gestation	114±5 days
Weaning period	5-8 weeks depending on production system & growth

3.10 Recommended practices to induce heat

A sow should come in to heat within 10 days post weaning. If the sow, does not come into heat within the stipulated period, smallholder farmers should follow some practices to induce heat. These include:

- Piglets are weaned at one go. If piglets are weaned one after another with some time interval in between, the sow would delay in coming into heat until the last piglet is weaned.
- Do not give any feed on the day of weaning, just provide them sufficient water.
- Give some extra feed (0.5-1kg) per day to the sow from the next day of weaning to maximum 10 days. This is called flushing. This helps in bringing the sow to come into heat. It also ensures sow's good health and more ovulation to increase litter size.
- Place the sow in a pen next to the boar.

- Put the sow with the boar for a short period every day when the heat is expected.

3.11 Reasons for not conceiving

There can be several reasons for not conceiving by a sow which are as follows:

- If the animal is in its first heat
- If the animal is not mated in proper time
- If the boar is too old or too young
- If the boar is used for mating several sows in a week.
- If the sow is not coming to heat regularly
- If the sow has mineral deficiency or suffering from any reproductive disorder
- If the sow is too fatty

3.12 Points to be considered for successful breeding

- Only one boar should be allowed to serve one sow
- The service should be supervised and the records like service date, sow name/number, boar name/number and the expected farrowing date should be recorded.
- In case of natural mating, sows should be brought to the place of boar. This allows the boar to do the mating comfortably. It may result in bigger litter size.
- Should allow the boar to meet the sow the highest possible number of times in a day.
- One boar should not be used for mating more than two sows in a week.
- In case of artificial insemination, first service should be given in between 15-18 hours of onset of heat. A second service is given after 12-14 hours from the first insemination

Table 5: Pig pregnancy calender-114 days

Bred Jan Farrow April	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Jan
	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	May
Bred Feb	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	--	--	--	Feb
Farrow May	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22				June
Bred March	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	March
Farrow June	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	July
Bred April	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	--	April
Farrow July	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	--	Aug
Bred May	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	May
Farrow Aug	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Sept
Bred June	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	--	June
Farrow Sept	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	--	Oct
Bred July	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	July
Farrow Oct	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Nov
Bred Aug	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Aug
Farrow Nov	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Dec
Bred Sept	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	--	Sept
Farrow Dec	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	--	Jan
Bred Oct	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Oct
Farrow Jan	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Feb
Bred Nov	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	--	Novr
Farrow Feb	23	24	25	26	27	28	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	--	March
Bred Dec	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Dece

Retrieved from:https://nationalswine.com/resources/docs/Swine-Gestation-Table.pdf

Role play

Instruction for the resource person: Divide the participants equally in three groups and ask them to do these exercises simultaneously (the resource person will ask the participants to complete the exercise within 15 minutes).

- Allow one participant to play the role of a buyer of piglets and another as seller. The buyer and seller will converse on the selection parameters of the fattened pigs. The rest few farmers in the group will note down the discussion and present before the resource persons.

Group Discussion

Instruction for the Resource Person: Divide the participants in four separate groups and ask them to discuss on the following topics keeping in mind the local context of the farmers:

- Best suitable breed of pigs for them
- Practical experience of inducing heat in sows
- System of breeding suitable for them
- Method of mating suitable for them

Key messages of session 3

- Farmers should select the breed based on performance of different breeds in the area, adaptability to the local climatic condition and preference of customers towards the fatteners/piglet of such breed.
- Good quality piglets/pig should be selected from well managed farms after visiting couple of times following certain criterion as explained in this session.
- Farmers should never buy piglets from market as the history of the piglets can not be ascertained in the market.
- Selective breeding should be followed to provide better progeny of the same breed while crossbreeding should be followed to improve local breed of pigs by crossing with exotic pigs.
- Method of mating is very much farm and location specific. Farmers should select the suitable mating system for his farm based on stated advantages and disadvantages.
- The end objective of any breeding and mating system is to produce better quality progeny of relatively larger litter size.

SESSION 4: Care and Management of Different Categories of Pigs

Session objectives
• To make participants know how to take care of the pregnant sows and how to help the sows in farrowing. • To make participants understand the caring practices of the lactating sow and piglets • To give knowledge to participants on the care and management of growing and finishing pigs and boar • To inculcate the practice of record keeping under different heads and teach about the weight determination formula for live pigs.
Training methods to be followed
• Participatory discussion • Distributing manuals and relevant handouts • Demonstration
Training materials
• Laptop, LCD projector and screen • Whiteboard and markers (multiple color) • Manual and handouts (record keeping formats) • Flip chart • Photos and illustrations • A live pig and a measuring tape for demonstrating weight

4.1 Care of the pregnant sow/gilt

- If the sow/gilt shows no sign of being in heat 3 weeks after mating she could be considered as pregnant. The pregnancy lasts for about 3 months 3 weeks and 3 days. During the pregnancy the sow should be provided with good quality feed and little extra feed for their pregnancy maintenance requirements
- Feed allotment should be higher from 80 days of pregnancy until 3 or 4 days prior to farrowing (delivery).
- Pregnant sows require some more mineral and vitamins than the requirements during the dry period. The resource poor farmers failing to manage sows on concentrate feed fully, should give at least some mineral and vitamin mixture.
- Feed should be reduced on last two days prior to the expected date of delivery
- Give the sow plenty of clean bedding material (e.g. dry paddy straw etc.) at least one week prior to the expected delivery date.

4.2 Signs that the pig is ready to farrow

- The sow shows restlessness and starts to make suitable space with bedding material within 24 hours prior to farrowing.
- The teat will produce milk when gently squeezed.
- Blood stained fluid may be passed from the vagina 1 to 2 hours before birth begins and if small greenish pellets appear the first piglet will appear within an hour.

4.3 Normal farrowing

Farrowing is a natural process and the sow usually needs no help. Once the first piglet is born the others will quickly follow one after another. Farrowing should be completed within 2 to 3 hours. The navel cord will get severed (no need to cut it) and the piglet will immediately search for mother's teat and milk. If the navel bleeds, tie it tightly with a clean string or cord.

4.4 When and how to help in farrowing

If the sow shows the signs of farrowing but do not give birth of a piglet and do pawing with a hind leg, or if 45 minutes pass since the first piglet appears with no sign of the second one, the sow should be helped in farrowing.

- Sows normally get farrowed at night and therefore, presence of an experienced attendant should be ensured during the time of farrowing.
- If any help is required to assist the sow in farrowing, the attendant may call a veterinarian or may try assist by himself.
- The person should wash his hands and arms with luke-warm water and soap and scrub under his fingernails.
- Hands should be soapy or should apply olive or sunflower oil to make them slippery.
- The person should try to put his hand into the vagina and should try to feel the piglet/ matter causing the blockage and try to remove it.
- If the piglet is not breathing clear the piglet's mouth and nose of mucous. One can gently slap it to encourage it to breath. Gently rub the piglets to dry and put its mouth on a mother's teat.

4.5 Care of the lactating sow and piglet

Teats should be long and thin enough for the piglets to grasp. A sow may suffer from mastitis developed as a result of damage to the teats caused by bite of the piglets. Clipping the teeth of the piglet prevents cuts to the teats.

A newly farrowed sow with its litter

Piglets do not grow at same rate. Piglets farrowed later are generally found to be weaker and smaller in size. Piglets fight during suckling and healthier ones grow even faster due their ability to

suck more milk by sidelining the weaker. Therefore, the smaller piglets grow at a much slower rate or even may die. In order to make them grow equally one can manage the suckling by allowing the weaker to drink more or put them with a different sow Another way is to make the weaker ones to suckle in the fore teats and the stronger ones in the rear teats . This is because there is more milk in the fore teats than in the rear teats.

4.6 Fostering piglets

- It is essential for all piglets to take colostrum (milk produced during first two days after farrowing which have high nutritive value) from the mother.
- If a sow dies during farrowing, one should try the piglets to mix with other similar suckling piglets, if available, so that the other sow accepts them as her own (other sow is called foster mother).
- If no foster mother is available, the litter can be reared by hand feeding.
- For hand feeding, bottles and teats (nipples) should be thoroughly cleaned after each feeding.
- Colostrum produced by cow (if available) can substitute sow's colostrum and after 3 to 4 days the piglets can be given normal cow milk.

Brooding of piglets

- A clean dry box containing clean bedding for the newborn piglets should be put in the farrowing pen. Else, an electric bulb should be put closer to the floor in creep area to give required temperature to the newborn piglets.
- Regular feeds must be given at an interval of 1 to 2 hours.

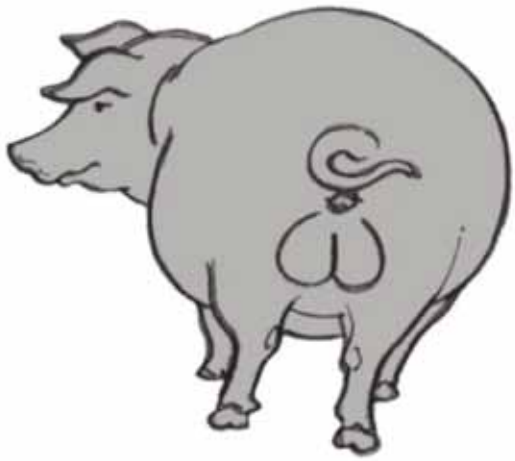
4.7 Care and management of growing and finishing pigs

This period is considered from weaning to the age of slaughter.

- Earlier weaning was done at 8 weeks (56 days) of age of the piglets. Now a days, under good management condition, piglets can be weaned at 5 weeks.
- Piglets should be weaned in groups so that they do not develop the stress of isolation. Also, sows come into heat only if all the piglets are separated from the mother. Delay in separation means delay in coming to the next heat; resulting one cannot expect two litters in a year.
- Periodic examination of fecal samples is recommended. Give dewormer drugs at every 6 months interval.
- Vaccination of piglets is essential against the known diseases like Swine Fever, FMD etc. and record of vaccination should be kept.
- As they grow, male and females should be separated.
- Pigs with poor growth and diseased/ deformed pigs should be culled.
- Piglets should be offered feed as much as required. Once the piglets get good growth at the beginning, they would grow faster in later periods even with under-supply of feed.
- One should provide feed twice a day, in earlier periods of morning and late in the afternoon
- During hot hours of the day, they should not be provided feed.
- Cleaning of the pigs and pig sty twice on every day is essential.
- Adequate care should be taken to prevent skin diseases and other infectious diseases.

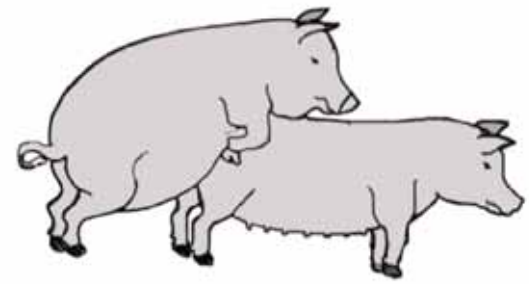
4.8 Care and management of boar

- The boar should be fed twice a day. One should avoid both over feeding and under feeding.
- One should feed a boar in the range of 2.00- 2.50 kg concentrate feed per day depending upon the body weight with adequate water.
- In case of feeding traditional feed resources, the requirement of traditional feed would be much higher than the range of feed as mentioned above because of poor nutritive value of the feed stuff.
- Traditional feed must be supplemented with protein source like fish meal/ meat meal/ soybean meal/egg to maintain a strong and healthy body of the boar.
- Handle temperamental/ nervous animals with care.
- Breeding should be done before feeding and best time is morning and evening.
- A boar should give first service at 7 to 8 months of age. A sow should be given service for 2- 3 times in one estrus. Second service should be after 12 hours of first service. This helps in getting more piglets.
- Breeding time should be confined to either early or late hours of the day.
- Boar to sow ratio should preferably be 1:4. In community level, one breeding boar against 10 sows can be considered the optimum.



Boar with a pair of well-developed testicles

- Same boar should not be used for breeding more than two sows in a week.
- Placing the sow with the boar in a slippery floor should be avoided as this might lead to injury of the legs in mounting.
- Boar should not be allowed to be fatty and lethargic. Sufficient space for exercise should be given.
- General health examination of the boar including the screening of ecto and endo parasites should be carried out periodically.
- Sow should be taken to the place of boar for mating as this gives more comfortable mating for the boar.



A fatty boar finds it difficult to mount a sow

A thin boar finds it easier to mount a sow

4.9 Culling

It is the process of disposing off the aged, unproductive pigs or pigs with incurable diseases/ disorders/deformities.

- Unproductive or less productive pigs should be disposed off from the herd as it results in economic loss.
- Sows with more than 5 farrowings may be culled as the litter size normally declines after this.
- Sows with defective teats, producing smaller litter (less than 8 piglets) and yielding less milk may also be culled.
- Gilt that fails to conceive after 3 services and the sows with very high inter-farrowing interval (more than 3 months) period should be removed from the herd.
- Infertile boars, too heavy boars, aged boars (after 5 years), defective boars and surplus boars need to be disposed off from the herd. Such practices ensure better profitability of the pig farms.

4.10 Record keeping

Pig farmers need to keep records to review the breeding programme, vaccination and deworming programme, stock of pigs/piglets, stock of feed, labour management, productive and reproductive performance, assess farm economics and to plan for future breeding and farm improvement programme.

Different records to be maintained in a pig farm

Table 6: Stocking record (For the month of... .....)

Date	No. of boar	No. of sow	No. of growers		No. of piglets		Pig died	Pig culled	Pig sold	Total stock
			M	F	M	F				
XX/XX/XXXX										
XX/XX/XXXX										

Table 7: Daily feeding register (For the month of… .....)

Date Date	Category of pigs	No. of pigs	Category of feed	Total feed stock	Feed Used (kg)	Balance in stock (kg)	Remarks
XX/XX/XXXX	Adult		Finisher				
	Grower		Grower				
	Piglet		Creep				
XX/XX/XXXX	Adult		Finisher				
	Grower		Grower				
	Piglet		Creep				

Table 8: Breeding and farrowing record

Identification number/ Name of sow	Breed of sows	Boar No./ name/ identification no.	Breed of boar	Date of service	Date of farrowing	No. of piglets born alive		No. of piglets weaned		No. of piglet died
						M	F	M	F	

Table 9: Health record

Identification no./ Name of Pig	Vaccination			Deworming		Treatment		
	Date of vaccination	Disease against which vaccinated	Scheduled date of next Vaccination	Date of deworming	Scheduled date of next deworming	Disease suffered	Treatment given	Outcome (Recovered/ not recovered

Table 10: Financial record for fatteners (one production cycle)

Purchase price of piglet	Cost of per kg feed	Total feed offered	Total cost of feed	Total cost of medicine, vaccine and treatment	Labour cost (if any)	Transpor-tation cost (if any)	Total production cost	Total revenue earned (unit price X pigs/ piglets sold)	Profit earned

Table 11: Financial records per breeder (one production cycle)

Breeding and related cost/sow	Cost of per kg feed	Total feed offered/ sow	Total cost of feed/ sow	Total cost of medicine, vaccine and treatment/ sow	Labour cost (if any) /sow	Transportation cost (if any) /sow	Total production cost/sow	Total piglets sold /sow	Sale price/piglet	Total Sale price/ sow /litter	Profit earned

4.11 Formula for determination of weight of pigs

A farmer can measure the approximate weight of a pig before sale by using a formula called Heart Girth method. This would help the farmer in bargaining and fixing the right price on pigs meant for sale.

$W = G^2 \times L/400$

Where, W= Weight of the pig in pound

G=Girth of the pig

L= Length of the pig

Measuring procedure:

- Measurement of Girth (G): Place the tape around the chest of the pig just behind the front legs and measure the circumference of girth in inches.
- Measurement of Length (L): Place the tape along its back from the base of its ears to the base of its tail and measure the Length in inches.
- To calculate the pigs' weight, first square the *Heart Girth* to get the *Girth Result*.
- Now Multiply the *Girth Result* by the *Length* and divide by 400.
- You now have the weight of your pig in Pounds.
- To convert the pound to kilogram (kg), divide the results in pounds by 2.2

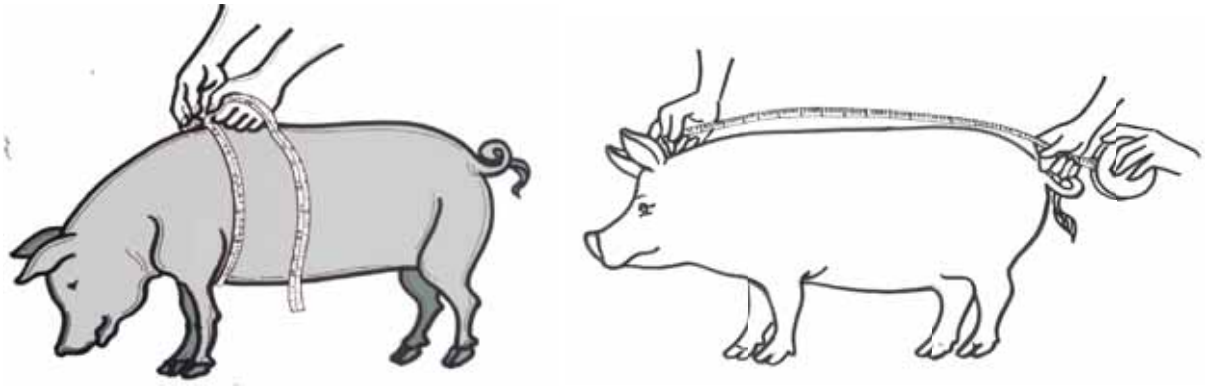
Example:

G=30 inch, L= 40 inch

Now, W=30 X 30 X40/400

=90 pounds/2.2

=40.90 kg



Measurement of heart girth and body length

For accurate measurement of weight, hanging balance or platform balance should be used.

A Platform weighing balance

A Hanging balance

Table 12: A sample work schedule of daily operation for small pig farmers

Time	Farm operation (regular)	Farm operation (occasional)
6.00- 8.00 am	Clean the pig sty and farm equipments	-
	Observe the behavior of the animals	-
	Segregate the diseased pig (if any)	-
	Segregate the sows in heat (if any)	-
	Prepare the feed for pigs	-
	Provide half of the required daily feed with adequate water	-
8.00 am-10.00 am	-	Treatment of sick animal/ vaccination of pigs/ castration, removal of needle teeth, ear tagging etc.
10.00 am-12.00 pm	Clean the surrounding of the pig sty and dispose the pig manure	Sell/buy pigs or piglets/do the necessary management in the pasture garden
	Collect or buy feed/ fodder	-
	Prepare the feed	-
4.00 to 5.30 pm	Prepare feed or supply remaining half of prepared feed to pigs with adequate water	Transfer pregnant sows to farrowing pen/ wean the piglets/deworm the pigs/ transport the pigs/ piglets/make entries in the farm record

4.12 Traceability

Traceability is a process to verify the history, location, etc. of pigs by means of online recorded data. This is done through a customized Management Information System (MIS). The *Pig Bandhus* will have to take the responsibility of inserting all the relevant data into the customized software installed in the tablets given to them. The data will be centrally processed and necessary information/documents will be supplied to all concerned. The following are the key activities for creating good traceability

- Ear tagging of each individual pig/piglet for identification.
- Entering the individual pigs/piglets profile and other relevant information into the

traceability software.

- Data are made centrally accessible and monitorable.
- Follow up activities to be sent back to field level operators i.e. *Pig Bandhus.*

By using traceability, it will be easier to-

- Sell pigs/piglets based on online information provided by traceability software;
- Take preventive health care services (e.g. vaccination, iron supplementation, deworming, castration, etc.) more timely and without any lapse;
- Trace back the source of the pork in the event of outbreak of any food born (pork) diseases;
- See the availability of stock in different places at different times.

Demonstration

Instruction for the Resource Person: Ask one of the participants to take the measurement (Heart and Girth) at appropriate place of the pig and note down the value in the white board/blackboard. Put the value in the formula and show calculation in the blackboard to arrive at the final weight of the pig. Ask each of the participants to measure one or two pigs in their own farm following the similar technique.

Key message of session 4

- Utmost care should be taken during the pregnancy period. Loss of single piglet shall count a heavy loss to the farmer.
- When the sow shows signs of farrowing, the farmer should keep her under close observation and veterinary doctor or other service provider should be called if necessary.
- Care of the piglets should be taken as per the norms so that it gets optimum milk, avoids trempling death, given Iron injection, deteething, deworming, etc.
- Care of the breeding boar should be taken as per the norms. It should never be allowed to mate with sows more than twice in a week.
- Unproductive or less productive pigs should be eliminated from the herd.
- All relevant records should be kept as per the proforma annexed.
- The piglets, growers and finishers are to be weighed regularly.
- A work schedule of daily operation is to be prepared and followed.

SESSION 5: Better Nutrition for Improved Productivity

Session objectives
• To explain participants about the key nutrients and their sources required for the growth of pigs • To make participants knowledgeable on locally available feeding materials, their sources, nutrients and computation of pig ration • To explain key points to be considered in feeding management • To make the participants know about the different feed crops and their standard method of cultivation.
Training Methods to be followed
• Participatory discussion • Distributing manual and relevant handouts • Group discussion
Training materials
• Laptop, LCD projector and screen • Whiteboard and markers (multiple color) • Training manual and handouts • Flipcharts • Photos and illustration

5.1 Basic nutritional requirement of pigs

Without proper feeding, animal cannot grow up to its genetic potential even under better management and healthcare services. For realizing better growth and production performance, pigs need to be fed with certain feedstuff which primarily delivers following nutrients.

The nutrients which should be supplied to pigs are:

- Protein/ essential amino acids
- Carbohydrates
- Vitamins
- Minerals
- Salt
- Feed additives
- Some essential fatty acids
- Water

5.1.1 Protein

- Protein is the building block of pig body. It is required for growth, maintenance and production.
- Apart from growth, it also provides energy.

Source of protein

Protein is available both in plant source and animal source.

Plant source: Ground nut cake (GNC), Till oil cake (TOC), Soya flakes/ Soya bean meals, Mustard oil cake (MOC), Cotton seed oil cake, Sunflower meal, etc.

Plant source of protein (Soya de oiled cake)

Animal source: Meat meal, Fish meal, Blood meal, Bone meal, Dried milk, Milk whey.

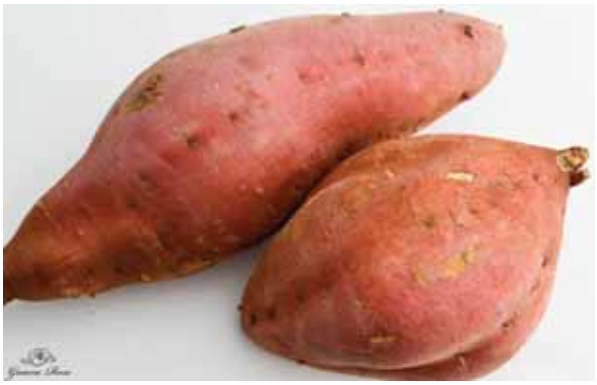
- Pigs should be given adequate amount of both animal and plant protein source for better growth
- With the increase in age from piglets to finisher/breeder pigs, the protein requirement in terms of percentage goes down from about 22% to 14%.

Animal source of protein (Fish meal)

5.1.2 Carbohydrates

- Carbohydrate provides required heat and energy for normal body functioning and day to day activities of pigs.
- Carbohydrates in cereals like- rice, maize, wheat, oats, grain, sorghum, barley, etc. helps in fattening of pigs.

- Carbohydrates are also found in by products of grains like- rice polish, rice bran, rice meal, wheat bran, etc.
- Carbohydrates constitute about 70% of total required feed per day.
- Pigs require large amount of energy and moderate amount of protein (15- 22%) for growth and development.



A

B

Sweet potato (A) and rice polish (B) as sources of carbohydrate

5.1.3 Vitamins

- Vitamins (A, D, E, K, B complex and C) are needed in its lowest amount for absorption and utilisation of different feed nutrients.
- Deficiency of vitamins in the feed taken by the pigs may cause numbers of ailments to the pigs including poor growth, weakness, anaemia, low production of milk by the sows etc.
- Vitamins are obtained mainly from different green forages. Some of the vitamins are also produced in the body (e.g. Vitamin D).
- External supply of small amount of vitamins especially during pregnancy and lactation help better growth of piglets and increase in milk production.
- Mixture of required vitamins and minerals (e.g. Milkmin, Medimix, etc.) are commercially available in the veterinary clinics and the mixture can be provided 1-2 teaspoonfuls per pig per day.

Vitamins and minerals supplement for pigs

5.1.4 Minerals

- Minerals are essential for the formation of bone, blood, teeth, muscle and milk.
- Supply of minerals in feed is essential especially during the time of pregnancy and lactation in order to ensure normal growth of piglets, increased milk yield, etc.
- Mineral mixture can be purchased from the veterinary pharmacy/ clinic. It is required only in small quantity say 1-2 teaspoonful per pig per day.
- Iron and phosphorus should be added separately as sow's milk is deficient in iron.

5.1.5 Common salt

Common salt is an essential item in pig ration. Higher amount of salt may lead to toxicity. So only a little amount i.e. 5 g /day is to be given to pigs. Deficiency may results in the birth of hairless pigs.

5.1.6 Water

Water is one of the most important components in pig diet. Only clean drinking water should be provided to pigs. Dirty water is the source of germs and may cause number of diseases. Fresh water is still needed even if liquid or wet feed is provided.

Function

- Water regulates body temperature;
- It remove waste products;
- It assists in digestion, absorption, transportation and utilization of nutrients.

Table 13: Minimum daily water requirement for pigs

Body weight of pig (kg)	Daily water requirement (lit.)
Newly weaned	1.0-1.5
Up to 20 kg	1.5-2.0
20-40 kg	2.0-5.0
Finishing pig up to 100 kg	5.0-6.0
Sows and gilts	5.0-8.0
Sows in lactation	15-30
Boars	5.0-8.0

Source: Code of Recommendations for the welfare of livestock; Pigs URL:government/uploads/system/upload/attachments data/file/69369 pb/7950-pig.

Note: The daily water requirement as indicated in the table may vary based on season, environmental temperature, type of feed, health condition and breed of animal.

5.2 Requirement of feed for different categories of pigs

Requirement of feeds for different categories of pigs varies based on age, weight and stages of life. The specific requirements are indicated in the table:

Table 14: Requirement of feed for different categories of pigs

Category	Age	Quantity of feed
Weaner pigs	2-4 months	0.25-0.75 kg/day
Grower pigs	5- 6 months	0.75 -1.50 kg/day
Adults	7-10 months and above	2.00-2.50 kg/day
Sow	Pregnant/lactating	2.00-3.00 kg/day (suckling mother should be given 0.25 kg/ suckling piglet extra)

5.3 Computation of pig ration with locally available feed resources

A daily ration is the amount of feed an animal needs every day. A good ration will contain all of the essential nutrients. Some nutrients are found in large amounts in some plants.

Compound ration

- It is a mixture of number of feed ingredients having sources of protein, energy, fat, vitamin and minerals in right proportion. The mixture is prepared in such a way that it provides all required nutrients to pigs.
- The mixed balanced ration is available in the market with different trade names.
- Concentrate feed can be prepared at the farm/feed mills by grinding the feed ingredients and mixing them in appropriate proportion. This requires a small grinder and a mixer to prepare.
- Incorporation of different feed ingredients (e.g. Maize, rice polish, wheat bran, soya bean meal, oil cakes, mineral mixture, etc.) is done based on the nutrient requirement of different categories of pigs.
- Maize, wheat, rice, etc. should form basic ingredients (about 70-75%). Protein supplements like oil cakes, fish meal, and meat meal should constitute about 23-28% of total quantity. Mineral supplements and salt should be provided in the ration (should constitute about 2.5%).
- Pure breed/ high quality cross bred pigs should be fed with 100% concentrate to grow faster with its genetic potential.
- Poor quality cross bred and indigenous pigs cannot grow to the desired extent because of poor genetic potential even if it is fed with 100% concentrate. Therefore, feeding 100% concentrate to poor quality cross bred/ indigenous pigs results in wastage of some extra feed. It is advisable to replace about 50-70% of the required concentrate feed by locally available feed resources for feeding the indigenous pigs.
- Those who cannot afford to provide any concentrate feed should give at least some fish meal/ meat meal/ soybean meal, particularly during early age, pregnancy and lactation. Along with these protein sources, they should also try to give small amount of mineral and vitamin mixture to pigs during these critical stages.

5.4 Examples of feed formula used for preparing pig rations

Table 15: Feed formula for different categories of pigs

Category of Pigs	Energy source		Protein source		Min+Vit source	Salt (%)	Total
	Maize (%)	Wheat bran (%)	GNC (%)	Fish meal (%)	Min. mix (%)		
Piglet (starter ration)	60	9.5	20	8	2.0	0.5	100
Grower (grower ration)	53	22.5	20	5	2.0	0.5	100
Adult (finisher ration)	40	32.5	20	5	2.0	0.5	100

Source: Animal Nutrition & Feeding Practices by S.K. Ranjan

Table 16: Quantity of different ingredients required for different categories of pigs

Ingredients	Starter (18-20% protein)	Grower (15-17% protein)		Finisher (14-16% protein)
		12 weeks-market age	9-12 months	
Maize	55	58	60	50
Groundnut cake	17	15	8	13
Wheat bran	20	20	25	20
Rice polish	-	-	-	10
Fish meal/ Soya meal	6	5	5	5
Mineral mixture	1.5	1.5	1.5	1.5
Salt	0.5	0.5	0.5	0.5
Total	100	100	100	100

Source: Animal Nutrition and feeding practices, S.K.Ranjhan

Note: The above feed formulation is just for brief idea. Every feed mill/ feed manufacturer have their own feed formula which is kept secret. If the farmer wish to produce his own feed, he can have a small grinder and a mixer. Feed could be prepared by incorporating locally available ingredients as suggested by a nutritionist to reduce the cost. The composition of feed may vary based on seasonal availability and price of the feed. The most three important criteria in selection of feed ingredients are nutrient content, palatability and price. Along with the lower cost the feed ingredient should be tastier for the animals. Good quality nutrient must be there.

A small feed grinder

A small feed mixture

5.5 Locally available feeding materials

- Pig farmers in rural areas are not much aware about the nutrient composition of different feed stuffs and importance of feeding different nutrients to pig. They provide only those feed stuffs which are readily available in the locality with little or no cost. The commonly used feed stuffs with their possible sources of nutrients are mentioned below. Pigs cannot digest more fibrous feed as it is a single stomach animal. Under smallholder farming system fibrous feed (e.g., jungle forages, green leaves, etc.) should not be fed more than 20% of the total required feed.

Table 17: Commonly used feed stuffs by small pig farmers and possible sources of nutrients

Feed ingredients	Major source of nutrient
Residue of country liquor/ rice bear/*Juguli*	Energy
Hotel/ Kitchen waste	Not specific (mainly energy)
Rice polish/ rice bran	Energy
Wheat bran	Energy
Maize	Energy
Fish meal	Protein
Mineral and vitamin mix (occasional)	Mineral + vitamin
Vegetables	Mineral + vitamin
Colocasia/taro	Energy
Tapioca/Cassava	Energy
Lucerne, cowpea, berseem etc.	Protein and vitamins
Banana/ fruits (occasional)	Mainly energy
Egg	Protein
Water hyacinth	Not specific
Green forage/ jungle forage	Not specific

- From the table above, it can be stated that locally available feed staff used for feeding of pigs are rich in energy but deficient in other nutrients. Therefore, they cannot support growth and reproduction in proportion to their genetic potential.
- For normal growth and reproduction of pigs, farmers should add some other feed ingredients which are rich in protein (oil cakes, fish meal, meat meal etc.) and mineral and vitamins more particularly during young age, pregnancy and lactation

5.6 Some points to be considered in feeding management

- Mouldy feeds should be avoided as these might lead to aflatoxicosis (a foodborne disease causing heavy mortality rate, particularly in young piglets).
- Water should be provided from a hygienic source to avoid water borne diseases. Water may be periodically treated with potassium permanganate or bleaching powder.
- If concentrate feed is not fed; sweet potato, broken rice, rice polish together with some protein source (fish meal/oil cakes), vitamins and minerals (mineral mixture available in veterinary clinic) could form the feed.
- If green leaves/ vegetables/ forages are used, the leaves and vegetables should be chopped into pieces and then it should be boiled to increase the digestibility of the ration

as well as to reduce the chance of infectious diseases.

- Instead of collecting and feeding jungle forages, pig farmers should cultivate some food-feed crops (e.g. maize, sweet potato, colocacia/ taro, tapioca/ cassava, etc.) at the homestead, which are good for both human and animal consumption. Many of these crops can be cultivated as a mixed crop in a small plot of land.
- Some of the forages may contain anti nutritional factor which is harmful for pigs. Therefore, care should be taken while selecting these forages as feed.
- Availability of forages depends on the season, region and traditional belief and knowledge of local people.
- Cultivation of food-feed crops (used for both human and animal consumption) for feeding of pigs may reduce the requirement of concentrate. Maize, sweet potato, colocacia, tapioca etc. can be grown in a small plot of land as mixed crop. Leaves of these crops can be cut/ plucked several times in a year and can be fed to pigs. Tubers are rich in energy and are good feed for pigs. It reduces the investment of time for collection/ gathering of forages.
- Some of the crops (e.g., Sweet potato vines) can be fed without cooking, which results in reduced cooking time. It also economizes in spending on fuel wood.
- Nutrient contents of different jungle forages are not known. Some of the forages may also contain anti- nutritional elements. Therefore, care should be taken while selecting these forages for feed.

5.7 Food-feed crop cultivation

There are certain crops that are used both for human consumption as well as for animal consumption. These are called food-feed crops. These forages could be cultivated in the backyard/ kitchen garden as mixed crops and can be used both as feed for pigs as well as c for human consumption. These crops include sweet potato, tapioca, calocacia / taro and maize.

Different types of food-feed crops cultivated in the same plot

5.8 Standard methods of cultivation of different food-feed crops

Table 18: Commonly used food-feed crops for feeding of pigs

Image	Food-feed crop
 **Sweet potato**	**Sweet potato (*Mitha aloo*)**: Tuber, vines and piles can be used as pig feed with or without cooking. It is a good source of carbohydrate. **Method of cultivation** • It grows on a variety of soils except clay. Being susceptible to water logging good drainage is needed in the plot. • It requires a warm humid climate. • Propagation of sweet potato is done by means of vine cuttings and planting. Cuttings of 20-25 cm length are planted on ridges at a separation of 20-30 cm. • Care should be taken to ensure sufficient moisture in the soil at the time of cuttings.
 **Tapioca**	**Tapioca/ Cassava (*Simalu aloo*):** Tuber, piles and leaves can be fed to pigs with or without cooking. It is a good source of carbohydrate. It grows naturally in many parts of Assam. However, cultivation is also possible in the farm premises. **Method of cultivation** • Cassava/tapioca can be grown on all types of soils except saline, alkaline and ill-drained soils. • Tapioca can be cultivated profitably on hill slopes, waste lands and lands where normal cultivation is difficult. The land should be ploughed two or three times or dug to a depth of 25-30 cm. • It is propagated from cuttings obtained from mature healthy stems. • April-May is the best planting season in Assam. Cuttings are planted vertically (after smoothening the lower portion) • Irrigation is not necessary for tapioca when the rain fall is well distributed.

Image	Food-feed crop
 **Colocacia**	**Colocacia/Taro (*Kachu*):** Only tuber is fed to pigs after boiling. It is good source of carbohydrate. There are several varieties of Colocacia naturally grown throughout the state but all varieties are not consumed by pigs. **Method of cultivation** • The best soil is sandy loam or alluvial with abundant organic matter. • The land should be ploughed 2-3 times after applying adequate quantities of organic manure and wood ash. • Spacing needed is 60 cm between two rows and 45 cm between two plants. • Planting is done on well-prepared land in pits filled up with burnt earth and ashes. • Weeding and earthing up should be done at 35-40 days after planting when plants attain a height of about 30 cm. All dead leaves should be plucked off.
 **Maize**	**Maize (*Makoi*)** It is a popular crop for both human and animal consumption. It is the best source of carbohydrate used for feeding of animals. **Method of cultivation**: • Well-drained soil should be selected. One ploughing is followed by 4-5 harrowings and planking. Spacing between rows is 25 cm and between plants is 10 cm. • Nitrogen should be applied in two split doses. The first split dose should be applied along with the full dose of phosphorus and potash at sowing time. The second split dose of nitrogen should be applied 4 to 5 weeks after sowing. • Irrigation is important to maintain optimum soil moisture conditions. Frequency of irrigation will depend upon rainfall intensity. Water-logging should be avoided. • One cutting in a year after 70-75 days of sowing yields optimum level.

5.9 Non-conventional/jungle forages used for feeding of pigs

There are several non-conventional/ jungle forages that are used for feeding of pigs by a section of smallholder pig farmers. These are mostly grown naturally. Feeding of non-conventional feed varies from place to place based on availability and farmers' knowledge about these. Examples of a few non-conventional feed stuffs are stated below.

Non –conventional forages used for feeding of pigs

Image	Name of the forage	Method of feeding
 **Water hyacinth**	**Water Hyacinth**	• The water hyacinth is a free floating perennial fresh water herb and is found at the surface of rivers, lakes, canals and ponds. • Water hyacinth can be used fresh, dried, chopped or ground or in the form of silage. • Fresh forage: Water hyacinth should be chopped and fed directly to animals. Amount should be limited as it causes mouth irritation palatable due to the presence of oxalate crystals. • Cooking: Water hyacinth can be chopped and mixed with by-products such as banana stems, rice bran or fish meal and then boiled to make a suitable feed for pigs.
 **Water spinach**	**Water Spinach**	• Water Spinach is a naturally grown plant that thrives well both in water or in marshy soil. • It has creeping and hollow stems and shiny leaves. • It can be fed to pigs as a good source of protein. • It does not contain any anti metabolite compounds. • Water Spinach can be used fresh, whole, chopped or mixed with other forages. • The leaves and stems of the water spinach are chopped into small pieces and are fed to pigs. • It can also be fed to pigs along with the chopped leaves of cassava or silage prepared from cassava leaves and other ingredients like broken rice, etc.
 **Azola**	**Azola**	• Azolla is a water fern that looks like an algae. • It is rich in protein (may contain 25-30% protein), minerals and vitamins. • A sq.m. of area can produce about 300 gm azolla/ day. • Can be cultivated in natural pond, plastic tray or concrete tank. • Should add 10-15 kg soil and 5 kg three days old cow dung • Should maintain water level of 8 cm. • Azolla will cover the pit within 7-10 days. • After 10 days 1 kg can be harvested per day/pit. • Application of Rock phosphate 1 tsf (10 gm), micronutrient mixture ½ tsf (5 gm) is essential. • Daily harvest of 1 kg/ day

Image	Name of the forage	Method of feeding
 **Hydroponics**	**Hydroponics**	• Hydroponic is a concept of growing crops under controlled environment using only water. No soil is required. • This technology is useful if there is shortage of fertile land for adequate growth, scarcity of water, labour and have extreme weather condition where there is no access to fresh greed fodder • Corn, maize, wheat and barley are most commonly grown in this system. • Hydroponic system requires a closed room which gets indirect sunlight • Room should maintain constant temperature of 23 degrees centigrade or 70 F • Humidity in the room has to be maintain between 40% to 60% • Less than 40% humidity will cause plants to dry and above 60% causes root rot

5.10 Preservation and value addition of forages

Silage making

Silage is a preserved pasture. It is an important way to preserve forage feed and to feed pigs during lean periods. Silage can be preserved for up to 2 years while maintaining their full nutrients. Prepare silage from excess forage (e.g., sweet potato leaves) it is still green and of good quality, and during a dry spell.

Small-scale silage making

Step 1. Prepare a shallow pit, preferably on slightly sloping ground. The depth of the pit should decrease from the higher side of the sloping ground to the lower side giving a wedge-like shape. Dimension of the pit depends on the amount of forage to be stored. A 72 cubic feet (say of 6 ft height and 3.5 ft diameter) holds 1000 kg of fresh, chopped material. This requires 20/30 liters of molasses and 10 meters of polythene sheet.

Step 2. Chop the forage to be ensiled to lengths of about 1 inch long.

Step 3. Put polythene sheets over the sides and floor of the pit so that the forage does not come into contact with soil.

Step 4. Empty 1 bag of about 50 kg of chopped material into the plastic lined pit and spread into a thin layer. Repeat this till the pit is filled to 1/3rd (6 bags).

Step 5. Dilute 1 liter of molasses with 3 liters of water. Sprinkle this mixture over the layer of chopped forage. Use a garden sprayer to distribute the solution evenly. This helps to feed the micro-organisms to make, the silage acid quickly, which will prevent rotting.

Step 6. Press the forage down with your feet or a suitable weight (e.g. a drum full of water) to force out as much air as possible. This will prevent fungi attacking and destroying the forage.

Step 7. Add another bag of the chopped feed, sprinkle diluted molasses and compact the forage again. Repeat this process of adding forage, diluted molasses and compacting until the pit filled in a doom shape.

Step 8. Cover the pit after a final pressing with polythene sheeting to prevent water seeping into the silage and dig a small trench around the sides of the pit.

Step 9. Then, cover the pit with soil: a layer of 24 inches (in the case of wet, fresh fodder) up to 36 inches (in the case of more dry forage) of soil to keep the air out and to prevent damage of the polythene by rain, birds and rodents.

Step 10. The conservation of the material by microorganisms takes a couple of weeks. Thereafter, it can be fed, but you better leave it until a time of feed shortage. With good sheeting and enough soil on it, the silage can be kept well for 1 – 2 years.

Step 11. Open the pit from the lower side of the slope. Remove enough material for one day's feeding, and then cover the open end again.

Different steps involved in silage preparation

Group discussion: Suitable feed regime

Instruction for the resource person: Ask the participants to divide in 3 groups and discuss on suitable feed regime for the area based on availability of feed resources, herd size, type of farming and purchasing capacity. Ask each group to present the key discussion outcome at the end.

Key message of session 5

- Pigs require different sources of nutrients like protein, energy, fat, minerals and vitamins for higher productive and reproductive performances
- Locally available feed stuff are high in carbohydrate and low in protein, minerals and vitamins. Therefore, pigs should be fed with source of protein (e.g. soyabean meal, fish meal, azola etc.) in addition to energy (e.g. juguli, rice bran, wheat bran etc.)
- Pigs cannot digest green forages like dairy animals, therefore its use should not be more than 20% of required feed.
- Green forages, particularly food feed crops should be cultivated by farmers at the backyard.
- Commercial pig farmers can prepare concentrate feed at the farm by installing a grinder and a mixture.

SESSION 6: Most Prevalent Diseases of Pigs and their Control Options

Session objectives
• To help participant farmers recognize a healthy pigs observing signs in body parts, excreta, and behavior • To make participants aware of the most prevalent diseases of pigs, major symptoms, mode of transmission and preventive measures • To make understand the roles and responsibilities to overcome the diseases problems, vaccination schedule etc.
Training methods to be followed
• Participatory discussion • Distributing manuals and relevant handouts • Experience sharing
Training materials
• Laptop, LCD projector and screen • Whiteboard and markers (multiple color) • Manual and handouts • Photos and illustrations • Flip chart • Thermometers

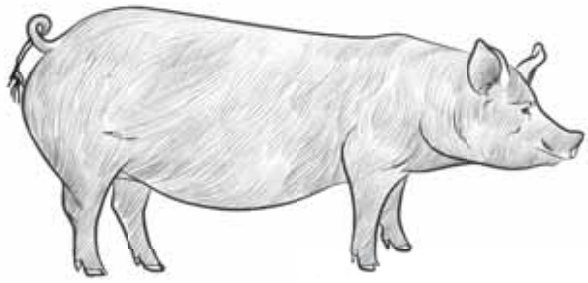
While we talk about diseases it is important for us to know what a healthy pig is. This would help us to understand and recognize a pig as diseased pig through its deviation from healthy pigs.

6.1 What is healthy pig?

- Pigs that are active, social and alert
- Free from any diseases
- Take feed and drink normally

6.2 How to recognize a healthy pig?

The owner/ farm workers should always observe all the pigs for following signs



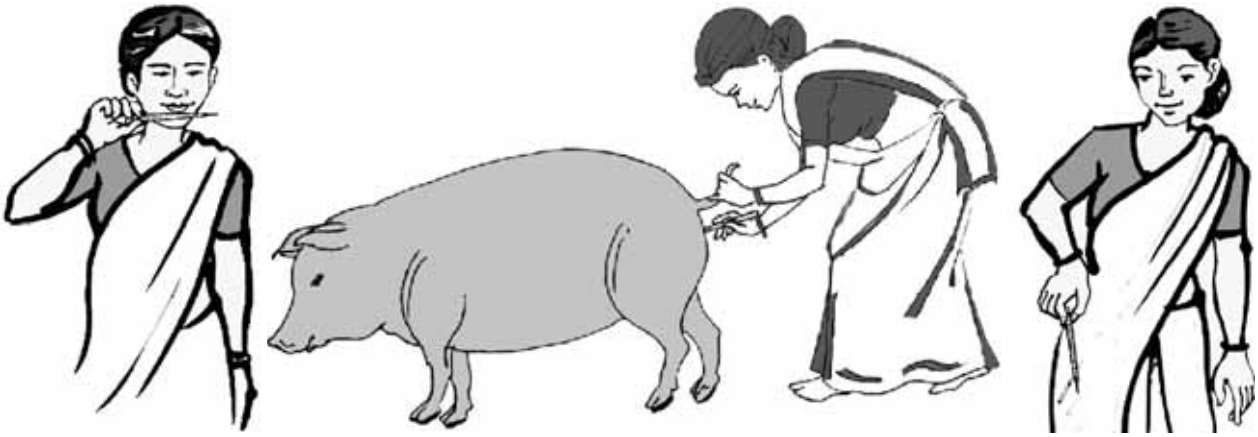
A healthy pig

- **Eyes:** The eyes should be bright and alert with no discharge at its corners.

- **Nose:** The nose should be clean with no discharge. The muzzle should be moist, not dry. Healthy animals frequently lick their noses with their tongues.
- **Ears:** Most animals have erect ears which move in the direction of any sound. Ear movements can also be quick to get rid of flies.
- **Legs:** It should stand on four feet. Irregular movement results from pain in the feet or limbs.
- **Tails:** A curly tail is a sign of good health

A healthy pig with a curly tail

- **Skin:** A scaly skin points out health problems.
- **Mouth:** There should be no saliva dripping from the mouth. If chewing is slow or incomplete it indicates for possible problem with the teeth.
- **Head movement:** A healthy pig should hold its head up watching what is happening around it.
- **Temperature:** The body temperature of the pig can be checked by touching the ear or by using a thermometer. Normal temperature of a pig is 102^{0}F.



Steps involved in recording temperature of a pig

- **Respiration:** Should be smooth and regular at rest. If the animal rests in the shade it may be difficult to notice the chest movement.

Taking respiration rate of a pig

- **Feces:** Feces should be firm. Diarrhea/dysentery is a sign of ill health. Similarly, difficulty in defecating is also a sign of bad health.
- **Urine:** Urine should be clear. Animal should not show any sign of pain or difficulty in urinating.
- **Eating behavior:** The animal should eat and drink normally. Failure to eat is an obvious sign of ill health. At times of making regular feed available, the healthy animal should have a full belly.
- **Movement of legs:** If an animal keeps looking at its flanks or kicks at its belly it can be an indicator of stomach pain.
- **Separation:** Animal kept himself / herself in isolation from the group is often a sign of a health problem.

6.3 Important diseases of pigs, main symptoms, mode of transmission and preventive measures

Most prevalent diseases of pigs in Assam is briefly stated in the table below

Table 19: Most prevailing diseases of pigs with cause, mode of transmission, symptoms and preventive measures

Disease	Cause	Mode of Transmission	Symptoms	Preventive measures
1.Swine fever	Virus	• Direct contact with an infected pigs, • Through contaminated utensils, • Visitors, birds and flies, • Droplet infection,	• High temperature 105- 1070F, • Vomiting and diarrhea (off smelling), • Conjunctivitis and nasal discharge, • Nervous sign like convulsion, tremor etc., • Loss of appetite	• Vaccinate the pigs against swine fever, • Isolate the diseased animals, • Thoroughly clean and disinfect the pig house, utensils and surroundings, • Inform neighbors about the occurrence of the disease, • Symptomatic treatment as advised by local veterinarian
2.Foot and Mouth Disease (FMD)	Virus	• Direct contact, • Contaminated feed, water, garbage etc., • Visitors, birds, flies, • Droplet infection.	• High fever 1040-1060F., • Appearance of vesicle, • Ulceration on mucous membrane of the mouth and foot, • Lameness and difficulty in eating, • Profuse sticky and foamy Salivation.	• Vaccinate against FMD, • Separate the infected pigs, • Clean the lesions of foot and mouth with potassium permanganate, • Apply antibiotic/ antiseptic solution/ ointment, if required, • Clean and disinfect the farm house, utensils and surroundings. • Symptomatic treatment as advised by local veterinarian

3.Porcine reproductive and respiratory syndrome (PRRS)	Virus	• Direct contact, • Contaminated feed, water, garbage etc., • Visitors, birds, flies etc., • Droplet infection,	• Anorexia, • fever, • Lethargy, • depression, • Respiratory distress or vomiting, • Mild cyanosis of the ears, abdomen and vulva, • Reproductive problems • increase in premature farrowing, • Abortions, stillbirth or weak piglets or mummified fetuses, • Pre-weaning mortality is high. Nursing pigs may have dyspnoea ("thumping"),	• Vaccinate against PRRS, • Separate the infected pigs, • Clean the lesions of foot and mouth with potassium permanganate, • Apply antibiotic/ antiseptic solution/ ointment, if required, • Clean and disinfect the farm house, utensils and surroundings • Symptomatic treatment as advised by local veterinarian
4.African Swine Fever (ASF)	Virus	• Direct contact, • Indirect contact through contaminated feed, water, garbage, visitors, birds, vehicles, flies etc. • Through soft ticks infestation.	• High fever, • Decreased appetite and weakness, • Red/blotchy skin lesions on the ears, abdomen, and/or hind legs, Diarrhea, vomiting, etc., which may be mixed with blood • Coughing, Difficulty in breathing. • Ocular and nasal discharge • Abortion of pregnant sows at all stages of pregnancy;	• Separate the suspected pigs • Testing of biological sample for confirmation of ASF • If positive, cull and bury the pigs • Thoroughly clean and disinfect the farm premises • Wait for 40 days for restocking • Introduce pigs of about 10% of total capacity in the farm at the beginning and check the occurrences of the disease for 6 weeks

5. Swine Dysentery	Bacteria	• Contaminated feed and water, • Contaminated soil.	• Diarrhea/ dysentery, • Yellow to gray, • soft feces, • High fever 104-105^{0}F.	• Treat the animal with anti diarrheal drugs, • Clean the farm house with disinfectant and keep it dry, • Provide water with electrolyte Sufficiently.
6. Piglet Anaemia	Iron deficiency	• Inadequate supply ofiron through feed	• Piglets become dull, weak and anemic • Skin develops • Wrinkles and roughness. • Visible mucous membranes become pale	• Iron injection on 4th and 14th day of age, • Smear iron salt paste or solution, • Use Ferrous sulphate around the teats so that the piglets • receive iron while sucking their mother.
7. Swine Pox	Virus	• Direct contact with an infected pigs, • Through contaminated utensils, • Visitors, birds and flies, • Droplet infection, • Pig lice may carry the virus for weeks or months;	• High rise of temperature (105- 107^0 F) with nasal and ocular discharge; • Initially, skin lesions of pox (follicular growth) of about 1 cm diameter appears. Ultimately, red brown scabs develop on skin within 8-11 days; • In severe cases, the lesions may be located inside the mouth; • Pigs become dull and depressed. • Conjunctivitis and keratitis may develop in piglet	• Consult with an experienced veterinarian; • Infected animal should be separated from other healthy animals. • Infected animal should be kept in clean and hygienic condition. • Pig sty, utensils and surrounding of the sty should be thoroughly cleaned to prevent from fly, lice, tick, mites etc.; • A course of ectoparasiticide drugs may be given to keep the pigs free from lice

8. Swine Brucellosis	Bacteria	• The boar is a major source of infection • Via the conjunctiva, through the nose or by mouth. • Spread by other carriers /Carrier sows. • Eating or rooting of aborted piglets, dead piglets, aborted materials • Exposure of cut or abraded skin to infected materials. • Suckling sows also shed the organism in milk which then infects their piglets.	**In Boar** • Swollen/painful testicles **In Sow** • Infertility. • Lameness. • Abnormal oestrus. • Abortions at any time. • Vulval discharges with pus or occasionally blood. • Delayed returns. • Lameness. **Piglets** • Paralysis of hind legs	• Treatment with antibiotics is not very effective and generally should not be attempted. • Affected pigs should be disposed off properly. • If the herd becomes infected, the most reliable method of control is to segregate and slaughter the herd and clean up the premises. • Aborted materials should be burnt or burried. • Aborted material should not be touched with bare hands. Should use gloves.

9. Parasitic Infestation	Internal parasite, e.g., round worm, tape worm, etc.	• Contaminated feed, • Water, soil, grass, etc., • Vertical transmission (from mother to offspring in the womb).	• Roughness of body coat and stunted growth, • Pot- bellied condition, • Loss of appetite, • Weight loss, • Diarrhea or constipation.	• Administer de-worming drugs at 6 months • interval.
	External parasites e.g., lice, tick, mite etc.	• Direct physical contact, • Close association of the pigs in dirty floor and environment.	• Itching, irritation and restlessness, • Scab, abrasion of and loss of hair.	• Clean and disinfect the farm premises and surrounding, • Do not allow pigs to scavenge in dirty and damp place, • Treat the pig with appropriate medicine, • Clean the pig with soap water and use Neem oil or Ascabiol or consult the local VO • Separate the affected pig from others, • Burn the floor/ wall (concrete) with blow lamp. • Provide dewormer as advised by veterinarian

Source: https://thepigsite.com/

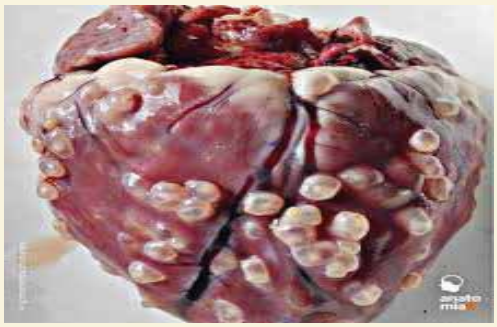
6.4 Other frequently encountered diseases/conditions

Table 20: Other frequently encountered disease/ conditions

Disease/ condition	Cause	Symptoms	Preventive measures
1.Atresia ani/ani et recti,	A congenital deformity (deformity which is acquired by birth)	• Absence of anus/both anus and rectum • Stool not passed out	Surgical intervention by experienced veterinarian right after birth
2.Scrotal/ umbilical hernia	• Congenital defect • Improper cutting of umbilicalcord • Castration by unskilled village people • Trauma	• Swelling in the below (ventral) surface of the abdomen • Swelling of the scrotum, sometimes misleading to enlarged testicles • Swelling reduces while laying the piglet ventral side (abdominal) up and a small hole can be felt by finger, even the finger can be inserted into abdominal cavity	Surgical intervention by experienced veterinarian
3.Uterine prolapse	• Prolonged labour/ farrowing • Older age of sows with large litters or that farrow very large piglet • Mineral deficiency • Hormonal imbalance (Estrogenic mycotoxins)	• Begins with the appearance of the red mucosa of the uterus. • Bulging out of part of or whole of the uterus/ both the horns	• Consult with the veterinarian • If survives, in most cases the sow should be culled for welfare reasons.
4.Mastitis	• Bacterial infection is the most common cause • Complication of FMD • Blunt teat • Poor hygiene	• Inflammation and swelling of the udder • Fever • Pain in the udder • Less milk secretion	• Consult with the nearest veterinarian • Maintain hygiene

5.Agalactia	• Poor nutrition • Mineral deficiency	• Less amount of milk in the udder	• Follow proper feeding schedule • Give properly balanced feed with optimum nutrition • Supplement the feed with minerals, vitamins and calcium • Feed the newborns with other sow's milk or cow milk
6.Still birth	• Genetic cause • Bacterial and viral Infections • Trauma during pregnancy • Malnutrition • Delays in farrowing • Oversized foetuses • Calcium deficiency	Giving birth to dead piglets at full term of gestation with in the membrane	• See history of the breeding stock while purchasing • Provide adequate nutrition • Avoid any trauma during pregnancy • Call veterinarian in case of delayed farrowing
7.Trempling death	• By the sows having lower mothering trait • Lethargy of the sow	The sow suddenly , without any signal, falls over the litter causing injury/death to the piglets	• Provision of creep box • Select the sow having good mothering trait

Table 21: Some important pig diseases with photographs of key signs

Name of disease	Images
Classical Swine Fever (CSF)	 A pig with CSF symptoms.  Bluish purple colour and bleeding under the skin
Foot and Mouth Disease (FMD)	 FMD lesion of foot  FMD lesion of snout
Porcine Reproductive and Respiratory Syndrome (PRRS)	 Respiratory symptoms in PRRS  Abortion in PRRS
Cysticercosis	  Cysticercosis (measly pork)
African swine fever (ASF)	 Red areas on skin of thigh and extremities  Necrotic lesions on skin of the abdomen

Sources of the images are shown at reference at the end of the document

6.5 Roles and responsibilities of the farmers to overcome the disease problems

- Closely observe the animals at least once in everyday, particularly during morning hours while animals are offered feed.
- If any abnormality is noticed, observe the animal further to identify whether the symptom is because of disease or in response to some stress or unfavorable condition.
- If the symptom is because of perceived threat of disease, immediately consult a veterinarian. Do not wait for further deterioration of the health condition of the pig.
- Separate the diseased pigs from the healthy one. Make separate arrangement for feeding and watering of the diseased pig, preferably in a quarantine shed.
- If any external parasites (flies, ticks, lice, etc.) are observed, the animal should be treated at the earliest.
- Special care should be taken for weak pigs/ piglets. Such animals may be offered additional good quality feed adding little mineral and vitamin mixture.
- The pig sty must be cleaned thoroughly every day. Care should be taken that no water-logging and deposition of farm waste near the farm takes place.
- Visitors should not be allowed to enter the farm without cleaning their hands and feet. The provision of footbath containing potassium permanganate solution has to be made at the entrance of the farm.
- For commercial farms bio-security measures should strictly be followed as stated in the housing and management section.
- Vaccinate the pigs against the major viral diseases with the help of a veterinarian. Deadly viral disease like Swine Fever cannot be treated successfully with any other medicines except through vaccination.
- Vaccine is given prior to occurrence of disease not during the time of disease.

6.6 Vaccination schedule of pigs

Vaccine is available against a few viral diseases of pigs. To protect animals against these diseases vaccine must need to be given at periodic interval following a proper schedule. A tentative schedule is mentioned below:

Table 22: Vaccination schedule for pigs (may vary from manufacturer to manufacturer)

Disease	Vaccine	Age of vaccination	Dose	Immunity
Swine Fever	Freeze dried tissue culture	2 months of age and a booster dose after 4 weeks followed by regular vaccination at 6 months interval	1ml s/c	6 months or 1 year
Foot and Mouth Disease	Polyvalent tissue, inactivated tissue culture	2 months of age and a booster dose after 4 weeks followed by regular vaccination at 6 months interval	2m i/m	5 months

Cysticercosis	Recombinant Porcine Cysticercosis vaccine accompanied by Oxfendazole at regular interval	2 months of age and a booster dose after 3-4 weeks followed by regular vaccination at 6 months interval	1 ml deep i/m behind the ear area	6 months

Precaution

- Above vaccination schedule is indicative only. It may vary depending on manufacturer's advice.
- Vaccines are generally stored at 2^0 -8^0 C temperature right from the point of production to the point of administration. But, it is advisable to follow the instruction manual given by the manufacturer because the required storage temperature varies from vaccine to vaccine.

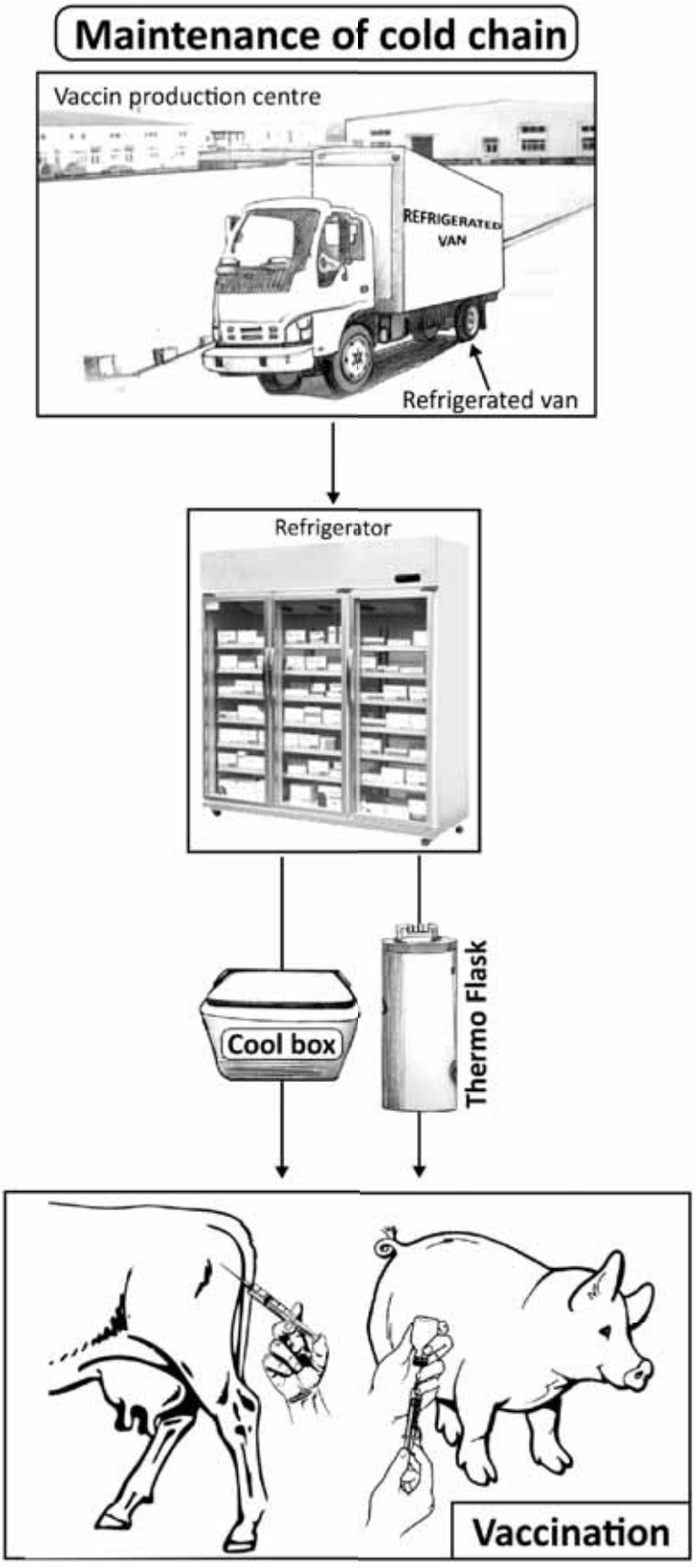
An ice box

A refrigerator

CSF vaccine preserved in a refrigerator

Thermos flask

- Vaccine should never be exposed to environmental temperature even during the time of transportation.
- During the time of vaccination, it should not be kept under room temperature for long time.
- When the vaccine is transported from the point of procurement to the farm, it should be transported in a thermos flask with ice.
- One must not use the vaccine that has expired.
- The route prescribed in vaccine should only be used.
- After vaccination, the vial, syringe, etc. should be burnt or buried. These should never be thrown in the open field, drain, etc.



A cold chain used for carrying vaccine

Experience sharing: Disease prevention and management practices

Instruction for the Resource Person: Identify couple of farmers who will share their experience of occurring similar diseases in their farms. The selected farmers will explain before the rest of the participants on the occurrence of similar diseases (as mentioned in the session) along with disease prevention and management practices adopted by them. This will be followed by a discussion among the rest of the participants on what practices to be adopted to prevent and cure particular disease in the local context.

Key messages of session 6

- The farmer should observe the pigs daily in the morning hours for any abnormality in behavior, feeding habit, organs, discharges, etc.
- If any abnormality is observed, he should call the local veterinarian.
- Separate the pig from the herd if diagnosed by the local veterinarian as infectious/ communicable disease.
- Regularly inform the local veterinarian for periodic vaccination and deworming.
- Clean the farmstead with suitable disinfectant at regular intervals and, as and when required.
- Prevention is better than cure. Taking preventive measures can reduce the chance of occurrence of many diseases and keeping the pigs in good health.

SESSION 7: Human Health Risk Posed by Pigs/ Pork and Risk Reduction Measures

Session objectives
• To make participant farmers understand how poor quality pork may pose human health risk • To sensitize participants about various disease transmission agents and their control options (through regular and special sanitation programme) • To make the participant farmers aware of the Zoonotic diseases and residues (Antibiotic, Pesticides and Aflatoxins)
Training methods to be followed
• Participatory discussion • Distributing manual and relevant handouts • Group discussion
Training materials
• Laptop, LCD projector and screen • Whiteboard and markers (multiple color) • Handouts • Flip chart • Photos and illustrations

7.1 What is human health risk?

It is the probability of causing any adverse effect in human body by any physical, biological or chemical agents with its potential risk of affecting negatively the human body.

7.2 Risk to human health and pork safety

There is a major risk to human health caused by germs present in pigs, pork and environment. One of the major risks is the zoonotic diseases that transmit from animal to human or human to animal. Poor quality of pork having disease causing agents is another important risk that cause food borne diseases. Quality pork depends on good practices related to farming, handling, slaughtering, transportation, storage and display of pork. Quality assurance plan should start at farm level. If pigs contain lot of germs, parasites, antimicrobial residues etc. at the production stage itself; traders/slaughterers or other pork value chain actors cannot eliminate the risk.

7.3 What is quality and safe pork?

Quality and safe pork-

- Should not contain any physical contaminant/adulterant.
- Has the normal colour, texture and flavor.
- Does not contain germs beyond the acceptable limit.
- Should not contain eggs, oocyst etc. of parasites
- Does not contain any residues (antibiotic residues, pesticide residues, etc.) beyond the acceptable limit
- Does not contain any toxic or poisonous substance (aflatoxins, phytotoxins, etc.)

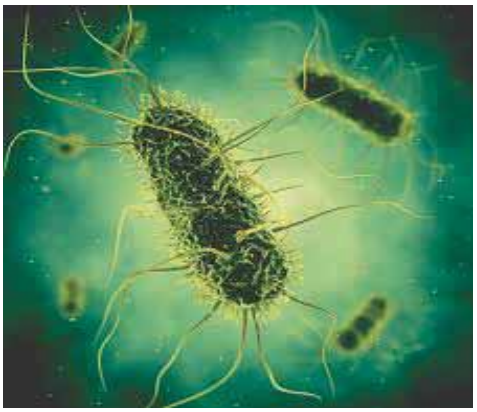
7.4 What are germs?

Germs are tiny living creatures and are present everywhere, more particularly in dirt, feces, other body excreta, farm wastes, etc. They are too small to be seen with the naked eye but can be seen with a microscope. Germs also come from the skin of animals and people, from discharges of animals and people, from the soil and untreated water; flies and other pests, etc. You may have heard of **'bacteria' or 'viruses'** – these are types of germs.

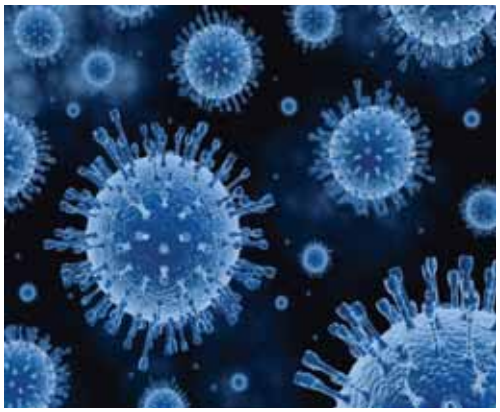
Some germs are always present in the body but, when they exceed the normal acceptable number they cause disease to pigs. Meat produced from the diseased pigs will have higher microbial count and consumption of such meat may cause disease to humans. Additionally, germs from diseased pigs may transmit to other pigs through direct/indirect contact with the animals or their excreta.

Meat is very rich in nutrients for both human and to germs as well. The germs grow faster in meat under warm environmental temperature and cause spoilage very quickly.

- Two types of germs are commonly available: **bacteria and virus**. Both causes diseases in human and animals
- Disease caused by bacteria can be cured by the use of medicine (antibiotic).
- Disease caused by virus cannot be cured by the use of medicine. Needs to prevent the disease by use of vaccine that helps the animal to increase its inner strength (immunity) to fight against the germs and to prevent occurrence of disease.
- Germs are transmitted from environment to animal, animal to animal, animal to human, human to animal and so on.
- Germs are mainly transmitted from the diseased animals by different means including feces, urine, skin contact, sneezing, coughing, ocular discharge, meat, milk, aborted materials, air, water etc.



Photograph of bacteria



Photograph of virus

7.5 How to reduce transmission of germs

7.5.1 Sanitation

It is the process of adopting hygienic measures to reduce presence of germs and create conditions that secure better health.

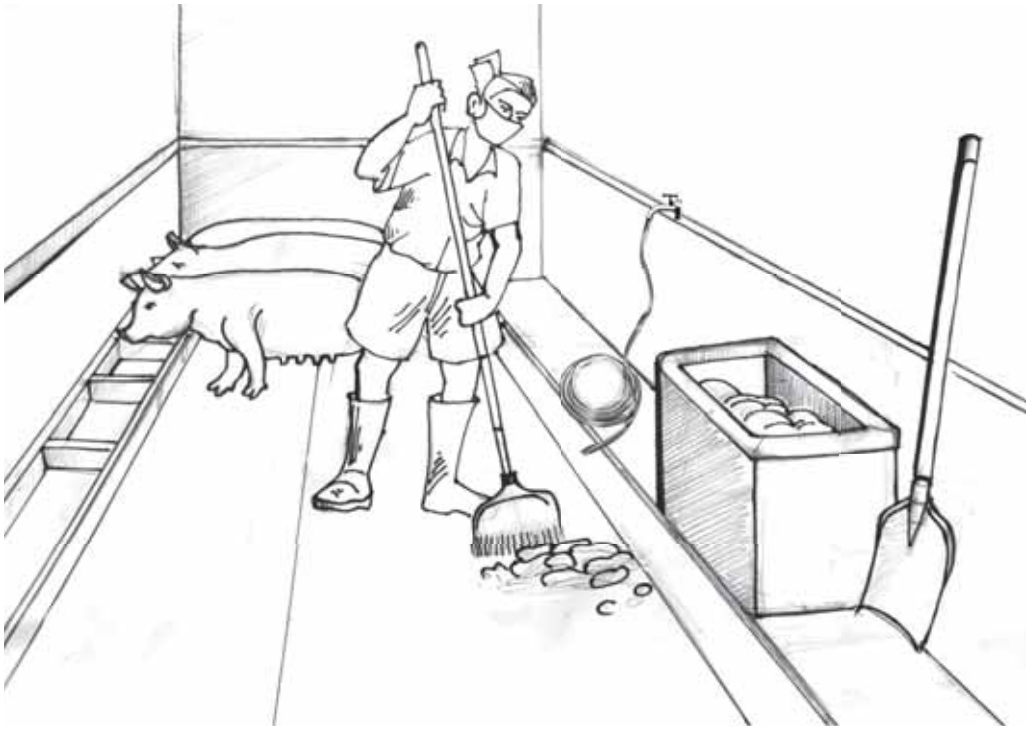
Popular proverb "**Prevention is better than cure**"-Pig farmers should always try to prevent diseases than letting the pigs to suffer from diseases and then try to recover them through treatment.

7.5.2 Importance of sanitation

Proper sanitation

- Helps in prevention and control of most of the infectious diseases.
- Helps in providing the most unfavorable conditions for germs.
- Prevents economic losses caused by infection.
- Lowers the rate of mortality and increases the longevity of animals.
- Helps in minimizing contaminations and production of good quality meat and meat products.

7.5.3 Regular sanitation programme



Cleaning of a pig farm

Infections and various disease conditions in farms can be prevented if following general sanitation practices are adopted:

- Proper ventilation of the shed should be ensured.
- All dirt in floor, walls, roof/ceiling should be cleaned thoroughly (at least once in a month).
- Proper and daily disposal of manure, feed wastes and other excreta to prevent occurring of breeding place of flies.
- Construction of proper drainage system and manure pit to facilitate drainage of liquid excreta.
- Watering and feeding utensils should be cleaned thoroughly every day with use of disinfectant like potassium permanganate, bleaching powder etc and subsequent rinsing with hot water to remove offensive smell.
- In case of earthen floor, remove 15 cm top soil and replace it by new soil/ sand.
- Burning of all sweeping and scrapings. Floor should be allowed to expose to sunlight.

- Application of heavy coating of white wash containing a reliable disinfectant (0.5 kg of lime in 4 lit of water) to the floors, walls and partitions, mangers etc.
- Judicious spraying for disinfectants surrounding the pig sty at a regular interval is essential along with cleaning of garbage.
- Dead animal should be disposed off properly through deep burying away from the farm and human habitation.

Disinfectant

- Compounds used to kill germs (bacteria, virus and parasites such as lice, mites, ticks and fleas) are called disinfectant.
- Since causative agents of many diseases are extremely small and may remain for indefinite period in dust, cracks, and crevices of buildings, disinfection must be done carefully to kill the germs in the contaminated premises.

Table 23: Common disinfectants and their level of concentrations, method of use and surface for use

Name	Concentration	Method of use	Surface for use	Remarks
Washing soda	3% solution in boiling water	Splashing, rinsing utensils	Utensils and floors	Little disinfection power but an effective cleansing agent.
Lime	½ kg lime per gallon of water as white wash+ 5% phenol.	Sprinkling, dusting of powder of lime alone.	Floors, walls and grounds	Use freshly prepared solution.
Potassium permanganate	1:10,000 solution in water.	Splashing (wet the surface with the solution)	Floors, gutters, and troughs	Disinfection action is due to oxidizing power
Phenol	2-5% solution in water	Splashing	Metallic objects and clothing	Goods disinfectant
Bleaching powder (calcium hypochlorite)	30% available chlorine	Dusting	Floors, gutters, passages	Protect it from sunlight
Boric acid	5-6%solution	Splashing	Skin, floors, walls equipments, wounds etc.	-

Source: Principles & Practices of Animal Health & Hygiene by Dr. Neeraj (1998)

Packet of Potassium Permanganate

7.5.4 Special sanitation programme (when pigs in a herd suffer from disease)

- Separate diseased animals from healthy ones (quarantine) to prevent spread of infection and to keep diseased animals under observation.
- Give curative treatment to diseased animals. Curative treatment should be given until the animals are fully recovered.
- Only the fully recovered animals should be reintroduced in the old stock.
- Thoroughly clean the premises and utensils using hot water and disinfectant. Pig sty and surrounding may be disinfected with lime, phenol, formalin, etc.

Cleaning and disinfection of farm premises and utensils

- Fresh lime can be sprinkled on the floor and walls for disinfecting them. Whitewash can be more effective disinfectant when phenol is mixed up to 5%. Lime can also be used for cleaning feed and water troughs.
- Farm utensils may be scalded with boiling water by adding washing soda.
- Teepol can be used for disinfecting metallic objects, clothing, etc.
- Skin disinfectants like iodine, iodophore, potassium permanganate, hydrogen peroxide, etc. may be used for cleaning the visible wounds of the diseased animal. Potassium permanganate is used extensively for wound dressing and foot bath.
- The dead animals, aborted materials, placenta, etc. should not be thrown away in the open field but should be buried deep enough that the wild animals like jackals/dogs cannot dig out.
- Bedding materials, gunny bags (*bosta*), curtains, etc. used for diseased animals should be burnt.

Disposal of dead carcass through deep burial method

- Discharges from nose, mouth, skin, eyes, uterus, dung and urine can become dangerous source of infection. To prevent the spread of these infective discharges, all persons other than attendant of diseased animals to be kept away from infected pens, utensils, clothing, etc.
- Dry sweeping or dusting may also be dangerous, as the organism may remain in the air of buildings and settle again on different places. Therefore, all surfaces should be moistened before sweeping and scrapping.
- All infected manure, bedding materials should be taken out carefully and burnt off.
- After completing the disinfection in every detail, one should thoroughly clean his/her hands, body, boots and other costume.
- Animal attendants and veterinarians should use protective clothing in handling of diseased animals.

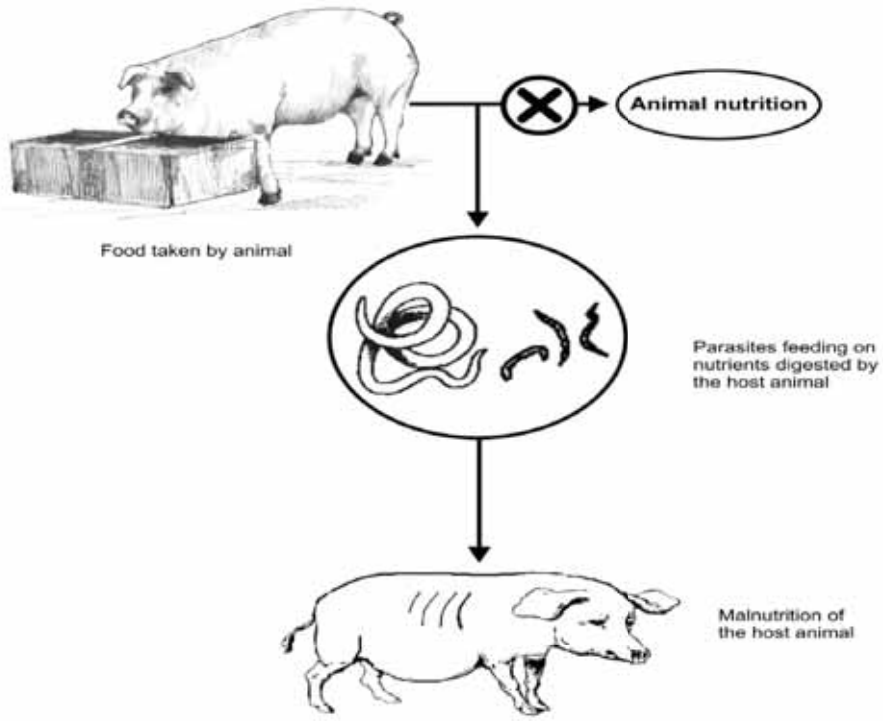
Various protective clothes used by farmers

7.6 Parasites

7.6.1 What are parasites?

In addition to bacteria and virus, there is another type of disease causing agent called parasites. It

could be either internal or external parasite and can be observed through naked eyes.



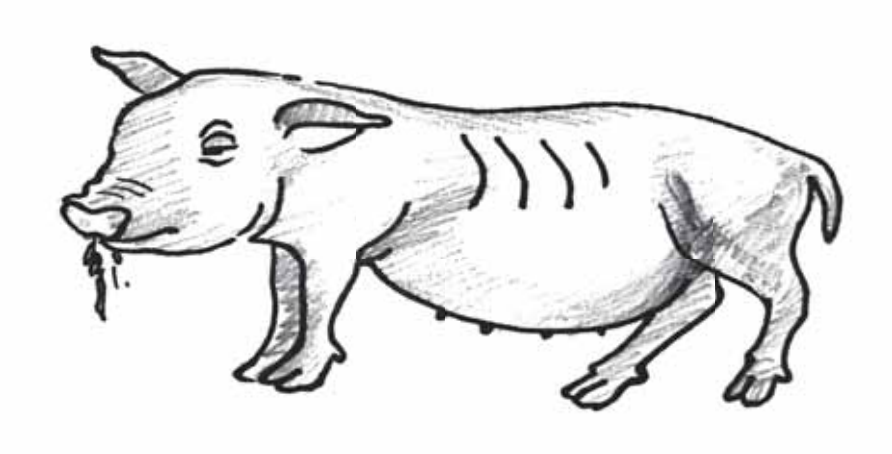
How parasites causes malnutrition in the host animal

- External parasites (lice, tick, mite, etc.) are found on the body of the animals and can be seen through naked eyes.
- Internal parasites (worms) are found inside the body of the pigs and many of those can be seen through naked eyes.
- If eggs/ worms are passed to human body through consumption of pork from affected pig, it can cause disease to human being.
- Some visible signs of pig/pork affected with parasites are appearance of cotton seed like follicle in the muscle/beneath the tongue/eye lids
- Generally the pigs coming from well managed farm contain lesser number of germs

Round worms of pig

7.6.2 Risk reduction measures from parasitic infestation

- Pigs sty, particularly floor, should be cleaned regularly with disinfectant solution.
- Pigs should not be fed green forages that are collected from damp places without boiling.
- Pig's feces should be examined at regular interval to know the presence of parasitic infestation in pigs.
- All pigs should be fed with broad spectrum deworming drugs at regular interval (six monthly).



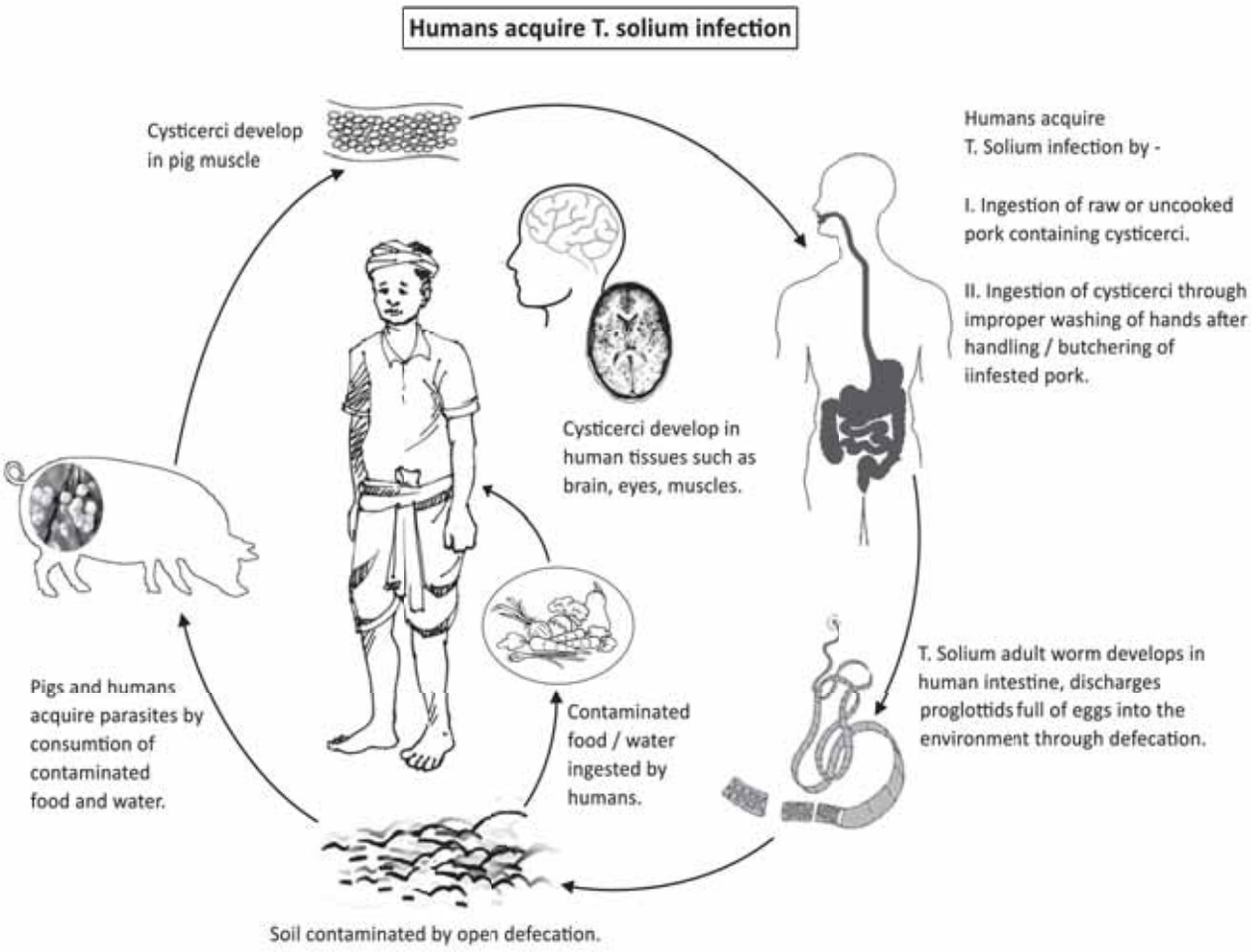
Stunted growth and pot bellied appearance in parasitic infestation

7.7 Zoonotic diseases

There are certain diseases that are transmitted from animals to human or human to animals. These diseases are called zoonotic diseases. Some of these may not affect an animal but animal can serve as a carrier of the disease. These diseases are mainly transmitted to farmers, farm workers, veterinarians, diagnostic laboratory technicians, traders, transporters and consumers through direct or indirect contact with the animals or their products/ excreta. Therefore, it is important to prevent these transmissible zoonotic diseases for both men and animals.

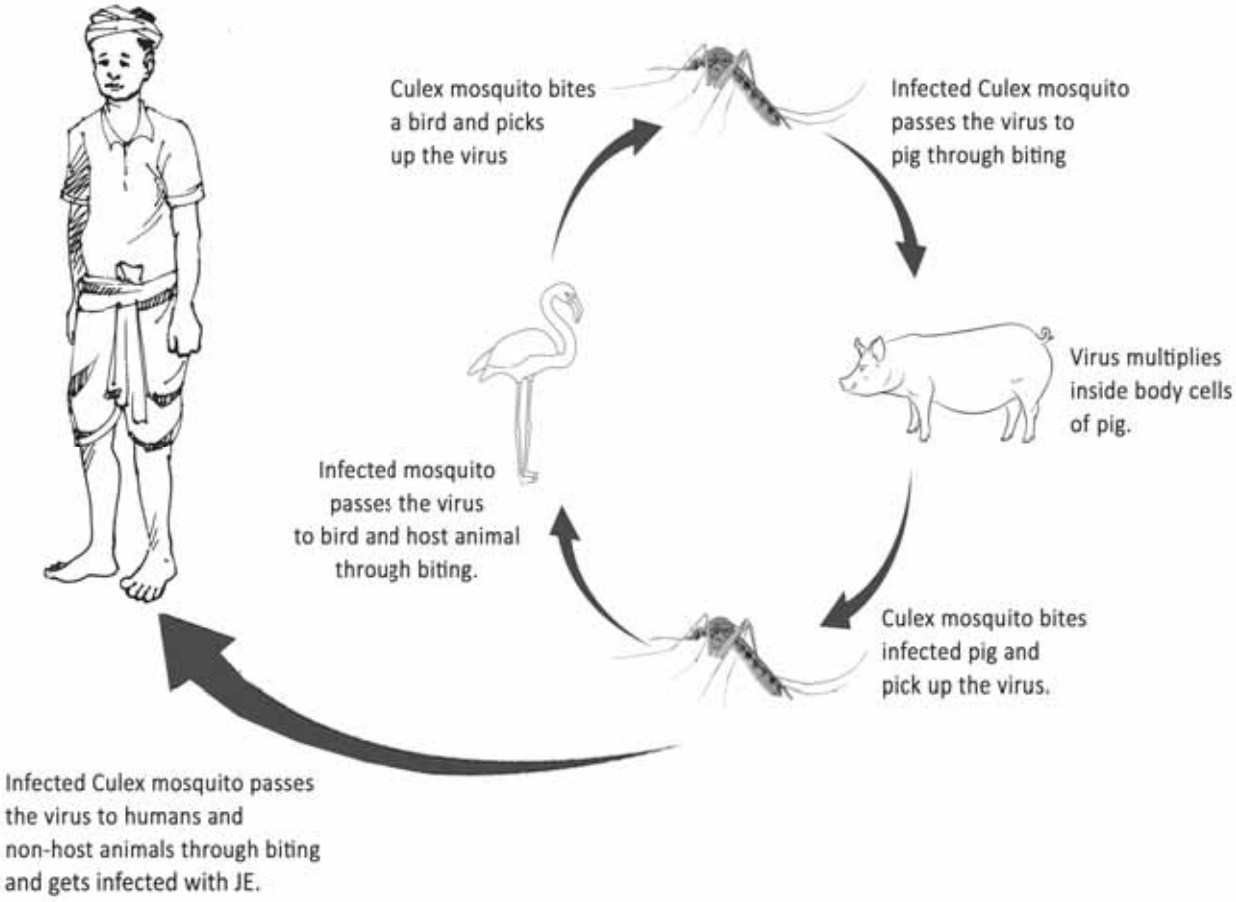
Some of the important zoonotic diseases of pigs are

Cysticercosis: This parasite can be ingested via undercooked pork or improper sanitization of hands and utensils and instruments after handling of pork. It may cause gastrointestinal signs, or as well as, neurological disease (Neurocysticercosis) and muscular pathology. Proper cooking and sanitization can virtually eliminates risk of infection.



Cysticercosis cycle

Japanese encephalitis (**JE**): This is an infection of the brain caused by the Japanese Encephalitis Virus (JEV). If infected, human suffer from occasional inflammation of brain. Symptoms may include headache, vomiting, fever, confusion, and seizures leading to death. This occurs about 5 to 15 days after infection. JEV is generally spread by mosquitoes, specifically those of the *Culex* type. Pigs and wild birds serve as a reservoir for the virus.



Japanese Encephalitis cycle

Brucellosis: This disease may cause abortion in female pigs and infertility to male pigs. One form of this bacterium can be transmitted from swine to humans. Farm workers, lab technicians, commercial pork handlers are usually exposed by contact with reproductive fluids or tissues or meat. It may cause prolonged intermittent fever, headache, body pain etc. It may affect any organ of human body and symptoms may appear based on organs affected.

Ascariasis: This roundworm infection is due to ingestion of parasite eggs, and may be related to contaminated food. Clinical signs may include abdominal pain and coughing. Proper hygiene and food handling practices greatly reduce the risk of infection.

Leptospirosis: This bacterial disease is usually spread by contact with infected urine or waste.

It causes general flu-like signs in people, but can cause miscarriage and fetal death in pregnant women. Hygienic work practices are recommended to reduce the risk of infection.

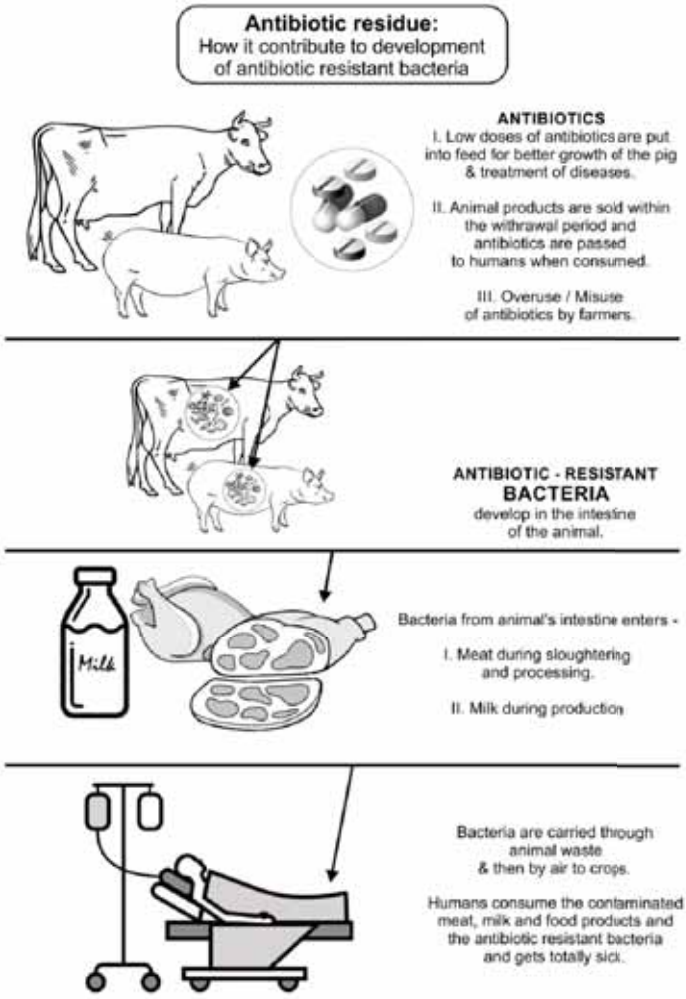
Risk reduction practices

- Diseased animals and their excreta, tissues, blood, aborted materials, etc. should not be touched with bare hands.
- Should always use mask, hand gloves and other such personal protective clothing.
- Should wash hands and feet with soap-water and should take bath after handling any such infected materials.

7.8 Residues in pork

7.8.1 Antibiotic residues

Antibiotics are given to the animals to treat infectious diseases and are also used as growth promoters for the feed that is given to the animals. The particles of these antibiotics may remain in the muscle. Humans get the antibiotic particles through consumption of meat. The germs present in the human body get exposed to these antibiotic particles present in pork and when they fall sick, these antibiotics, if taken as part of treatment measures, might not work or fail to cure the disease. To overcome this following risk reduction practices should be adopted.



Antibiotic resistance causing problem to human health

Risk reduction practices

Pig farmers should

- Not try to treat animals on their own.
- Consult veterinary practitioner for treating the animals.
- Note that all the diseases don't require the treatment by antibiotics.
- Always complete the course of antibiotics (about 5 days).
- Not consume or sell pork till three days after the completion of antibiotic course (withdrawal period).

7.8.2 Pesticide residues

Pesticide is a chemical substance used for destroying insects or other organisms harmful to cultivated crops/fodder. When the animals intake plants or feed sprayed with pesticides, the particles of the pesticide come in to pork they produce.

Risk reduction practices

- Pesticides cause a wide range of toxic effects in human. So, the pork containing particles of pesticide are harmful for you as well as to your consumers.
- Avoid using chemical pesticides on the farm. Herbal pesticides may be used instead of the chemical pesticides.
- Avoid giving your animal the feed that are cultivated in an area where pesticides are used in cultivation of feed and fodder.

7.9 Aflatoxins

Pork gets contaminated with aflatoxins due to the consumption of maize stored in damp/wet places. These toxins can pose health hazards in the pork consumers.

Risk reduction practices

- The feed and fodder given to the animals must be stored in a clean and dry place.
- The stored feed must not come in contact with water/moisture.
- The storage area must have proper ventilation.

Group discussion: Human health risk from pig farming:

Instruction for the resource person: Ask the participants to divide in four groups and ask them to discuss on the possible risk to human health in their context from the following diseases/conditions

1. Infectious bacteria/viral disease
2. Parasitic disease
3. Antimicrobial residues
4. Pesticide residues

At the end of the discussion each group member will present the key points. Resource person will add, if required.

Key message of session 7

- The farmer should acquire the basic knowledge of germs causing diseases to pigs, zoonotic diseases, worms, their mode of transmission, disinfection, sanitation, etc.
- He/she should maintain regular sanitation measures in his farm including provision of a foot bath/dip, apply suitable disinfectant in the farmstead, properly dispose off the dead pigs, isolate the pigs suffering from infectious/ communicable disease in the quarantine shed, etc.
- He /she should observe the pigs regularly for any kind of external parasites and take necessary measures if found any.
- He /she should carry out faecal sample examination in the nearby Vety. hospital for occurrence of internal parasites and take necessary measures if found any.
- He /she should go for periodic deworming in consultation with the local veterinarian
- He /she will not collect feed/feed ingredient from a source where it is known to be contaminated with pesticides or it is found to be mouldy.
- He /she should never use antibiotics by his own.

SESSION 8: Restraining/Handling and Transportation of Live Pigs

Session objectives
• To make the participants know the different methods of restraining and handling pigs for treatment and travelling. • To make them understand the care to be taken during loading and transportation in vehicles
Training methods to be followed
• Participatory discussion • Distributing manual and relevant handouts • Demonstration
Training materials
• Laptop, LCD projector and screen • Whiteboard and markers (multiple color) • Manuals and handouts • Photos and illustrations • Flip chart • A growing pig and piglet • A rope for restraining

8.1 Natural behaviour of pigs

- Pigs are social animals.
- They, by virtue of their natural tendency, like to follow each other.
- Pigs find it difficult to adjust in Isolation from a group.
- Pigs, when removed from or added to a group, they will fight to re-establish social order.
- Pigs spend much of their time in forage-related activities, such as rooting, grazing and exploring with their snout.
- Pigs have tendency to chew any object, even ears or tails of each other.
- Pigs don't have sweat glands and hence, cannot withstand exposure to hot weather conditions. Avoid handling pigs under such conditions.
- To escape is a natural tendency of pigs for which they frequently injure themselves.
- Pigs don't like darkness, so they can be led to lighted areas easily for transportation, driving, etc.

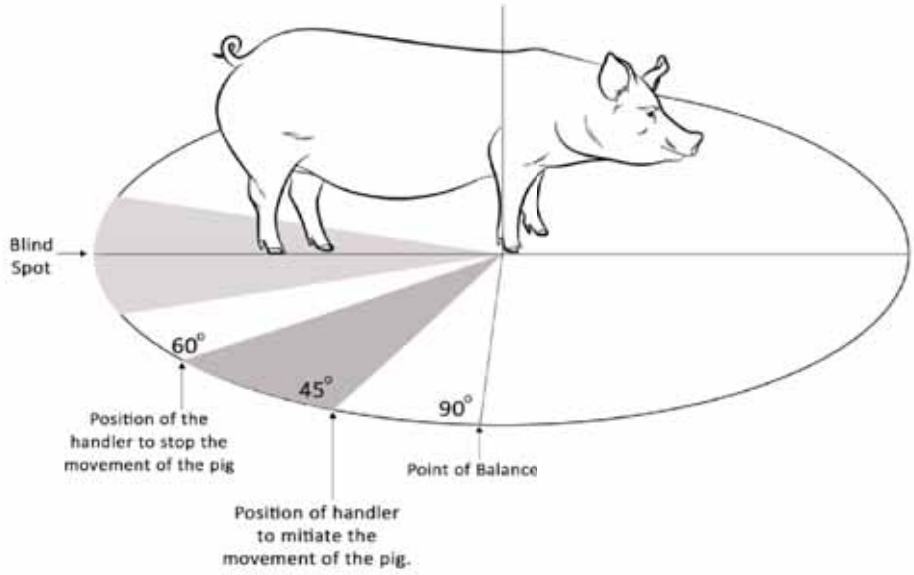
8.2 Flight zone and point of balance

Handling of pigs becomes much easier if the pig's flight zone and point of balance is understood well.

- The mid-point of shoulder of a pig is called the **point of balance**. Pigs can be touched or handled in this point comfortably without causing any panic or fear to the pig.
- If we draw an imaginary line along the bodyline towards the tail and another line through the point of balance transverse to the body line, an angle of 90^{O} will be formed.
- If one moves from the shoulder towards the tail to cover 45°, the pig will move forward
- If moved further up to 60^{o}, the pig will try to stop moving

- Again, if one moves further to the tail end of a pig (this point is called **blind spo**t) and stand at this point , it cause fear/panic to the pig

Flight zone & point of balance



Flight zone and point of balance

8.3 Demonstration on how to handle piglets and mature pigs by different methods for treatment and transportation

Pigs need to be restrained (controlled) for different purposes, such as-checkup of general health, administration of medicines, conducting minor surgical operation, giving identification mark, etc. The First Aid (FA) practitioner must know appropriate techniques of restraining pig for safety of the animal as well as for himself. There are different methods of restraining both pigs and piglets. The most common methods of restraining pigs/ piglets are stated below.

A piglet can be restrained by two ways

8.3.1 Restraining piglets on its side (for injection/ vaccination/treatment)

- At first, the piglet is placed in a room or pen where it is to be restrained;
- After cornering the piglet, hold the rear leg with one hand and use the other hand to grasp the front leg on the same side of the pig as shown in Figure;
- Holding the front and rear legs, lift the pig completely off the floor and gently but firmly put the pig back on the floor;
- Use your knee to put pressure on the side of the pig to retain the control.

Restraining piglet by putting pressure on the back

8.3.2 Restraining piglet by holding its rear legs (for transportation)

- At first, the piglet is placed into a room or pen where it is to be restrained;
- After cornering the piglet, one should catch the piglet by grasping its hind legs with one or both hands. He/she should quickly adjust his/her grip and hold the pig's back against the front of the handler's legs and its nose to the ground;
- He she should lift the piglet free off the ground by bringing both of its rear legs up to almost the height of his/her waist.

Restraining piglet for transportation

8.3.3 Method of restraining older or heavier pigs

For restraining heavier pigs, following methods are commonly used.

Restraining by using a slip knot

- A loop is prepared with a rope by a giving a slip knot as shown in the photograph. The strength of the rope must be in proportion to the size of the animal.
- One should put the slip knot in to the mouth and over the nose /upper jaw. The handler should make sure that the loop is above the tongue and pulled back into the mouth, and the loop is not around the lower jaw;
- He/she needs to pull the other end of the rope as tight as possible.

- The rope is then tied off on a post of the shed or a tree .It is best to limit the length of the rope to only a foot or two in order to restrict the movement of the pig.
- After completion of the intended job, one should loosen the rope from the pig by pulling the slip note and quickly move away

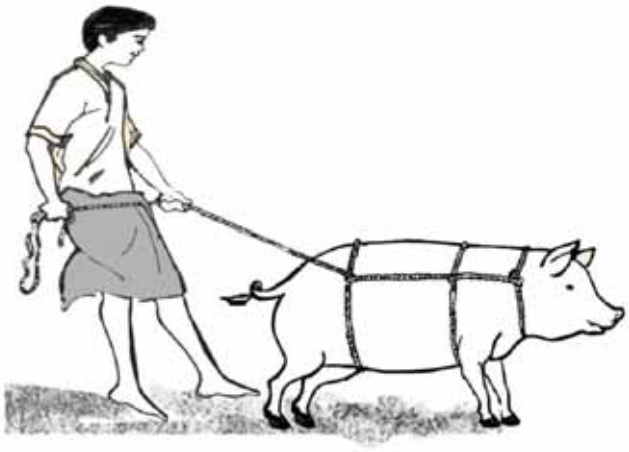
Preparing a slip knot

Restraining a heavier pig with the help of a rope

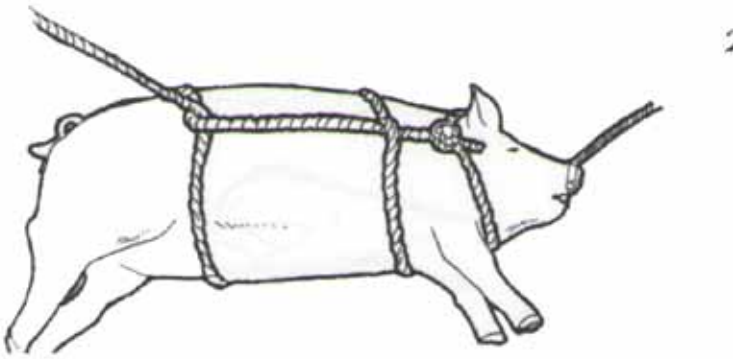
Restraining by laying the animal on its side

In case of surgery, foot trimming, or other management procedures

- The pig is restrained using a slip knot;
- A loop is formed at the end of a 15' length rope and is placed around the neck of the pig taking care not to place the knot on the top of the neck but on the side of the neck;
- One should use the long end of the rope to give another half hitch around the body immediately behind the front legs;
- He/she will take the rope further back along the top line and place a second half hitch just in front of the rear legs;
- The pig can now be laid upon its side by pulling on the end of the rope that extends to the rear beyond the second half hitch; (as shown in the illustration);
- As the animal begins to go down in response to the tightening hitches, it can be guided with the rope and snare to lie on one side or the other;
- When the management task is completed, one should loosen the half hitches;
- Finally it is to remove the slip knot and observe the pig for a few seconds to see whether it is recovering properly or not.



Efforts to restrain a pig by pulling the rope



A restrained pig

Restraining by grasping the tail and lifting the hind quarter

This is one of the commonly used methods in the field condition for minor procedures like administering medicines, local applications, injections, ear tagging, etc. This method includes:

- One should gently approach the pig without making it scared, preferably by the attendant/ owner;
- Then to get the animal familiarized by gently petting over the back;
- One should go on petting towards the tail and catch hold of the tail on the base with both the hands within a fraction of second and then to lift the hind quarter upward;
- The pig will show only a limited movement with the forelimbs;
- The pig may be restrained by tying its legs with a rope for even better control.

Effort to restrain a pig by holding on its tail

Restraining by tying the fore-legs and hind legs separately

- The pig is laid on its side with the help of three or four persons securely applying force;
- The fore legs are closely tied with a strong rope;
- Same procedure is applied to the hind legs;
- A 3-4 feet long rope is passed through the middle of the left and right legs along the body length and above the knots tied already to the legs;
- A knot is given with both the open ends of the rope in such a way that all the four legs are closely brought together;

- One should put some pressure over the shoulder area with the knees;
- Then some extra pressure is put over the shoulder area with a bamboo pole being held by two persons if required.

Caution

Pregnant pigs should not be restrained unless it is of utmost necessity. If it is very essential, adequate care should be taken so that no harm is caused to the fetus.

- Never to restrain the pigs on uneven surface or very hard surface (e.g. rock)
- Never to restrain the pigs under direct sunlight during hot summer.
- Never to restrain the pigs on hot surface like sand during hot summer.
- Never to restrain the pigs in dark.
- One should never beat the pigs during restraining. It is better to offer some feeds during restraining and handled with care to make it comfortable.
- One should gently release the pigs after restraining to avoid any unintended injury.

8.4 Transportation of pigs

Points to be considered during transportation of live pig/ piglet

Improper handling of pig prior to and during transportation may result in excessive shrinkage loss, wound, injury, crippling loss, occasional death and dissatisfied customer.

Normally for transportation of pig/ piglet by road, truck/ mini truck/ auto van/ pulling cart is used depending on the distance and number of pigs to be transported. For long distance travel, train is preferred. During the process of transportation of pig, following precautions should be taken:

- Transporter should clean, disinfect and change the bedding materials (sand, straw, etc.). Generally pig is transported with about 1 inch (2.5 cm) sand, and in wintertime straw is placed on top of the sand but not during hot weather.

Clean and adequate bedding materials

- Care should be taken that pigs are properly loaded. Below capacity loading can be just as dangerous as overloading. In the case where truck or train bogey is not fully loaded one may use partition to keep the animals closer together; and in very long trucks to keep animals from crowding from one location to another.

Use partition in truck that is not fully loaded to keep the animals closer together

Consequences of loading only a few pigs in a truck for transportation

- Provision of halt is the single most important factor for consideration during transportation. Halting time and place should be finalized and organised before starting the journey in order to avoid any last minute hassles.
- Animals should be fed and watered properly prior to loading. Pig transported should either be fed lightly or withhold feeding for 12 hours before loading depending on distance, temperature and treatment upon arrival.
- Pigs that are overfed or watered in excess at the time of loading defecate and urinate excessively. As a result, the floor becomes dirty and slippery and the animals may feel uncomfortable. Such pigs shrink heavily and present an unattractive appearance when unloaded.
- Efforts should be made to keep the pigs quiet. Hot, excited animals experience more shrinkage and are more prone to injury or death.
- Transporter should never lose temper and should avoid hurrying and striking. The animals should not be beaten with such objects as pipes, sticks, canes or forks; instead a flat, wide canvas slapper or something like broom should be used.
- When mixed loads (consisting pig, cattle, goat etc.) are placed in the same truck or train bogey, partition each class of animals separately. Also, boar, sow, piglet, diseased pig should be properly partitioned.
- Whenever possible, avoid transporting particularly when weather is too hot or too cold. During such time, shrinkage and death losses are higher than normal weather. During warm weather travelling at night or in the evening is suitable. If required, wet the sand during hot weather.

Pigs shall not be transported during hot sunny hours of the day

- Drive truck carefully. Slow down on sharp turns and speed breaker. Avoid sudden stops. Provide covers for trucks to protect from sun during summer and cold during winter.

Consequences of overloading a truck and sudden stop during transportation

- Remove protruding nails, bolts and sharp objects in truck or train.
- Do unloading slowly and carefully. Do not drop animals on the ground. Back the truck slowly and squarely against unloading dock.

Proper unloading of piglets

Pigs shall not be unloaded inhumanly

Demonstration: Restraining and handling pigs

Instruction for the Resource Person: The training facilitator shall arrange one piglet and one growing pig from farms nearby to the training venue and also one rope meant for restraining. The resource person with the help of couple of participants shall demonstrate the various techniques of restraining and handling pigs. This will be followed by a discussion among the rest of the participants on the techniques of handling and restraining pigs.

Key message of session 8

- It is very important to properly handle and restrain the pigs/piglets for various purposes like-treatment, vaccination, deworming, first aid, castration, transportation, etc. Unless handled properly, there may be injury to the animal as well as to the handler
- The farmer should approach the pig in a very friendly way, by petting on its back or scratching the belly before restraining.
- The farmer should restrain/ handle the pigs in the proper way and to take help from other person if necessary. Haphazard way of restraining would lead to severe injury to the pigs.
- A pregnant sow should be restrained only when it is of utmost necessity, and that to be done under the supervision of the local veterinarian. Never to restrain a pregnant sow by casting or laying on its side.
- Care should be taken while lifting the hind quarter by holding the tail. Always catch hold of the tail at the base and not at the tip.

SESSION 9: Welfare of Animals and Care for Environment

Resource person
An experienced AHVD officer or an experienced pig trader
Session objectives
• Make the participants understand ways for mitigation of environmental stress arising due to rearing of pigs • To make the participants understand the importance and practices of animal welfare (more particularly of pigs).
Training methods to be followed
• Participatory discussion • Distributing manuals and relevant handouts • Experience sharing
Training materials
• Laptop, LCD projector and screen • Whiteboard and markers (multiple color) • Manual and handouts • Flip chart

9.1 Care for environment

While we plan for piggery development, we should also think of environment in order to reduce the negative impact on environment. Consumers have also increasingly become more concerned about the environment and they prefer to take food/animal products produced in eco-friendly environment. Pig farmer should play a constructive role in protecting environment by reducing effect on air, water, land and natural resources. In promoting piggery, following points should be taken into consideration for environmental protection:

- Reduce, Reuse or Recycle (RRR) farm waste as appropriate. Stress should be on scientific use of farm manure either for cultivation or for fuel production.
- Do not allow farm waste to get into the water stream/ drains that may pollute the water reservoir used for taking drinking water by men or livestock.
- Provide feeds and fodder that are easily digestible. This would result lesser greenhouse gas emission from pigs, lesser feed requirement and increased productivity.
- Reduce use/ wastage of water and energy by improved housing and management.
- Reduce off smelling/ bad odour in farm premises by adopting improved clean and hygiene practices and proper drainage in order to reduce environmental pollution.
- Dispose dead animals, aborted materials, biological waste etc. by burying to prevent spread of infection.
- Avoid disposing off veterinary medicines, vaccines and their containers, etc. to open places/water bodies where those may pose a potential threat to the local environment.

9.2 Animal welfare

Animal welfare is primarily concerned with the well- being of the animal. In general, consumers perceive high animal welfare standards as an indicator that food is safe, healthy and of high quality.

Animal welfare organizations mainly talks about 'five freedoms' in regard to animal welfare. These five freedoms are stated below:

9.2.1 Ensure animals are free from thirst, hunger and malnutrition

- Provide sufficient feed and clean drinking water for all animals everyday as per their nutrient requirement at different stages of their life.
- Protect animals from toxic plants and other harmful substances.
- Do not feed animals with mouldy feeds.
- Store chemicals securely to avoid contamination of pastures, and observe withholding periods for pasture and forage treatments.

9.2.2 Ensure animals are free from discomfort

- The farm house should protect the animals from all adverse climatic conditions.
- Adequate floor space should be allowed to the animals for their comfortable stay.
- Protect animals from adverse weather conditions (hot, cold, rains etc.) and the consequences there of.
- Have plans to protect pigs against emergencies (for example back-up power supplies) and natural disasters (for example fire, drought, flood, earthquake etc.).
- All animal housing should be adequately ventilated allowing sufficient supply of fresh air to remove humidity.
- Proper care should be taken for comfortable transportation, feeding, watering and loading and unloading of animals.

9.2.3 Ensure animals are free from pain, injury and disease

- Check animals regularly to detect injury and/or disease. All the injured/ diseased animals should be treated.
- Do not use procedures and processes that cause un necessary pain.
- People carrying out veterinary related tasks should be able to demonstrate competency to treat an animals or to do castration, injection etc.
- Avoid castration by local community people.

9.2.4 Ensure animals are free from fear

- Pigs should be handled with care to keep them free from fear.
- Pigs should not be beaten up.
- Avoid producing loud noise near the farm/animal.
- Use suitable farm utensils, bedding material etc. that are suitable for pigs.
- Do not unnecessarily disturb animals at odd hours.
- Animals should be checked for any abnormal behavior every day.
- Allocate sufficient space for comfortable stay of the pigs.

Experience sharing

Instruction for the Resource Person: The training facilitator will identify couple of participant farmers who have seen pig husbandry practices showing cruelty to animals/welfare of animals of other farmers and its repercussions on farming (if any). This will be followed by a discussion among the rest of the participants on the do's and don'ts for the cruelty/welfare of their pigs.

Key messages of session 9

- While running a piggery farm, there is production and generation of different types of waste having negative effect on environment. There may be emission of foul smelling gases, green house gases, pollution and contamination of water sources.
- The farmer should not allow contaminating the source of water by the waste generated in the farm.
- The farmer should bury the dead pigs or other biological waste and the left over medicine, vaccine vials, etc.
- Never keep the pigs under starvation, in unhygienic condition, under stressful condition, in panic, left untreated, unnecessary beating, etc.
- Never handle/restrain in a harsh way which may lead to stress and injury.

SESSION 10: Entrepreneurship Development in Pig Farming

Session objectives
• To give a gist on the plan to be taken by an entrepreneur for an improved pig farm. • To give an idea on improving personnel business and behavior skill needed for entrepreneurship. • To guide in marketing of pig by an entrepreneurial farmer
Training methods to be followed
• Participatory discussion • Distributing manuals and relevant handouts • Case study
Training materials
• Laptop, LCD projector and screen • White board and markers (multiple color) • Manual and handouts • Post training evaluation form • Flip chart

10.1 Who is a livestock entrepreneur?

- An individual who create a new profit making animal based farm/ enterprise.
- An individual who is capable to plan, execute, lead and take risk.
- An individual who enjoys most of his profit/revenues generated out of the farm/ enterprise.

10.2 How an entrepreneur can plan for an improved pig farm (based on the knowledge gained in the previous chapters)

10.2.1 To determine the size of the farm

- Assessing own financial resources and capacity;
- Assessing the capacity to avail credit;
- Working out the economically viable size of the farm;
- Working out the total expenses required;
- Working out the estimated production in a year;
- Assessing the market demand and price;
- Working out the expected revenue to be generated;
- Assessing the availability of farm inputs, labour and other resources;

10.2.2 To determine the infrastructure requirements

- Identify a suitable site for starting the farm;
- Decide the type of housing to be followed (conventional scientific/modern scientific etc.);
- Decide the type of materials/structures to be used for housing (concrete, wooden, slated floor, cage, automatic drinker etc.);
- Working out the total infrastructure requirements (pig sheds, quarantine sheds, water,

electricity, drainage, approach road etc.);

- Decide the farm waste disposal/use options (bio gas plant, farm manure, vermin-composting etc.);
- Decide the bio-security infrastructure requirement and implementation plan;
- Decide the feeding regime and required infrastructure plan (fully concentrate/partly concentrate/fully non-conventional) ;
- Decide the feed arrangement plan (farm produced/procurement from outside) ;
- Decide market infrastructure and equipments required, if any;
- Prepare the design and layout;
- Make a cost estimation of the total infrastructure to be created;

10.2.3 To determine the operationalization of the farm

- To work out the number of piglets (male and female) to be introduced in phased manner.
- To identify the possible sources of piglets (breed, growth performance, price, transportation cost, certification process)
- To identify the possible sources of concentrate feed/feed ingredients (price, quality, ease of transportation etc.)
- To make arrangement for procurement and storage of quality feed/feed ingredients at competitive price
- To make arrangement for procurement of non-conventional feed stuffs and cultivation food feed crops, including storage of them.
- To make arrangement for procurement, storage and administration of vaccines and dewormers
- To make arrangements for need based veterinary services with an experienced local veterinarians
- To work out the labour requirements and their skill development plan (numbers, trainings, exposure visit plan)
- To recruit preferably experienced labourers/supervisor/farm manager
- To regularly assess the comparative market demand and price of farm produce (fattened pigs and/or piglets) and choose profitable market option.
- To make arrangement for keeping different farm records and books of accounts for proper farm planning (preparing formats of record keeping)

10.2.4 To operationalize the access to institutional services plan

- To do the needful to get access to credit from Banks
- To do the needful to get insurance services from reputed insurance companies
- To establish network with all concerned (bank/insurance company/input suppliers)
- To establish network with the AHVD to get access to benefits offered by department under different govt. supported schemes

10.2.5 For successful implementation, following points should be considered

- The entrepreneur should be ready to devote time and energy for management of the farm. One should not solely depend on others' labour for management of the farm.

- Initially, the size of the farm should be within manageable limits from all aspects. It may even be necessary to start first with the help of the family members/1-2 hired labourers.
- In the case of limited capital in hand, improvement of infrastructure like land development, boundary fencing, farm building, etc. should be taken up in a phased manner.
- Under similar circumstances, initially farmers should consider investing sufficiently on productive components like piglets, feed, health care and management, and subsequently he/she can improve the infrastructure from the revenue generated out of the farm.
- In the same way, only good quality piglets have to be purchased and fed adequately to ensure more production and more profit. The health care measures must not equally be ignored.
- Consultation with a veterinarian or experienced person to learn about the suitable breed, housing system, etc. is helpful.
- Before purchasing piglets, different pig breeding farms may be visited in the area to assess performance and history of different pig herds. Ideally, piglets should be procured from same the agro-climatic condition.
- The pigs should be vaccinated with good quality vaccine against prevailing diseases like swine fever, FMD, etc.
- De-worming drugs have to be administered periodically.
- Cleanliness of the farm must be maintained.
- Food-feed crops like maize, tapioca, colocacia, sweet potato, etc. as mixed feed for the pigs may be cultivated.
- Farmers should know how to weigh the pigs through heart girth method or weighing balance.
- Loan, if any, must be repaid timely to build reputation with the bank.

10.3 Personal business and behaviour skill of a pig entrepreneur

In order to promote the farming business of a pig entrepreneur, he should inculcate certain good business and behavioural skills as follows:

- **Active listening skill:** A pig entrepreneur should possess the skills to listen actively while dealing with his stakeholders, customers and input suppliers (including labour). He should also be able to read body language as well as verbal communication. He should try to respond according to the opinion of persons with whom he is dealing with.
- **Keep emotions in control:** Sometimes conflict may arise with the input suppliers and customers. So, a pig entrepreneur should have the ability to keep his emotions under control even under difficult circumstances.
- **Clear and effective communication:** A pig entrepreneur should communicate to his clients the way they understand the most. The customers and traders may be a simple person with lesser business tricks. A pig entrepreneur, while negotiating with them, should try to communicate slowly and clearly without expression of any excitement, anger and emotions.
- **Collaboration and teamwork:** For effective business management of a pig entrepreneur, he will need support from many others. To strengthen his association with others he should take all concerned into confidence, communicate transparently, keep commitment, discuss issues on time, give due share/credit for their contribution and appreciate the

contribution that others have made in making things happen.

- **Problem solving skills:** A pig entrepreneur may confront variety of problems in the field while delivering the services. He should try to inculcate good practices that may potentially diffuse the tensions. He should avoid stating/behaving the way that may escalate the situation. He is the best person to judge the situation and behave according to need.
- **Decision making ability:** When a pig entrepreneur faces a business client with particular problem, he should have the ability to correctly assess the situation and make a decision which is appropriate under the given circumstance and act accordingly. If required he may discuss with other business associates or any other concerned person prior to making the decision.
- **Maintaining good relationship:** A pig entrepreneur should always try to maintain friendly working relationship with all concerned for making his business even better and rewarding**.**

10.4 Marketing

For good marketing of the farm products, the entrepreneur shall have to

- Study the nearby markets for the price, availability, seasonality, etc.
- Design the farming schedule in such a way that the products could be sold during the festive seasons when the price is higher.
- Look for availability of suitable and preferred breed.
- Look for availability of feed ingredients at a cheaper price.
- Record body weight gain at regular interval.
- See whether optimum weight is gained at slaughter age.(breed specific)
- Do regular vaccination and deworming
- Provide feed containing optimal proportion of different nutrients.

Case study

The training facilitator will identify a local pig entrepreneur before the start of the training and invite him during the particular day when this session is planned. The pig entrepreneur will explain to the participants the grow up of his business from the scratch and will also tell the cyclical ups and down in the business, his overcoming and learning's from the cyclical trend of his business and lessons the fellow trainees should learn.

Table 24: Sources of the images of various disease symptoms of pig

Sl. No.	Name of Disease	Symptom	Source
1	Classical Swine fever (CSF)	A pig with CSF symptoms.	*https://www.dayafterindia.com/2017/08/07/210-pigs-piglets-died-classical-swine-fever/*
		Bluish purple colour and bleeding under the skin	*https://thepigsite.com/articles/how-to-farm-pigs-health-issues*
2	Foot and Mouth Disease (FMD	FMD lesion of foot	*https://www.pigprogress.net/Health/Health-Tool/diseases/Foot-and-Mouth-Disease-FMD/*
		FMD lesion of snout	*https://www.agriculture.gov.au/biosecurity/australia/naqs/naqs-target-lists/fmd*
3	Porcine reproductive and respiratory syndrome (PRRS)	Respiratory symptoms in PRRS	*https://www.globalmeatnews.com/Article/2013/03/21/New-Zealand-court-rejects-pork-industry-s-PRRS-plea*
4	Cysticercosis	Cysticercosis (measly pork)	*https://factcheck.afp.com/no-your-heart-wont-look-simply-eating-pork*
5	Mange/ scabies	A pig infested with mange	
		A pig heavily infested with mange(whole body)	*https://www.cram.com/flashcards/swine-medicine-8204708*

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Annexure-I

Performance Indicator-Training of Pig Farmers

Sl No.	Performance Indicator (CB pigs)	Expected performance	Achieved Performance	Remarks
1	Litter size at birth (average no.)	10		
2	Piglet mortality rate	10%		
3	Breedable age of gilts	6-8 month		
4	Body weight at birth	2 kg		
5	Body weight at weaning	8-12 kg		
6	Litter size at weaning (average no.)	9		
7	Demand for piglets at the farm gate	Very high		
8	Age of attaining 80 kg body weight	8 months		
9	Age at weaning	6 weeks		
10	Breed characteristics of piglets	Prominent		
11	No. of croppings per year (no)	1.8		
12	Time required to come into heat post partum	60 days		
13	No. of abortion/ stillbirth	Negligible		
14	Occurrence of scrotal hernia and other physical deformities	Negligible		
15	Stamped death of piglets	Negligible		
16	Boar used for service per week	2 times		
17	Breeding, feeding and health care records	Yes		
	Increased in income than before training	Increased in 25% than before		

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