Artificial Insemination – Level1

Learning Guide

Unit of Competence: - Design Strategies and Deliver Genetic Improvement Service

Module Title: - Designing Strategies and Deliver Genetic Improvement Service

Artificial Insemination – Level1

Learning Guide # 39

Unit of Competence: - Design Strategies and Deliver Genetic Improvement Service

Module Title: - Designing Strategies and Deliver Genetic Improvement Service LG Code: AGR ATI1M 12 LO1- LG-39

TTLM Code: AGR ATI1M 12 TTLM 0919v1

LO1. Assess AI services in genetic improvements

Instruction Sheet	Learning Guide #39

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Assessing major required operations in AI services
- Discussing Advantages and Disadvantage of AI

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- Assessing major required operations in AI services
- Discussing Advantages and Disadvantage of AI

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
6. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	Assessing major required operations in AI services

1.1 **Assessing major required operations in AI services**

Introduction

Artificial insemination (AI) has been defined as a process by which sperm is collected from the bull, processed, stored, and artificially introduced into the female reproductive tract for the purpose of conception.

The acceptance of AI by farmers and good conception rate both depend largely on the regular daily availability of the service throughout the year without interruption.

The Organization should be adapted to local conditions and the AI Programmed must be well planned and the availed resources should not be dispersed too far, since the continuity of operation primary relies on the interest of farmers to improve their herds with AI and the number of animals to be presented for AI services.

Based on research recommendations both from the country and other tropical countries regarding breeding operation, NAIC follows and always makes suggestions to the field staff in regions to implement the following activities:-

- The indigenous cattle to be inseminated with HF or Jersey as per the local choice to produce crossbreds.
- Crossbreds to be inseminated with crossbred bulls of HF x indigenous or Jersey x indigenous accordingly based on the crossbred female type to maintain the desired exotic inheritance at approximately 50 – 75%.
- Indigenous breeds to be inseminated with indigenous as per local

1.1.1 Role of inseminator

The present conception rate for AI with frozen semen at the field level is reported to be low. The main reason is

- Improper handling and / or deposition of the semen.
- **Thawing** and i**nsemination** are the two important phases to be handled by the inseminator with most care With chilled semen
- Deposition of semen either, in cervix or uterus results in same conception. While with frozen semen
- if semen is deposited in the vagina conception is very low,
- if deposited in cervix the conception rate is lowered
- Optimum conception occurs with deposition in the body of **uterus**.
- The service of skilled inseminator is essential in maintaining optimum fertility in the field.
- It has been observed that inseminators who had been inseminating for many years were only 25 % accurate in semen deposition. Though it is very difficult to motivate experienced inseminators it certainly demonstrates the need for retraining.

1.1.2 Nitrogen Tank

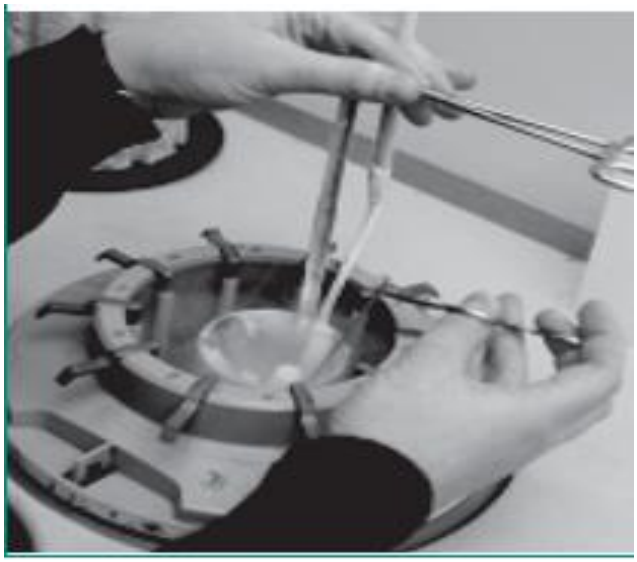
- Check that the semen in tank is full of liquid nitrogen when delivered.
- Twice weekly, check liquid nitrogen levels in the semen tank.
- Twice weekly, check the semen tank for 'frosting' on the outside of the neck of the tank. This indicates a tank insulation breakdown.
- Identify straws using coloured marker rods placed in the goblets (or a similar system).
- Know the location of each bull's semen before you retrieve the straw from the tank. You only have two seconds to check the bull's name on the straw before it starts to thaw.

1.1.3 Semen storage and handling

The sperm contained within frozen semen straws are fragile and require great care when handling

Proper AI practice:

- Know the location of each bull's straw before lifting the **canister.**
- Lift the canister only as high as the 'frost line'.
- Only lift the canister up to the 'frost line' in the tank to select straws
- Lift selected straws using tweezers.
- Lift selected straws using tweezers; only lift one straw at a time.



1.1.4 Thawing straws

The major objectives of t**hawing** are-

- To bring the sperms to incubation temperature
- To make the sperms metabolically active and efficient.
- To achieve dynamic activities of the sperms in terms of its motility and fertility
- To achieve the best possible conception rates after AI
- To make the sperms compatible for the process of AI

1.1.5 Thawing of semen

Theoretically, the faster a sperm is frozen; the more rapidly it should be thawed for optimal survival.

- To bypass crystallization zone, thawing must be rapid and uniform.
- The most convenient method is to plunge the straw in warm water.
- The temperature should be **38- 40 °C for10- 60** seconds for optimal survival of spermatozoa.
- During thawing entire straw must be completely submerged in water bath.

Thawing straws Procedures

- Prepper Hot water

- Thaw straws in a water bath kept at 32–38°C for at least on average 30 seconds.
- Keep straws in the water bath until shortly before use.
- Monitor water temperature continuously with a thermometer in the water bath. Semen **rapidly damaged if thawed in temperatures outside the 32–38°C range.**
- An automated thawing flask that controls water temperature is useful if you are inseminating large numbers of cows.
- Ensure the water level covers all but the top 1 cm of the straw.
- On cold days, rub the gun briskly with a dry paper towel to avoid cold shock and keep the loaded gun warm before use.
- Only touch the ends of the straw and do not allow it to flick.
- Dry each straw thoroughly with a paper towel before loading into the gun.
- Load the straw into the gun, then cut it at right angles with clean scissors before covering with a sheath.
- Keep the loaded gun free of contamination and out of direct sunlight.

1.1.6 Procedure for loading the AI Gun

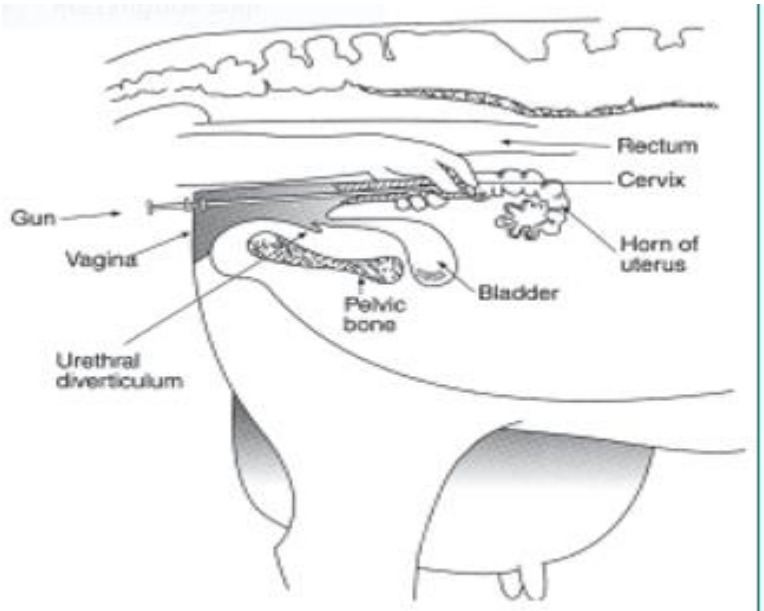
- Identify the canister from which the desired semen is to be taken. Ascertain the colour of the straw by reading identification tag.
- Remove the lid from the container and lift the proper canister up to the level of the frost line. Never lift thecanister above the neck level.
- With a help of forceps, grasp an individual straw and remove it, at the same time lower the canister immediately back into the container. If you are unable to take the straw within 10 seconds, lower the canister back to nitrogen, wait for some time and make next attempt.
- With the wrist movement give one or two jerks to the straw to expel liquid nitrogen trapped at the end of factory seal.
- Dip the straw into a clean water bath at 37- 40 °C for 10- 60 seconds.

- Remove the straw from bath and dry the straw with a clean tissue paper or cotton. Inspect the straw carefully and discard straw with cracks or defective seals. Semen must never come in contact with water.
- Place the straw in the chamber of insemination gun. To obtain a perfect fit, it is essential that the laboratory seal be removed by cutting at right angle through middle of the airspace. Make sure that the clipped end of straw has a straight clean cut with nojagged edges. Straws cut at other angles will result in back flow and wastage of semen at the time of insemination.
- The post thaw survival of spermatozoa is poor. For maximum reproductive efficiency, thawed semenshould be used immediately. Therefore, do not thaw more than one straw at a time.
- Precautions while inseminating a cow
- Work under very hygienic conditions, handle semen and AI equipments correctly and do not try your own\
- Introduce the AI gun first at 45 ° angle, then horizontally and glide along the dorsal side of the vagina. Never use force while introducing the AI gun. This would lead to injuries in the reproductive tract and affect the conception rate. If an animal jumps or falls down, withdraw the AI gun immediately to avoid injury to the cow.
- Insemination of a cow should not be done in hot climate, as pregnancy can never be established.
- Remember that poor fertility with frozen semen is due to improper handling or improper deposition of semen by the inseminator.

1.1.7 Insemination technique of Recto vaginal or cervical fixation method:

- Patience**,** practice and proper hygiene are the keys to good insemination technique
- A.I. in cattle is done in **standing** animals
- Wipe the lips of the cow's vulva clean of mucus, dirt and faeces using a clean paper towel.

- Provide a clean entry for the gun through the vulva – Open the lips by pressing your arm down in the rectum or with the aid of paper towel.
- Direct the gun upwards at 45° to avoid the opening to the bladder.
- Follow the progress of the gun with your hand in the rectum. Do not push your hand towards the cervix ahead of the gun
- Work the gun through the cervix. Place the index finger at the front of the cervix to feel the gun passing through, preventing the gun progressing too deep into the uterus. Position the gun so it is only just protruding from the front of the cervix.
- **Intra uterine** inseminations are more efficient than **intra cervical**. Insemination
- Deposit all the semen slowly into the body of the uterus just through the cervix. Wait a moment before withdrawing the gun
- Remove the gun with a smooth action while the arm is still inserted in the rectum.



Correct placement of semen: deposit all the semen just through the cervix.

1.1.8 Estrus synchronization procedure

- Manipulation of the reproductive process and offers several benefits

- Reduces and in some cases eliminates the need to detect estrus and allows the herd manager to schedule breeding activities in a predetermined period lasting from 1 to 12 days.
- Artificial insemination (AI) activities are confined to a few intensive days
- Creates a more uniform calf crop.
- Enables more cows to be bred to a superior sire.
- Shortens the breeding and calving seasons.
- Cows not conceiving will return to estrus again beginning about 18 to 25 days after the synchronization period.
- The females will still be synchronized to a slight degree, which gives a second chance to artificially inseminate each female in the early part of the breeding season.
- Without synchronization, the herd manager is faced with a 21-day period of continual estrus detection and only one opportunity for AI in most females.
- This is because only 5 to 7 percent of females will display estrus more than once during the first 21 days of breeding

For best results with estrus, synchronization program and ensure optimum fertility and ranchers should:

- Provide adequate nutrition, because undernourished cows may not respond to treatment, much less conceive.
- Vaccinate before the breeding season to prevent reproductive diseases.
- Arrange for the services of experienced AI technicians.
- Acquire high-quality semen.

1.1.9 Estrus synchronization producers

Estrus synchronization programs use one or combination of three hormones:

1. Prostaglandins
2. Progesterone
3. GnRH.

1. Prostaglandins (PG) are produced naturally in the animal's body and function, in part, to affect the estrous cycle. In cyclic females, estrus occurs within 2 to 6 days after they are given **intramuscular injections** of prostaglandin F2 alpha (Lutalyse®) or one of its analogues (ProstaMate®, Estrumate®, estroPLAN®, In-Synch®).

Remember: Anestrous females do not respond to prostaglandin injections. Estrous-cyclic females can respond to injections between days 7 and 16 of their cycles if they have a functional corpus luteum (CL).

The CL is a gland that develops in the ovary and secretes the hormone progesterone into the cow's blood. Estrous-cyclic females at days 0 to 6 and 17 to 21 of their cycles are without functional CLs and do not respond to injections. However, an estrous-cyclic female without a functional CL will respond to injections if they are given in a specific sequence.

2. Progesterone is a naturally occurring hormone that functions to maintain pregnancy. This hormone also "blocks" estrus and ovulation during the diestrus phase of the estrous cycle.

Two kinds of progesterone products are used to synchronize estrus:

A. controlled intra-vaginal release device (CIDR®), which is an insert that contains progesterone. A special applicator tool is required to insert the device. A string is attached for removal at the end of the treatment.

B. MGA® (melengestrol acetate), which is a progestin feed additive. It acts like progesterone in the body. Because both CIDR® and MGA® products "hold" animals out of estrus, their timed removal will synchronize estrus in responding females. When CIDR®s are used in combination with GnRH or prostaglandin, 20 to 40 percent of anestrous females may be induced into estrus.

C. GnRH, or gonadotropin-releasing hormone (trade names Cystorelin®, Fertagyl®, Factrel® and OvaCyst®), is a naturally occurring hormone that causes the release of other hormones. One of these hormones affects follicle development on the ovary; another causes ovulation. Research indicates that when GnRH is given with prostaglandin to estrouscyclic and noncyclic females, the patterns of follicular development are altered, inducing ovulation. This treatment may induce estrus in 10 to 30 percent of anestrous females.

GnRH treatment not recommended for **pre-pubertal heifers** because these young heifers have not yet established fertile estrous cycles and have no consistent response to this hormone injection

1.1.10 three synchronization protocols

The three protocols discussed below (and also depicted, along with others, in Figure 1) illustrate the continuum from:

1. **Low-cost** and **high labor**
2. To medium-cost, medium-labor
3. To higher cost, low labor and fixed-time AI.

The key is to select a protocol that fits your needs in regard to cost, labor, time, animal handling, experience and other factors.

1. One shot PG *(12 days estrus detection required)*

This is a low-cost, low-risk program. It requires more labor, but that also allows animals to be observed for cyclicity. Hence, the possibility of wasting semen on non-cycling animals is minimized.

Days 0 to 6. No injections are given. Begin estrus detection and AI by the AM-PM rule (that is, females are inseminated 12 hours after the onset of estrus). Continue estrus detection and AI for 6 days.

- Day 0 should coincide with the usual start of the breeding season.

- Day 6. Calculate the percentage of females inseminated in the first 6 days.
- If it is less than 15 percent, the number of estrous-cyclic females may not justify continuing the program.
- If it is more than 15 percent, inject all females not inseminated in the first 6 days with an intramuscular prostaglandin shot.
- The dosage will depend on the type of prostaglandin used. Read and follow the label or prescribed directions.
- Days 6 to 12. Continue estrus detection and AI (following the AM-PM rule).

CIDR® - PG *(3 or 4 days estrus detection required)*

- Day 0. Insert a CIDR device.
- Day 6 (or 7). Remove the CIDR and inject prostaglandin. (The label recommends day 6, but research suggests day 7 is acceptable.).
- Day 7 (or 8). Begin estrus detection and AI for 3 to 4 more days (AM-PM rule).

Fixed-time AI (TAI) Co-Synch + CIDR®

(No estrus detection required)

- Day 0. Insert a CIDR® device. Inject GnRH.
- Day 7. Remove the CIDR® device and inject prostaglandin. If you are treating lactating cows in "marginal" body condition, a 48-hour calf removal may improve the response.
- Day 9. Inject GnRH and begin timed (or mass) AI at 54 ± 2 hours for heifers, 60 ± 6 hours for cows.

Other synchronization protocols

Many other synchronization protocols are also available

Some use estrus detection, fixed time AI, or combinations of both early estrus detection and fixed-time AI (the latter being used when it may be desirable to improve AI conception in early estrus responders rather than waiting to do fixed time AI with the whole group).

Some protocols use an alternative progestin product called MGA®, a feed additive offered by feed mills that are permitted to mix medicated feeds. Although MGA® is used to prevent estrus in feedlot heifers, it can also be used to synchronize estrus in breeding females.

1.1.11 inseminating a group of synchronized cattle:

Breeding a group of cattle during a short period of time following estrous synchronization may present problems for the herd manager and Al technician. Although artificial insemination of synchronized cows is the final step in a synchronization-breeding program, it is critical to the success of the entire program. It is important that special consideration be given to proper semen handling and insemination technique to ensure optimum conception rate.

1. **Personnel**

Assign each person a job to move the breeding phase of this program along efficiently. One individual should be responsible for thawing semen and preparing the inseminating gun. This relieves the AI technician of additional tasks, allowing concentration on proper AI technique. Additional people could move cattle to and from the breeding chute. Everyone should be thoroughly instructed in their specific jobs prior to the breeding.

2. **Physical facilities:**

Ensure an adequate holding area is available where heifers can be assembled for treatment, heat detection, and breeding. This area should have a breeding chute or similar arrangement where animals can be treated and artificially bred in a safe and efficient manner, If possible, the synchronized animals should be observed for heat following hormone treatment. This would require that the holding area be equipped with sufficient feed and watering facilities for approximately five days until all synchronized cows are bred. The breeding chute area should be covered to protect semen, supplies, records, and personnel from adverse weather.

3. **Procedures:**

A. Prepare a list of selected mattings if numerous AI sires are to be used for breeding the synchronized cattle. This list could be used in selecting which unit of semen is to be thawed and inseminated for each particular cow. An inventory system describing the location of semen from each bull within the semen tank is also desirable.

B. Follow thaw procedures according to the recommendations of the AI organization supplying the semen. The thaw water must be maintained at the proper temperature for each dose of semen thawed. NOTE: recent research from Washington State has shown that 10 to 20 straws can be thawed simultaneously as long as the thaw bath water remains a constant 95ºF and the environmental temperature is not severely cold. Straws thawed in bulk should be agitated slightly to keep them from sticking together. Bulk thawing of semen should only be considered when a large group of synchronized cattle are to be inseminated.

C. Do not prepare the insemination gun too far in advance of insemination. Breed the cow as soon as possible after the semen is properly thawed and the inseminating equipment is assembled.

D. Prepare insemination devices in a warm, clean environment near the breeding chute, but far enough away to avoid excessive dust and debris near the cattle. This will minimize the chance of contaminating the equipment and semen.

4. Other considerations:

A. Handle animals gently to avoid unnecessary excitement before, during, and after breeding. Undue excitement may adversely affect sperm transport within the female reproductive system causing a lower conception rate.

B. Breed animals based on standing heat, remembering to breed the animals 10 to 12 hours after the beginning of standing behavior.

C. Use proper insemination techniques. Sufficiently qualified inseminators should be on hand if many cows are to be bred over a short period. Consult your AI representative for advice and help in this regard. The success of a synchronization-breeding program depends on prior planning, teamwork, and attention to detail by everyone involved.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write the main reason of conception rate by frozen semen in the field is lowed! (4point)_____,_____,_____,_____

_____,_____,_____,_____

_____,_____,_____,_____

2._____is the process of heating frozen semen to prepare for insemination (2point)

3. What are the major objective of thawing of straw? (4point)

_____,_____

_____,_____

4._____is the process of inserting thawed straw in AI gun (catheter) (2point)

5. Write the three types of hormone used for estrus synchronization programs! (3point)

_____,_____,_____

6. Write the three synchronization protocols! (3point)

_____,_____,_____

Note: **Satisfactory rating – 7 and 14 points** **Unsatisfactory - below 7 and 14 points**

You can ask you teacher for the copy of the correct answers

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	Discussing Advantages and Disadvantage of AI

1.2 Discussing Advantages and Disadvantage of AI

1.2.1 Efficiency of inseminator

AI is introduction of male reproductive cells into the female reproductive tract by an artificial means. They are different ways of AI excerption. e.g.

- AI in animals
- AIH in human (when semen is from husband)
- AID in human (when semen is from Donor)

Artificial insemination is an unnatural act to which cows may react unfavourably. Extreme excitement or irritation at this time may upset the delicate nervous and hormonal relationship.

Practical experience shows that careful, skilful technique is must for successful AI programme.

Some trained inseminators have lower than normal conception rates even though they are able to deposit the semen at the right place. These persons usually are too rough in their technique.

For the best psychological cooperation from the cow, irritation and excitement should minimized, both before and after manipulations of the genital system.

Successful artificial insemination programs based on a clear understanding of the anatomy and physiology of reproduction in cattle.

Before attempting to inseminate cows, you must develop **a mental picture of the anatomical parts** that comprise the female and male reproductive tract. In order to understand

- why an animal displays the many signs of estrus
- when she should be inseminated
- how the pregnancy develops,
- you must clearly understand the hormonal mechanisms controlling the estrous cycle in cattle.

1.2.2 Advantages of AI

- Better genetic improvement
- Better breeding records
- No hidden expenses
- Spread of disease can be controlled
- Crossbreeding is easier
- More uniform calf crops
- Calving season can be narrowed
- Dangerous bull need not be kept on the farm and
- Organized breeding management and record services are provided.
- In swine AI is often used to decrease the cost of maintaining males at the production unit.
- In turkey's AI is used because mating cannot occur naturally.

1.2.3 Disadvantages of AI

- It requires well-trained operations and special equipment; Necessitates the knowledge of female reproductive tract
- It requires more time than the natural services.
- It necessitates the knowledge of structure and function of reproduction, on the part of the operator.
- It requires well-organized facility and close supervision of the actors of this sector.
- It is not yet fully practical to bring cows in "true heat" at will, heat detection requires more time and tedious
- It reduces market for the bulls while that for the superior germ plasm is increased.

- Selection of the sire should be very rigid in all respect.
- It may be subjected to certain disease if comprehensive and strictly controlled hygienic is not in place.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1_____ is introduction of male reproductive cells into the female reproductive tract by an artificial means. **AI (2point)**

2. **Successful artificial insemination programs based on a** clear understanding of the _____and _____of reproduction in cattle. (2point)

1. Write at least six advantages of artificial insemination! (4point)

_____,_____,_____,_____

_____,_____,_____,_____

2. Write at least six limitation of AI! (4point)

_____,_____,_____,_____

_____,_____,_____,_____

_____,_____,_____,_____

_____,_____,_____

Note: **Satisfactory rating – 7 and 14 points** **Unsatisfactory - below 7 and 14 points**

You can ask you teacher for the copy of the correct answers

Answer Sheet

Score = _____
Rating:

Name: _____ Date: _____

Short Answer Question

Artificial Insemination – Level1

Learning Guide # 40

Unit of Competence: - Design Strategies and Deliver Genetic Improvement Service

Module Title: - Designing Strategies and Deliver Genetic Improvement Service LG Code: AGR ATI1M 12 LO2- LG-40

TTLM Code: AGR ATI1M 12 TTLM 0919v1

LO2. Plan of AI services

Instruction Sheet	Learning Guide #40

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Carrying out technical considerations

- Undertaking economic consideration

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- Carry out technical considerations
- Undertake economic consideration

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
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5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
6. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	**Carrying out technical considerations**

2.1 Carrying out technical considerations

2.1.1 Care and Handling of Frozen Semen Equipment and Field Application of Frozen Semen

Care and maintenance of containers:

- Avoid dropping or jolting the vivo stat
- Avoid forcing the **plug cap** or **canisters**
- Tilting or putting it on its side leaving the plug cap off should be avoided
- Avoid pulling or pushing the vivo stat along the ground
- Handle carefully the vivo stat and remove or replace the canister easily
- Always keep the vivo stat in vertical position and while lifting, lift with handles only
- Never keep the vivo stat open for long time, dirty air, carbon dioxide and oxygen will enter the vivo stat and cause damage.
- The neck tube of the container is the most vulnerable part and can get damaged by mishandling and can cause leakage of the container.

Routine maintenance of vivo stat: A vivo stat in continuous use should be emptied of liquid nitrogen every twelve months and left to warm up over a week.

The canisters and plug is removed and gaseous dry nitrogen should be flushed out for one hour. This procedure prevents to build up the contaminants (including oxygen) in vivo stat. Paint the vivo stat when the paint is lost, with special low temperature resistant paint.

2.1.2 Field application of frozen semen for artificial insemination:

Some salient points for consideration

- Frozen semen should properly handled once it supplied to field staff.
- The semen straws should not exposed to sun or wind.
- The container should not kept in sun or rain.
- Straw should be quickly taken out one at a time with the help of forceps and not by fingers.
- It should be shaken once or twice vigorously so that liquid nitrogen from plug is removed
- Thaw the straw in warm water at 35° C in thermos flask for 30 seconds

- The insemination gun and other equipment should be kept dry and warm at 35°C to avoid cold shock after thawing.
- Straw should be wiped, and dried with tissue paper and the scissors should be dry.
- The straw should be held with the cotton plug down wards.
- The straw is then placed in chamber of gun previously warmed up by rubbing.
- The sealed end is then cut through air bubble and the sheath is then placed over the straw and fixed neatly.
- The semen should be utilized within five minutes after thawing.

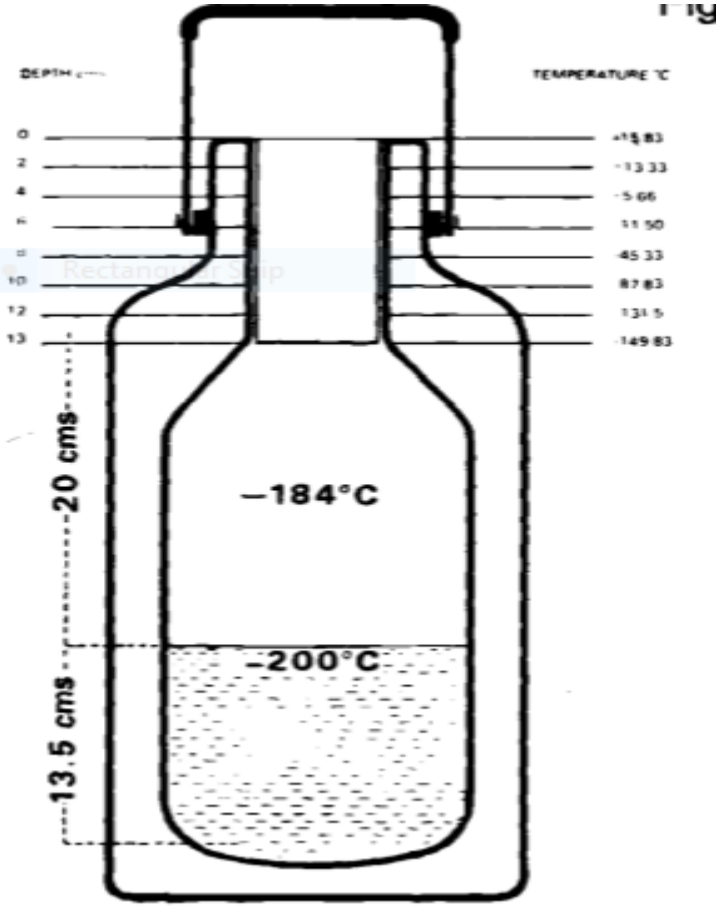
The container should be taken as near to the animal which is to be inseminated as possible and all the above procedures should be adopted.

While taking out the straw the canister should not lifted above the frost line of the neck of the container for longer time and the canister should immediately lowered in the container under liquid nitrogen

The inseminator should have a clear understanding of the basic principles of handling semen, liquid nitrogen and LN refrigerator.

- Training and retraining of the inseminators are essential for any Al organization.
- Prime importance should given to replenishment of liquid nitrogen in LN containers as per schedule.
- A uniform procedure for thawing should be adopted, preferably a water bath at a temperature of 35°C for 30 seconds should be used.
- Palm thawing or pocket thawing should be discouraged for getting optimum results.
- The frozen semen once thawed should be utilized immediately within 5 minutes. Thawing frozen semen and holding in warm water for more than half an hour should be avoided as aging process of spermatozoa starts resulting in poor fertility.
- The frozen semen should always be kept under **liquid nitrogen**. The critical level of liquid nitrogen and the temperature pattern in the container will be as follows

- ✓ In AL3 or BA3 container, the critical level of **liquid nitrogen is 10 cm**.
- ✓ If the liquid nitrogen level goes **below 10cm** the Liquid nitrogen should immediately replenished (refilled).



- ➢ The frozen semen should never taken out of container unless, the cow examined per rectum and confirmed in heat.
- ➢ The frozen semen after, thawing should be deposited half a centimeter ahead of internal opening of cervix.
- ➢ If the canister is lifted out of vivo stat containing liquid nitrogen it immediately starts warming up. This causes following disadvantages:
- ➢ The canister contents will warm up and may become damaged

- When a warm canister is returned to the vivo stat a heavy loss of liquid nitrogen will result
- The ice formed on the canister will drop off into the vivo stat, when canister is replaced causing an undesirable sludge to build up.

If the vivo stat is kept open for long time ice formation takes place on the neck of the tube and when the cap is being replaced it falls in container causing damage.

Forceps should take out the straw. Do not press too much the forceps otherwise; the straw will break as the straws become brittle while in liquid nitrogen.

Care should take not to drop the straws in container as it would be very difficult to take out the straws and an attempt to take out the fallen straws may damage the container.

The container cork should put in position immediately after taking out the straw. If delayed the cork becomes wet because of the water of condensation and if put in without wiping gets fixed because of ice formation. Therefore, cork should place in position only after thorough drying by towel.

Frozen Semen is one of the most advanced and sophisticated technique in livestock breeding and its impact on rapid improvement of cattle is beyond doubt

2.1.3 AI and sire selection

- Artificial insemination (AI) allows farmers to improve profits through the genetic improvement of their herds.
- Managing an AI program is another process that requires careful planning.
- Good AI programs involve good heat detection, proper AI practice and the careful selection of AI sires.
- Conception rates resulting from AI are reduced substantially when semen is **not stored** and **handled correctly** or when insemination technique is **unsound**

2.1.4 Assessing AI practice

The performance of AI can assessed using the conception rate

The non-return rate can provide an early warning of a low conception rate to AI .
If the non-return rate for your herd is less than 60%, or conception rate is low (less than 49% in seasonal/split calving herds or 43% in year-round calving herds) you need to investigate potential causes, such as the following, and take the recommended action:

- Inadequate AI practices or poor quality semen – review AI practices on your farm
- Poor body condition at calving or excessive loss of body condition following calving
- review body condition score targets and herd nutrition
- Inaccurate heat detection – review your heat detection program
- Excessive numbers of late calvers (seasonal/split calving herds) review calving pattern.

There are other possible causes of low non-return rate and low conception rate. You may need to seek help from an adviser.

- AI technicians, whether professional or DIY (doing it your), can measure their performance using the conception rate.
- Conception rates can be compared to expected performance or between individual AI technicians.

The conception rate achieved in a herd can vary for a number of reasons. That makes it difficult to compare the conception rate achieved by a single technician to expected performance targets. However, conception rates achieved in heifer AI programs are generally high (expect 60% in heifers achieving target weights) and can be used to assess the AI practices of the technician.

- A conception rate of less than 55% in well-grown heifers suggests that AI practices should be reviewed.

- The second method of assessing the AI practices of technicians relies on having more than one technician operating in the herd. Comparing the conception rates achieved by multiple technicians gives an indication of whether AI practices are up to scratch.

2.1.5 Professional AI technicians

- If all inseminations are performed by professional AI technicians: Check that the National Herd Improvement Association (NHIA) accredits your technicians
- Check that non-return rates achieved by your technician monitored as part of their business's quality assurance program.

2.1.6 It is important to prepare for AI.

A well-planned system with your farm team ready, supplies at hand and facilities in good shape is more likely to be successful.

- Check AI facilities provide
- Safe working environment.

2.1.7 Timing of AI

Both sperm and eggs have a limited lifespan in the race for the two to meet.

The timing of AI in relation to a cow's heat signs is important to the likelihood of conception.

Best conception rates occur following insemination **4–12 hours** after a cow has first stood to be mounted.

Inseminate cows at the next opportunity after detection of standing heat:

Cows first seen on heat before or at the morning milking – inseminate that morning or that evening.

- Cows first seen on heat through the day or at evening milking – inseminate that evening or the next morning.
- If inseminating twice daily, do not delay insemination unnecessarily

It is not necessary to re-inseminate a cow if she is still on heat at the next milking. However, if the cow is on heat two milkings (24 hours) later, re-inseminate her.With holding inseminations

Once mating begins in seasonal/split calving herds, inseminate all cows seen on heat that have calved more than 3 weeks before

In year-round calving herds, inseminate all cows seen on heat after their Voluntary Waiting Period, except cows definitely culled.

2.1.8 Check points before insemination:

- If heifer – weight > 250 kg cattle & >300 kg buffalo y No abnormal discharge y Non pregnant
- Gap - 60 days post partum in normal calving, 90 days post-partum in abnormal calving (Dystocia, ROP, abortion etc.)
- Type of semen used (Liquid/Cryopreserved).

Insemination technique in cattle:

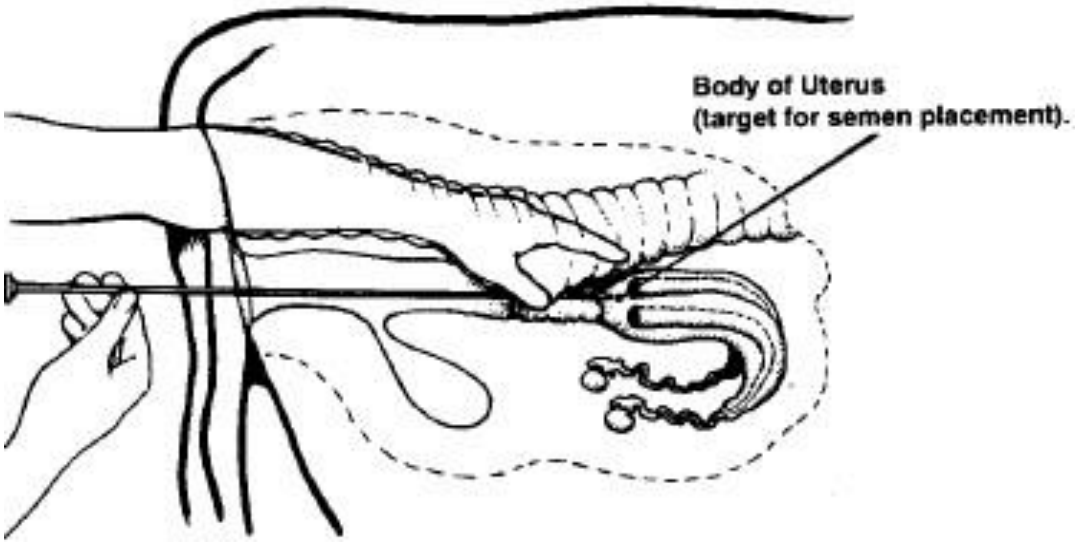
- Loading of A.I. gun
- Ready all necessary instruments before opening liquid nitrogen container.
- Raise desired canister to the neck of container , keeping the straws in goblet as deep as possible
- Take out desired straw as quickly as possible and shake them in air and put immediately in water bath for thawing.
- Thaw at 37°C for 30 sec.
- Remove straw from water bath and wipe out all water from outer surface of straw.
- Hold straw vertically with factory seal end towards downward side and shake air bubble from middle of straw to lab seal end.
- Withdraw piston of gun and place straw in barrel of A.I. gun.

- Factory seal end should be inside gun and lab seal end should face outside.
- Cut straw at right angle.
- Fix A.I. sheath over A.I. gun from its broad end.

2.1.9 A.I. with liquid semen:

- A.I. in cattle and buffaloes done in **standing** animal.
- Sterilized catheter (AI gun) of
  - ✓ 40 to 42 cm in length
  - ✓ outside diameter of 5-6mm
  - ✓ inside diameter of 1mm is fitted to a clean
- Dry plastic syringe (2-5ml) with rubber connector is required.
- After sucking some air (0.5 -1.0 ml) about 1ml semen is sucked in the pipette.
- A.I done with **recto-vaginal method.**

Semen deposition site:



Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. How the AI technician taken out straw from the plug cap or canisters? (2point)

_____

2. What is the critical level of liquid nitrogen in the Nitrogen Tank? (2point)

_____

3. The Best conception rates occur following insemination _____ **hours** after a cow has first stood to be mounted. (2point)

4. What are checkpoints before insemination the animal? (3point)

_____

_____

_____

Note: **Satisfactory rating – 4 and 9 points Unsatisfactory - below 4 and 9 points**

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Question

Information Sheet-2	**Undertaking economic consideration**

2.2. Undertaking economic consideration

2.2.1 Economic Value of Artificial Insemination

The most widely utilized technology in dairy farm is **AI,** which widely used for the production of herd replacements.

AI plays an important role to:

- increase the yielding capacity of cows
- **appropriate** and c**heapest** way of genetic improvement
- Realization of breeding programs has to be well organized
- Excited in a very reliable way
- AI is fully functional when it is corporate with good animal husbandry such as effective heat detection (Noakes, 2009)

It provides economical means for livestock growers

- To breed their male having very desirable trait
- Reduce the cost of keeping bull during AI.
- The dairy industry‟s goal has always been to produce quality milk for the consumer market.
- In many countries yield per cow has more than doubled in the last 40 years.
- This dramatic increase in yield per cow is due to rapid progress in genetics and management.
- A.I. works to eliminate that variability and get cows pregnant, on average, 3-5% faster than natural service bulls, regardless of the environment or season.

2.2.2 Genetic advantage

- The genetic dollar/cow/year advantage when using average and high net merit A.I. sires over natural service bulls for a 700-cow operation. A.I. Services and semen costs are included.
- Investing in high net merit A.I. sires can have an approximate 3:1economic return.
- Even at a moderate level of reproductive efficiency (conception rate = 35% for cows and 65% for heifers and heat detection rate = 42.5% for cows and 70% for heifers) and no synchronization programs, A.I. on average is genetically more profitable than natural service.
- Lowering and controlling dystocia. Calving problems will cost the dairy at calving, re-breeding and lost days of milking. \

- A.I. provides the opportunity to choose sires with the specific benefit of calving **ease**, unlike natural service where calf size and ease of delivery are unknown. Lower Somatic Cell Count (SCC).
- Utilizing A.I. allows you to choose proven sires with high reliability that specialize in reducing SCC and lower mastitis in the herd to avoid the negative mastitis/reproduction effect (Josefsson and Gunnar. 2002

Self-Check -2	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is the most widely utilized technology in dairy farm? (2point)

_____

2. What are the economic importance of Artificial insemination in the growth of livestock (dairy) production? (4point

_____

_____

_____

_____

Note: **Satisfactory rating – 3 and 6 points** **Unsatisfactory - below 3 and 6 points**

You can ask you teacher for the copy of the correct answers

Score = _____

Rating: _____

Answer Sheet

Name: _____ Date: _____

Short Answer Question

Artificial Insemination – Level1

Learning Guide # 41

Unit of Competence: - Design Strategies and Deliver Genetic Improvement Service

Module Title: - Designing Strategies and Deliver Genetic Improvement Service

LG Code: AGR ATI1M 12 LO3- LG 41

TTLM Code: AGR ATI1M 12 TTLM 0919v1

LO3. Carryout AI service delivery strategies

Instruction Sheet	Learning Guide #41

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Carrying out Stationed delivery strategies
- Undertaking mobile delivery strategies

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- Carrying out Stationed delivery strategies
- Undertake mobile delivery strategies

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**

6. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	**Carrying out Stationed delivery strategies**

3.1 Carrying out Stationed delivery strategies

The national artificial insemination center was established in 1981, with the mandate to serve at the country level.

NAIC is a government organization that makes this service available to **rural**, **peri-urban**, and **urban** areas through the regional offices throughout the country.

The main objective of the support was to achieve an efficient and reliable artificial insemination service.

Initially service was based on production and use of fresh semen until the liquid nitrogen plant was installed in 1984.

Bulls donated by the Cuban Government (25 Holstein and 10 Brahman) and importation of 44,800 doses of Friesian and 2,000 doses of Jersey semen were the source of semen used for frozen semen technology .

To date, semen collection was based on **exotic** and indigenous, as well as crosses of these breeds, namely Friesian, Jersey, Brahman, Boran, Barka, Fogera, Horo, Sheko, and

crosses of 50% and 75% Holstein-Friesian indigenous bulls. From the total semen produced, the major share is from Friesian (75.3%), followed by Jersey (10.5%).

The NAIK at Kality, is serving as the main semen collection and preservation center; the satellite AI centers to be used for services, and then Holetta bull/dam farm, was the base for nucleus bull-producing, testing and rearing farm (Getachew and Gashaw 2001).

Later production of semen from crossbred animals (Friesian x Fogera, Friesian x Boran, Friesian x Barca, Friesian x Arsi) and from indigenous breeds (Barca, Borana and Fogera) are undertaken and some doses were distributed.

From 1981, until 1999 a total of more than **300,000 semen** doses were produced and distributed by NAIC (1999).

Stationery AI service delivery system,

Inseminators stationed **individually** and **farmers** bring their cows to the insemination point.

The system recommended when:-

- There is high cattle density in a particular area
- When there is large commercial farm to employ the technician and enough number of cows to occupy the technician for full time
- When it is not possible to provide the technician with means of transport due to financial reason etc.

Advantages

- No needs of transportation
- The inseminator can adapt better with local farmers
- Farmers can make better contact with the inseminator for advice easily
- Near by farmer can be visited upon request

Disadvantages

- Cost of additional LN2 container
- LN2 consumption per performed insemination
- Large number of inseminators is required to be assigned in many areas where AI is required
- Hard for supervision and requires more supervisors

Farm Visit system

The other AI delivery system is a system in which AI technicians use **motorcycles** or **car** in order to visit AI crushes built along the:

- Main road in rural
- Peri-urban areas and known sites of the area
- The inseminator visits different farms on schedules
- The Technician can use means of transport or foot

Advantages

- Every farm can be visited daily
- The technician can see the herd & look at the management and can give comment
- Farm records can be counter-checked with insemination certificate set records
- The technician can discuss with the owners or managers of farms and forward advice about the herd conditions

Disadvantages

- Driving speeds low to move from herd to herd
- If sanitary precautions are not taken carefully, diseases can be transmitted from farm to farm by the visiting technicians

Information Sheet-2	Undertaking mobile delivery strategies

3.2 Undertaking mobile delivery strategies

- The most common AI service delivery system **mobile service** delivery systems.
- It is a system in which AI technicians use **motorcycles** in order to visit
- Smallholder dairy farms when informed by the owner through telephone on in person at their office.

Mobile service delivery system, Daily run (round) System include:

- The inseminator using motorcycle or car
- Covers Known route and distance each day
- Visits crushes erected along the route
- Crush Visit is thus time scheduled
- Supervision is easy along the route by the supervisor

Advantages

- Less number of LN2 container is used when many technicians operate from common center
- Many smallholder farmers can be covered
- Saves long distance travel by farmers
- Large number of farmers along the route can be visited by the inseminators without making dalliance un necessary

Disadvantages

- High cost of transport & initial investment
- Requires all weather road
- Diseases transmissions by the animal on way from the farm to the crash and back to the farm
- The investors can only the cow, not the from where the cow came
- In using motorcycle, the accidents related to it is high and needs careful driving

Telephone Call system

- It is another Variant of farm Visit except that the visit is made up on call
- The telephone call system is used in large city areas
- In areas where telephone Service is not available in person call, written information and the like can be used according to the agreed means between the farmers and the technician in that particular area of operation

Artificial Insemination – Level1

Learning Guide # 42

Unit of Competence: - Design Strategies and Deliver Genetic Improvement Service

Module Title: - Designing Strategies and Deliver Genetic Improvement Service LG Code: AGR ATI1M 12 LO4- LG.42

TTLM Code: AGR ATI1M 12 TTLM 0919v1

LO4. Record, monitor and report AI service

Instruction Sheet	Learning Guide #42

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Describing technical recording procedures on AI certificates
- Identifying records managements and reproductive performance computations
- Submitting regular AI services report

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- Describe technical recording procedures on AI certificates
- Identify records managements and reproductive performance computations
- Submit regular AI services report

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
6. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	Describing technical recording procedures on AI certificates

4.1. Describing technical recording procedures on AI certificates

4.1. Describing technical recording procedures on AI certificates

AI Service Packages

Artificial insemination packages that are desired by almost all smallholder farmers include:

a) Insemination

b) Synchronisation

c) Feed Formulation

d) Veterinary Support e) Semen Straw Provision

The technical recording must be:

- Systematic
- Comprehensive
- Easy for recording & understanding

The technical recording of AI

- Is made on AI certificate set
- Recording is performed during insemination time

For recording determination of animals is important

- Ear tag
- Tattooing
- Branding
- Ear notching (Permanent and cheap) easy

The aim of AI certificate set in recording

- To give information to farmers about AI
- To provide technical data
- To be voucher etc.

Description of AI certificate set

- One original
- One copy for each of three series

One pad of AI certificate

- Consists of 50 series (200 pages)
- Enough to accommodate information of 50 female including repeat insemination during same calving interval
- Each series of the pad consists of different serial number
- Each of insemination a copy corresponding to the insemination number is retained by the inseminator, the rest are given to the farmers

Instruction how to record on AI certificate

- All writing has to be on the original page and transferred to all copies in the series using carbon papers
- The head of the page contains in the form of drawing to put the positions of ear notches on the animal for identification
- For each AI scheme, the reference No used at head quarter will be applied

Farm

- The number given to the farm is recorded in the box
- For local information, owner's name and sub-location will be recorded

Animal

- The notched ear number (tag) must be carefully read before entering in the box allocated for ear number
- The animal's name should also indicated in the space provided
- The breed of the animal will be indicated using the following letters
- ✓ F= Friesian
- ✓ J= Jersey
- ✓ Fx = Friesian cross
- ✓ Jx = Jersey cross
- The sire is indicated by his code No, if this is not known the the box should be left blank

- In the " Box" section write as DD MM, YY eg 03 01 99 = September 03, 1999
- In all boxes where DD MM YY are required only 2 digits

Last calving

Write DD MM YY

27	12	99

August 27, 1999

- If the date of last calving is not known, NK should be entered in the box
- In the case of heifer's insemination, H should be entered in the box
- If the AI certificate set is a continuation of previous set of insemination within the calving interval, the the X should be entered in the year box

Insemination

- Write this section DD MM YY (Date, Month, Year)
- Enter the bull code at its appropriate place
- Enter the technician code & then put signature
- Time of insemination should be indicated using the 24 hours clock
- According to Ethiopian counting, it starts at 1 during the rises and ends at 24 hrs before sun rises the next day
- It is important that the inseminator recommends that the farmer to report the animal, if it comes on heat after 3rd insemination to take the case to the veterinarian office or animal husbandry officer for treatment and advice before coming to use another set

Measures

- To be used for recording pregnancy and infertility problems treatment
- If the technician performs only insemination and not pregnancy diagnosis (PD) then this section must be filled by veterinarian animal science officers carrying the PD, treatment and advice

General rules and procedures in recording AI Certificate set

- When the first insemination of the series carried out:
- The head of the set must be filled indicating ear notches
- Enter all the required information accordingly

- Detach the complete series , retain the first copy and give the rest to the farmer
- Tell the farmer to bring the series with cow if she repeats for more information
- If and when the animal requires a second service , the technician
  - ✓ Must check the animal No (ID)
  - ✓ Should enter information about second insemination on the original while carbon paper is used on copies
  - ✓ After completing the information, the technician retains the second copy for reporting and gives the rest to the farmer
  - ✓ **Simil**ar measures are taken during the third inseminations
- At the time of third insemination the farmer must be told to see veterinarian if the cow repeats again
- If after treatment and recommendation, the cow comes for fourth insemination-
- A new set is stated from the first insemination
- The head of the set and all necessary information are recorded except that a letter X is entered in the year box of last calving section
- On series of the set of information should be used within a period of 90 days each

Information Sheet-2	**Identifying records managements and reproductive performance computations**

4.2 Identifying records managements and reproductive performance computation

Record keeping is an important activity in any dairy enterprises. Farmers should therefore ensure that all farm activities are recorded promptly. Records are important to farmers because they can help farmers in many ways such as in making:-

1. Management decisions
2. Financial accounting
3. Identifying problems
4. Planning for the future
5. Determining whether targets are met

In the dairy enterprise, several types of records kept by the farmer. For a successful operation of a dairy enterprise the following records should kept by the farmer.

- Pedigree and numbers of each animal kept on the farm
- Dates of heat periods
- Breeding pregnancy checks, bulls used
- animal health records deworming, vaccinations
- Performance records milk production, growth rates etc.

Good records should have the following characteristics:

1. Easy to update
2. Easy to understand
3. Up to date i.e. include the latest event (current)
4. Easy to access
5. Easily summarized

Several types of records are kept which include:

1. Ancestry or genetic records. These include the maternal and paternal records
2. Breeding records -sire, date of breeding, pregnancy confirmation, date of calving, and particulars of calf.
3. Veterinary records - disease type, date and treatment
4. Production - amount of milk (daily, weekly or monthly), butter, fat, drying date.
5. Feed records - these could be amount of concentrate fed for pasture grazed animals or the totals amount fed for zero grazed animals.
6. Financial records - all financial transactions should be recorded.

Recording

Records are important because they give the animal's ancestry and hence prove quality and increase the value of the animal. Records also help farmers in making management decisions.

Farmers keep mainly two types of records

- Pedigree records which show the ancestry of the animals
- Performance records.

The following are sample record cards that farmers can keep:

i. Record Card for Daily milk yield
ii. Cow Identification and Health card:

iii. Breeding / Reproduction Card

iv. Calving Record

Table12. Record Card for Daily Milk Yield												
		1	2	3	4	5	6	7	8	Total milk	Average Per day	Comment
Jan	AM											
	PM											
Feb	AM											
	PM											
Mar	AM											
	PM											
Apr	AM											
	PM											
May	AM											
	PM											
Jun	AM											
	PM											

Table 13. Cow Identification and Health Card					
Cow identification			Health record		
Cow name	Sire	Dam	Date Born	Illness/Event	Outcome
Number		Number			
Breed		Breed			
Birth date		Sire name			
Date animal received		Number			
Source		Breed			

Table 14. Breeding / Reproduction Card				
Lactation No……Date of last calving……				
Date on heat				
Service dates				
Bull /AI				

Breed and owner				
Pregnancy check Date and result				
Date to dry				
Date to calve				

Table 15. Calving Record

ID				Birth			Weaning		12 months		Remarks
Number	Name	sex	ID	Date	Wt		Date	Wt	Date	Wt	

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the importance of record for the farmer to manage farm? (5point)

_____,_____,_____

_____,_____

2. What are the characteristics of good record? (5point)

_____,_____

_____,_____,_____

3. What are the types of farm records? (5point)

_____,_____,_____

_____,_____,_____

Note: **Satisfactory rating – 8 and 15 points** **Unsatisfactory - below 8 and 15 points**

You can ask you teacher for the copy of the correct answers

Score = _____
Rating: _____

Answer Sheet

Name: _____ Date: _____

Short Answer Question

Information Sheet-1	**Submitting regular AI services report**

4.3 Submitting regular AI services report

Reporting

The technicians` monthly report format

The technicians summaries detailed monthly activity on a standard formatted reporting sheet

On the reporting sheet there is the space to enter necessary information indicating.

- Region
- Zone
- Local station
- Month and year of the report
- the technician names, code, and signature

The reporting sheet consists of three major sections:

- Detailed series of inseminations bull- wise
- Details of second inseminations (repeats) bull-wise
- Details of
    - ✓ PD
    - ✓ Calving
    - ✓ Crush construction and repair
    - ✓ Distance moved (traveled) by technician
    - ✓ Calves born and sex
    - ✓ Semen obtained, wasted, used and balance
    - ✓ fee collected
    - ✓ Consumable AI items balance

The first section of the report that contains details of the series of insemination is Technician wise

Monthly report summery Received Reports are summarized according to :

- ✓ Region

- ✓ Technician
- ✓ Bull used

- Information summarized include
  - ✓ Number of reported technician
  - ✓ Inseminations performed
    - ❖ first
    - ❖ second
    - ❖ third
    - ❖ total
  - ✓ Calves born
    - ❖ Male
    - ❖ Female
    - ❖ Total
- Pregnancy diagnosis
  - ✓ Positive diagnosis
  - ✓ Farmers report
- Semen dose obtained
- Semen does wasted
- Semen dose available
- Fee collected
- Consumable balance at the end of the month
- From the recorded data on AI set & reports
    - ❖ NR% of bulls and technicians
    - ❖ Calving intervals
    - ❖ Inter service intervals
    - ❖ Calf mortality, sex and disposal
    - ❖ Abortion and the like could be determined

Type of Report Summary Formats

- Region wise summary format
- Technicians wise summary
    - This month
    - Up to this month
- Technicians NR% summary
- Bull's NR% summary
- Reproduction record sheet

⇨ Monthly report for planning service as required by the planning service on the standard Report

- Total inseminations
- Pregnancies
- Calves born
- Bulls and technicians
- NR% summary

⇨Sample performance reports that are produced in the form of papers

- Reproduction efficiencies
- Calving & calves status

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