Dairy production

Level-III

Learning Guide-33

Unit of Competence: Perform Dairy Cattle Production Activities

Module Title: Performing Dairy Cattle Production Activities

LG Code: AGR DRP3M09 LO1-LG-33

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LO 1: Assess husbandry practices of dairy cattle

Instruction Sheet	Learning Guide #33

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

- ☞ Checking equipment and materials for feeding and watering dairy cattle
- ☞ Confirming safe and sound operation
- ☞ Carrying out record keeping for dairy cattle
- ☞ Performing dairy animal housing, sanitation, feeding, identification, dehorning and fencing
- ☞ Managing dairy cattle dry off period properly
- ☞ Recognizing, risk assessing and controlling potential and existing OHS hazards

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**:

- ⇒ Check equipment and materials for feeding and watering dairy cattle
- ⇒ Confirm safe and sound operation
- ⇒ Carry out record keeping for dairy cattle
- ⇒ Perform dairy animal housing, sanitation, feeding, identification, dehorning and fencing
- ⇒ Manage dairy cattle dry off period properly
- ⇒ Recognize, risk assess and controlled potential and existing OHS hazards

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below from 3 to 7.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4, Sheet 5 and Sheet 6”.
4. Accomplish the “Self-check 1, Self-check 2, Self-check 3, Self-check 4, Self-check5 and Self-check 6” **in page -5, 8, 18, 52, 57 and 63** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1” **in page -64, 65 and 66.**
6. Do the “LAP test” **in page – 67** (if you are ready).
7. Then processed to the next learning guide

Information Sheet-1	Checking equipment and materials for feeding and watering dairy cattle

1.1. Introduction

Dairy - is a place /building where milk is kept and milk products are made.

- is a shop /place where milk and milk products are sold.

Dairy farm: is a farm that produces milk and milk products

Dairying /dairy farming: is the business of a dairy farm

Dairy cattle: are cattle that raised primarily to produce milk and milk product such as cheese, butter, and cream etc and are of different breed.

Dairy Cow: Refers to any type of cow used to give milk previously or provide milk currently or have never given milk before and pregnant now

Milking Cow: Refers to cows actually giving milk/lactating.

New born: - The young of the domestic cow, from birth up until the calf begins to eat only dry feed rations, usually around 6-to-10 weeks of age.

Weaned Animals: - A young calf that is removed from being fed milk or milk replacer to eating only dry feed, usually about 6-to-10 weeks of age.

Dry Cows – Non-lactating pregnant cows from the end of lactation until next parturition.

There are Different breeds of dairy animals

World dairy cattle's are:

Ayrshire, Guernsey, Holstein – Friesian, Jersey, Milking short horn and Brown Swiss etc…

Ethiopian Dairy cattle type:

There are many local cattle types/breeds in the country, which vary in size and colour. However, all are grouped in to *Bos indicus.* It is a well-known fact that *Bosindicus* is adapted to tropical environment through natural selection.

- Horro (dominating western part of the country around Horro in Wollega),
- Boran (Dominating southern part of the country around Borena),
- Fogera (Northern part of the country around Fogera).
- Berca (Northern part of the country around Eritria, Tigray and Gonder).
- Arsi-Bale (Dominate the highlands of central region of Arsi and Bale)

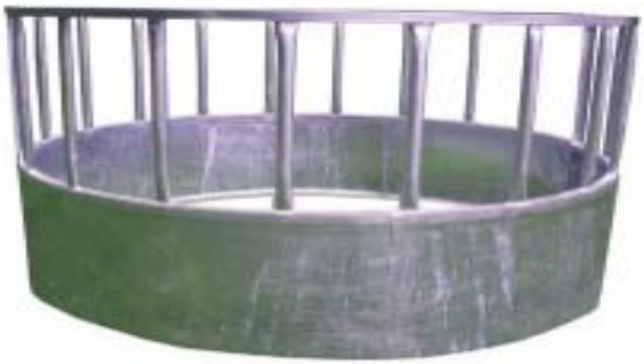
In general, indigenous cattle are multipurpose in their function i.e., meat, milk and draft.

1.2. Checking equipment and materials for feeding and watering dairy cattle

- To take good care of animals, during feeding and watering for normal growth and production there are some equipments and materials that can be useful and practical to have within reach in the following some of the more common equipments and materials are listed which are widely available in dairy farm.
- Good quality storage facilities will help reduce unnecessary waste
- Ensure that your dairy cattle, are kept sheltered from the elements with our livestock housing, temporary barns and hoop buildings and.
- Farm carries a large selection of livestock equipment such as animal watering systems, nipples and water bowls to help keep your dairy cattle healthier by supplying cleaner water — water your animals like the pros! Tend to your, herds with everything from range feeders to feeder platforms, as well as hay racks and feed buckets.
- If healthy and safe dairy animals are as important to you as it is to us, be sure to view our dairy animal's pens.
- Cows should have easy access to water and there should be sufficient waterers (number, size, capacity) to accommodate all animals in a pen or lot.
- Cows are sensitive to water problems because of the large volume they drink. Excess nitrate, salt, bacteria, algae or chemicals can decrease water consumption and cause adverse health effects. High water quality is vital.
- In addition to testing water for nitrate and salt level, simple management practices such as cleaning water troughs is important.
- The following Equipment and materials are checked and confirmed for its safe operation before starting feeding and watering of animals. Some of these materials and equipment may include: Feed and water buckets bails, teats, troughs, drums, racks or rings for roughage, troughs or bins for concentrates, water troughs or drinkers.

Fig. 1.1 water trough

Bateman Cattle Ring Feeder - Standard



Bateman Circular Sheep Feeder

Watering Bowls

Livestock Troughs

Custom Water Tanks & Troughs

Fig.1.2. different type's dairy cattle of feeder and water troughs

Self-Check -1	Written Test

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

1. Why you are checking the materials and equipments of waterer and feeder troughs before feeding and watering your animals ?(3pts)
2. List the most known Ethiopian dairy cattle breeds. (4pts)
3. What is the difference between milking and dry cows? (3pts)

Note: **Satisfactory rating - 10 points** **Unsatisfactory - 10 points**

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

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

_____

3._____

_____

Information Sheet- 2	Confirming safe and sound operation

2.1. Ensure farm tasks are carried out safely and competently

- **Have appropriate procedures and equipment in place for undertaking dairy farming tasks**.
  - It is important to ensure tasks undertaken on the farm are done safely, correctly and consistently by all farm staff.
  - It is the dairy farmer's responsibility to ensure that farm staff are aware of and understand the procedures specific to their enterprise. They also need to clearly identify who is responsible for particular tasks.
  - It is good practice to have a written procedure, usually called a Standard Operating Procedure (SOP), which details how to carry out a task in a controlled and repeatable manner.
  - It should cover all requirements to carry out the task, including details of process, equipment and materials, and any relevant risk and safety issues.
  - It may be necessary to carry out a risk assessment on potentially hazardous tasks. Clear procedures competently carried out minimise the risks to staff, animal health, animal welfare, and milk quality and safety
- **Induct and train/educate staff appropriately for their work Farm staff need to be properly trained to work productively and safely.**
  - This includes being formally introduced to the working environment & their specific role.
  - New staff should be supervised by a competent person until they are familiar with their tasks and understand the farm's specific management systems and potential risks.
  - Training opportunities for existing staff can also improve productivity and increase work satisfaction.
  - Training and educational opportunities can be used to monitor farm procedures and provide feedback for continual improvement.
- **Ensure staff carry out their tasks competently**.
  - Good managers have systems in place to ensure that tasks carried out by others on the farm are being undertaken competently and in a timely manner.

- Good communications, backed up by visual checks, appropriate record keeping or other methods of verification, are good practice.

♠ **Choose competent people for training, advice and interventions**

- Choose competent and qualified people to develop and deliver staff training.
- Only seek and act on advice from sources and individuals that are appropriately skilled or qualified.
- Use appropriately qualified and authorised professionals to undertake specialist tasks on the farm such as veterinarians, milking machine technicians, dairy hygiene specialists, accountants and the like.

Self-Check -2	Written Test

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

1. How dairy farm employees Confirming safe in dairy farm operation activities ?(5pts)

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

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

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

Information Sheet- 3	Carrying out record keeping for dairy cattle

Record keeping is a necessary element of good livestock business management. With no written records, farmers have to depend on their memory while making decisions regarding their farm practices. But, memories can become unreliable after a few days, months or years. Thus, recording of the performances of the animals can be done easily if animals have some identifications / numberings. Thus, both animal recording and identification are always required.

There are several useful records such as production and financial transactions in the dairy enterprise. If we know what is happening on the dairy farm we need to maintain some useful farm records. Farm records are like the progress report cards students get at school. If farmers have farm records, they can tell how well they are managing their farm in comparison to other farmers. They can also see the strengths and weaknesses in their farm operations. It is also important to have accurate facts and figures when borrowing money, seeking government loans and tax returns.

Advantages of record keeping at farm

- Records provides basis for evaluation of animals from past records hence helps in selection and culling animals
- Helps in preparing pedigree and history record of animals.
- Helps in assessing the past records and designing better breeding plans to check inbreeding, selecting superior parents and helps in better replacement and culling practices.
- Helps in progeny testing of bulls.
- Helps in analysing feeding cost and benefits from animal product outputs. Hence helps to formulate economic feeding strategies for optimal productions.
- Helps in detection of abnormal conditions or disease status of the herd that leads to loss in body weight, loss in milk production etc.
- Helps in finding the commonly occurring diseases in the herd and thus to formulate in time precautionary measures like vaccination, deworming etc.
- Helps in fixing proper prices of animal meant for purchase and sale.
- Helps in overall better supervision and management of herd.
- Helps in ascertaining the income and expenditure (economics) of dairy farm.
- Helps in estimating the cost of milk production.

- Helpful in comparing the efficiency of labour and herd with other farms.
- To compare the herd performances in different years to determine the amount of profit/loss each year and setting future goals/directions for the farm.

Good records should have the following characteristics:

I. Easy to update

I. Easy to understand

III. Up to date i.e. include the latest event (current)

IV. Easy to access

V. Easily summarized

Types of records to be maintained at a dairy farm

1. **Livestock register** : This register records the number of the animals at the farm along with their identification number, date of birth, sire number, dam number, calf and its sex, date of calving, date of purchase, date of sale/auction/death.
2. **Calving register:** This register maintains the records of calving that take place in the farm. It maintains dam and sire number of the calf, calf number, sex and its date of birth and any other remarks like type of calving (normal/abnormal).
3. **Daily milk yield register:** This register records the daily milk yield performance of the cows.
4. **Calf register:** maintains the records of calf at the farm, calf number, sex of the calf, sire number, dam number, birth weight etc.
5. **Growth record of young stock:** this record maintains the weight of the young stocks at different intervals.
6. **Daily feeding register:** This register records the amount concentrate, dry fodder, green fodder and other feeds given to the animals daily.
7. **Herd health register:** This register maintains the record of the diseased animals along with history, symptoms, diagnosed disease, treatment given and name of the veterinarian who treated.
8. **Cattle breeding register :** This register maintains the details of breeding practices in the farm such as cow number, date of calving, date of heat and services along with the bull number, date of successful service, pregnancy diagnosis records, expected date of calving, actual date of calving, calf number etc.
9. **Animal History sheet:** This maintains animal number, breed, date of birth, sire and dam number, lactation yield records, date of drying, date of disposal/death, cause of disposal etc.

The major types of records which are all described below:

1. Identification
2. Breeding
3. Production
4. Feeding
5. Disease and treatment records
6. Financial records

1. Identification Records

- An identification method should be cheap, not harming the animal, reliable to read at a distance of at least 2-3 metres and by preference be permanent.
- Identification of the animals is of course not necessary if a farm has only one animal of a certain species, sex and age group.
- Identification of animals is usually through use of numbering, by marking of the animal and by description of certain characteristics of the animal. The latter is the most animal friendly, and can be done in practice by drawing e.g. the different color spots of the animals, or certain cowlicks, or taking photos. Giving the animals names and keeping a table with the characteristics of the animal and link it to the name can work in many cases.
- Intrusive methods of identification can be subdivided into 2 categories: permanent at the animal itself (which affect the animals most when doing it) and non-permanent.

a) Permanent Identification

- Tattooing (ear or under)
- Brand (Hot iron, freeze and chemicals)
- Ear-notching, Punching
- Tags (Ear-tags, Flank-tags, tail-tags and Brisket-tags; permanent if they do not fall off)

b) Non-Permanent identification

- Collars or neck or leg straps (chains)
- Paint and dyes (can be very animal friendly, but if the paint is full of chemicals it is not healthy and is not recommended, please check)

Table3 .1. Cow Identification and Health Card

Cow identification			Health record		
Cow name	Sire	Dam	Date born	Illness/event	Out come
Number		Number			
Breed		Breed			
Birth date		Sire name			
Date animal received		Number			
Sources		Breed			

2. Breeding Records

The importance of breeding records is to measure the productive efficiency of the herd and to enable selection. For example, many farmers would like a cow or a goat which gives birth yearly, or a sow 2 liters per year. Therefore, an accurate up-to-date breeding record of each individual female is necessary. An indicator for fertility/efficiency of mating or inseminations is e. g the number of mating or inseminations needed to get an animal pregnant. If many mating or inseminations are needed, it can indicate that there is a problem with the female or the male, or it can indicate that the observation of the heats is not efficient, or the semen, the technique of insemination is insufficient, or the feeding is imbalanced. If the cow is taken to a bull, it can be the cow or the bull which has a problem. Data for insemination or service with a male also is needed to be reminded when the female should be prepared before giving birth, e.g. like in the cow's case, to be dried off in time.

The most important data in breeding records include:

- Pedigree/parentage (name or other identification of parents and grandparents)
- Fertility (dates of all services (this also allows calculating the number of services per conception), dates of giving birth (allows to calculate the age of first calving/giving birth and the period between successive birth)
- Birth details (number and weight of newborns, was assistance necessary? Stillborn / perinatal deaths / vitality score)

Table3.2. Breeding / Reproduction Card

Location No. ---------- Date of last calving -------

Date on heat	
Services dates	
Bull/AI	
Breed and owner	
Pregnancy check date result	
Date to dry	
Date to calf	

Table 3.3. Table calving record

ID				Birth			Weaning		12 month		Remarks

Table 3.4. Cow cards for planned fertility management

Cow No				
Last calving date	Date vet. Examination	Examination of remark e.g Pregnancy diagnosis	Service date	Expected calving date

3. Production Records

These records are useful in measuring the performance of the animals and the herd. It contributes greatly to the economic appraisal of the enterprise. It can help farmers take decisions on investments, based on how many animals produce how much on the farm. The

records can also be used by the whole sector to improve the genetics of the animals in the country, with specific focus on the production.

Production records are kept of:

- Animal products like eggs per hen per week and milk per cow per day in combination with milk quality data, and of
- Animals which are slaughtered, in terms of for example weight, weaning age and weight, daily gain, production period, and how many animals e.g. per litter reached slaughtering.

Production records are also necessary when farmers start selling products together, to know how much is available every day or every week or in a certain period.

Table 3.5. 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											

4. **Feeding Records**

Feeding records give information about the amount, type and quality of the feed. Feeding records can be used both for day to day management and adjustment of the feed ration. Together with the production data, it can for example be used to adjust if a milking cow needs more concentrate, or help in decisions about examining animals which seem to not grow, but still eat very much. It can also be used for planning of activities related to feed conservation and establishment of grazing areas in the following season.

The important feeding records are:

- Produced and available fodder on farm; quantity and if possible quality of the different feeds. Including content of energy, protein and minerals
- A feeding plan which tells how much feed is required per day per animal in different age groups (grown-ups, newborn, pregnant the first time etc.) or per group of animals
- Left-over feed if any (per head and per feed, if possible)
- Spoilage (per batch)

Table 3.6. Feeding Record sheet

Type of Feed	Unite of Measurnment	Feed In take per day per cattle							
		Cattle 1		Cattle 2		Cattle 3		Cattle 4	
		Name/ID	Qty.	Name/ID	Qty.	Name/ID	Qty.	Name/ID	Qty.

5. Disease and treatment records

Disease and treatment records are necessary to keep track of the disease events in which each animal is involved during its lifetime. This can guide to better management practices by leading the attention to repeated events or certain vulnerable groups of animals over time (e.g. it can show how animals almost always need disease treatments during weaning). It provides information about the health status of each individual animal and the whole heard, and it can help ensuring important vaccinations given at the right time. On basis of the disease and treatment records, success of interventions both for prevention and treatment can also be evaluated. After treatment with dewormers, acaricides and antibiotics and other medicines, milk and meat cannot be eaten by humans for some time. The records are essential for keeping track of this, e.g. when this withdrawal time is over. In organic animal husbandry, the

withdrawal time is normally longer than the ordinary withdrawal time (double, or three times)

Disease and treatment records can for example involve:

- Disease occurrence and date
- All handlings to cure diseases (also non chemical treatment)
- Vaccination
- Dipping/spraying
- Treatment
- De-worming
- Postmortem

Table 3.8 Disease occurrence and treatment record sheet

Date	Animal no.	Kind of disease	treatment	Remarks

6. Financial Records

The records of the costs and earnings related to the animal farming be kept for cash analysis and enterprise appraisal. In most households, the most necessary records are simple overview over the family cash flow, that is, the total economy in the household: what comes in? And what do we buy? In addition to this, keeping records of the animal enterprises is an important part, because it can show whether it gives an income to the family or not. If records are kept particularly for the animal herd as an income generating commodities, it will help the family to see what they invest in it, and what it costs to produce it. Also in relation to the animal farm, an investment is more than an expenditure, an investment hopefully enables and improves the production in the future. It is also important to count approximately how many hours of work it has taken in the animal herd, because it can help price setting. Economic records are of paramount interest in providing the farmer with information concerning the profitability of his farm. Moreover they are of great help in decision making at the right time. For example, is it

profitable to feed concentrates, is it advisable to apply for a loan or credit to invest in a machinery or technology?

Answering these questions is only possible if adequate records are available. Moreover, for tax purposes and for the purpose of getting loans or credit, economic records are required.

Self-Check -3	Written Test

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

1. What is the importance of record keeping in dairy farm?(3pts)
2. What are the major types of records in dairy farms? (4pts)
3. Write the characteristic good data records should have exists.(3pts)

Note: **Satisfactory rating - 10points** **Unsatisfactory - below 10 points**

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

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

_____

3._____

_____

Information Sheet-4	Performing dairy animal housing, sanitation, feeding, identification, dehorning and fencing

4.1. Performing dairy animal housing

Appropriate housing and husbandry are essential for the health and well-being of dairy cattle. Animal handling is a key factor. Employers have an obligation to properly train employees. Most husbandry systems impose restrictions on some freedoms of cattle. However, modern dairy farming should not cause unnecessary discomfort or distress.

Producers should consider the following animal needs:

- shelter
- feed and water to maintain health and vigor
- freedom of movement and exercise for most normal behavior
- company of herd mates
- light during daylight hours and night-time lighting to enable inspection
- slip-resistant flooring
- veterinary care, diagnosis and treatment, disease control and prevention
- no unnecessary surgical alterations
- Emergency preparedness for fire, mechanical breakdowns, and the disruption of feed supplies

Producers meet the needs of their cattle under a variety of husbandry and management systems. Husbandry and housing are important determinants of appropriate cow numbers and densities within specific housing systems.

Housing systems

Housing conditions have a significant impact on the welfare of dairy cattle. Dairy cattle in developed countries are housed according to their reproductive state, size, age, and lactation period using a variety of systems.

The welfare of dairy cattle depends not only on the specific housing system, but also on the details and management of a particular system. Details would include stall design, type of flooring, feeding system design, stocking density, cattle traffic patterns, location of water bowls or troughs, and handling system. Housing system design should take into consideration environmental and management factors. At all stages of life, cattle should be housed under

conditions conducive to health, comfort, nourishment and safety. The system should allow cattle to express innate behavior and be designed to avoid suffering from pain, fear, injury or distress.

In planning and designing of suitable housing accommodation for dairy cattle, consideration should be given to the comfort and health of the animals along with economic use of labour for various dairy farm operations like feeding, cleaning milking and maintenance of farm sanitation.

For the better welfare of the animals following points are to be considered in planning and construction of dairy cattle housing.

- Sufficient area should be available to all categories of animals. The floor should be sloped sufficiently for effective drainage.
- The partition of individual calf pen should be such that each calf has an opportunity to see other calf but cannot mix each other through partition.
- Adequate ventilation, effective temperature and humidity to be ensured in the animal shed.
- The space allowances for cattle housed in group should be calculated in relation to the total environment, the age of stock and the size of group. The group size should not exceed more than 50-60 and preferably be 35 to 40 per group.
- When the cattle are fed in group there should be sufficient feeding space to avoid competition for feed and fodders

Importance of housing:

- To protect the animals from adverse climatic conditions
- To provide clean and comfort shelter
- To protect animals from predators and theft
- To improve production and reproduction efficiency
- For proper feeding management
- Better efficiency of herd and labour
- Better care and supervision of animals
- Better economic return from the farm
- To improve clean milk production

The following factors should be considered while deciding the location of the farm:

Facilities	Characteristics	Required for
Size & shape	Enough	Ease of operations
Topography	Elevated (high, leveled without abrupt slopes)	Low cost of construction
Soil type	Fertile and leveled	Low cost of fodder production
Water supply	Natural, Clean, Regular	For all operations
Drainage	Good drainage system	Hygienic need
Accessibility to fields	Easily visible, away from highways & rail tracks and Approachable.	Ease of monitoring
Roads	Away, but not far away.	Ease for transport.
Views	Good natural views	Aesthetic factor
Sun exposure	Maximum	Disease control
Wind protection	From strong winds	Disease control and Stress reduction
Electricity	Regular	For every operation
School, Bank, Hospital	Nearby, approachable	Essential for children, labour &workers
Service facilities	Workshop, Medicines, General stores, Fertilizers, etc.	Ease of use
Erosion control	Area be covered with vegetation	Protection to crops & soil
Vegetation	Good cover	Ensures fertility of land, checks soil erosion
Marketing facilities	Nearby, assured, regular.	Ensure selling of products.

Systems of Housing

- Dairy cattle may be successfully housed a wide variety of condition, ranging from close confinement to little restrictions except at milking time.
- There are **two** systems of housing for cattle;
    1. Loose housing system
    2. Conventional housing systems
- Each system has its own advantages and limitations.

Loose Housing System

- Loose housing may be defined as a system where animals are kept loose except milking and at the time of treatment. The system is most economical.
- In the loose housing system animals are kept in an open lot or on pastures and are not bound except at the time of milking. The open area will have a shelter on one side under which the animal can retire during the time of excessive heat, cold or rains. One common manger and a common water tank can be provided for these animals.
- In loose housing, animals are usually kept loose in an open paddock in group of 40-50 throughout the day and night except during milking and some other specific purposes like treatment, breeding etc., when the animals are required to be tied.
- This housing system generally provides continuous feeding-box along with covered standing space, open paddock which is enclosed by brick wall or railing and common water trough. A separate structure of calf pens, milking barns, calving pens, dry pens and heifer pens etc., are required for this system.
- Under loose housing system, the entire shed is surrounded by boundary wall of 5 feet height on three sides and on one side of house; there is provision of 2-2.5 feet of manager space per cow.
- All along the manger, there should be wide water trough to provide clean drinking water.
- A common water tank can also be provided on one side of animal house.
- Concentrates are fed at the time of milking in hopper bin, where cows stand in stanchions under milking area. Paved area or open area is the place where animal gets fresh air and sunshine. There should be provision of balance for weighing animals and manure pit located away from the barn.
- In loose houses, it will be very useful to have shady tree both within the paddock area and around the building.

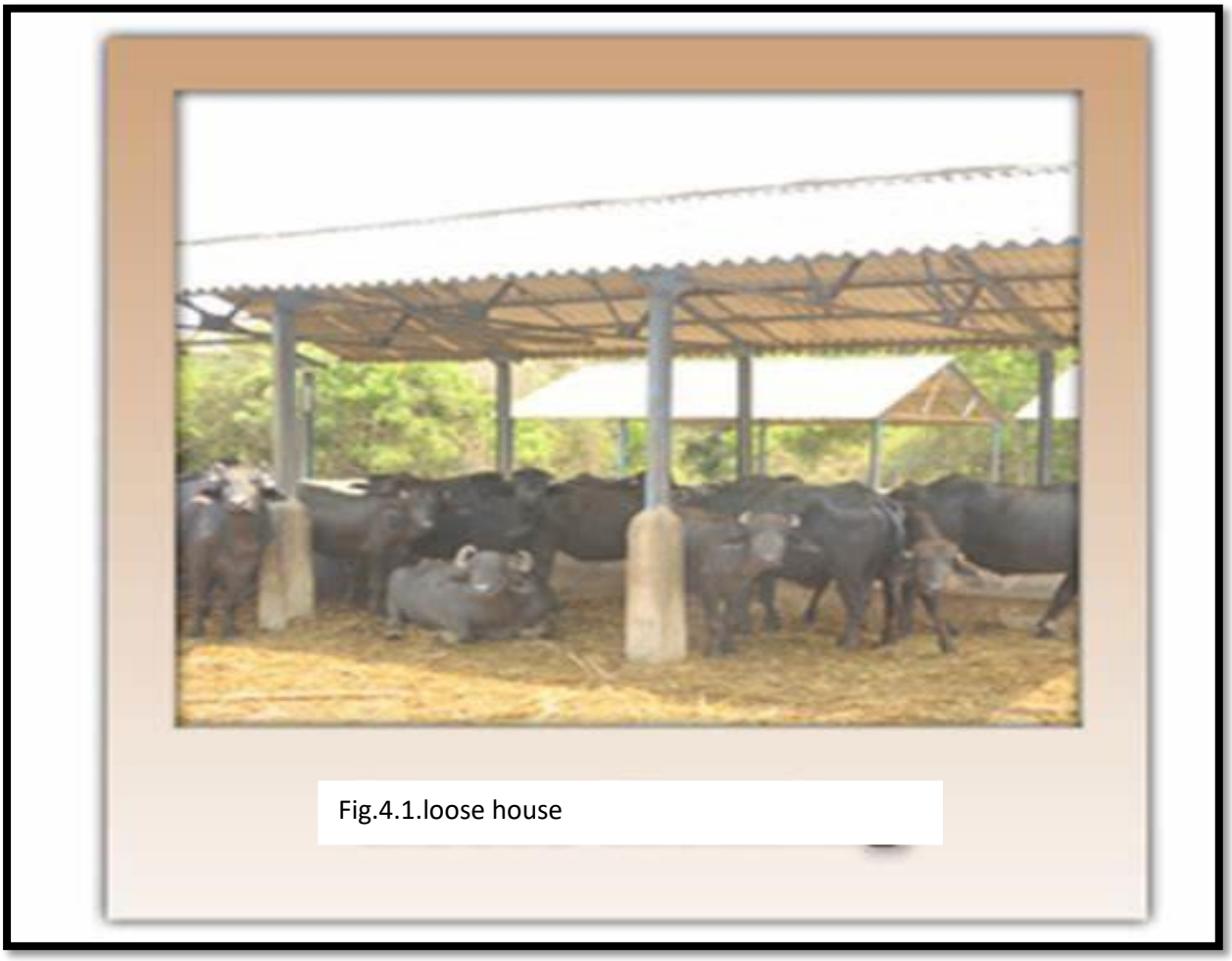


Fig.4.1.loose house

Advantages of loose housing system

- The construction cost is less and thus economical.
- This system of housing is more flexible and so it can easily be extended to accommodate more number of animals without much difficulty.
- Animals move freely/comfortably and can eat or drink as and when they desire.
- Heat detection is easy and efficient.
- Feeding, watering and cleaning operation can be done conveniently with the minimum labour requirement.

Disadvantages of loose housing system:

- Individual feeding attention is not possible.
- Health management is not adequate.
- Disturbances during heat period (oestrus) are encountered by fellow animals

Conventional housing system

- Animals are confined together on a platform, secured at neck by stanchion. These are also called as stanchion barn.
- The cows are fed as well as milked in this barn. The barn is completely roofed and the wall also complete windows or ventilators located at suitable places.

Fig. 4.2. Well dimension and comfortable conventional house

It is classified on the basis of barn system:

a. Single row cow barn system:

If the number of animals is less than 10, single row system is preferred. Manger is along the side wall parallel to the length of shed.

b. Double row cow barn system:

When numbers of animals are more than ten; they are tied in two rows in two ways.

Advantages of Conventional housing system:

1. Animals are less exposed to harsh climatic condition.
2. Animals can be kept clean
3. Maintain good health and hygiene

Disadvantages:

1. It is comparatively costly.
2. In warmer part of country it is not recommended because the air in the barn tends to humid and barn floor become damp during autumn and rainy season.

(1) Tail to tail system

The animals do not face each other. The manger & feeding passage is separated and the cleaning passage is common.

Fig. 4.3.tail to tail house system

(2) Head to head system:

They face each other. Manger may be common or separate (with feeding passage)

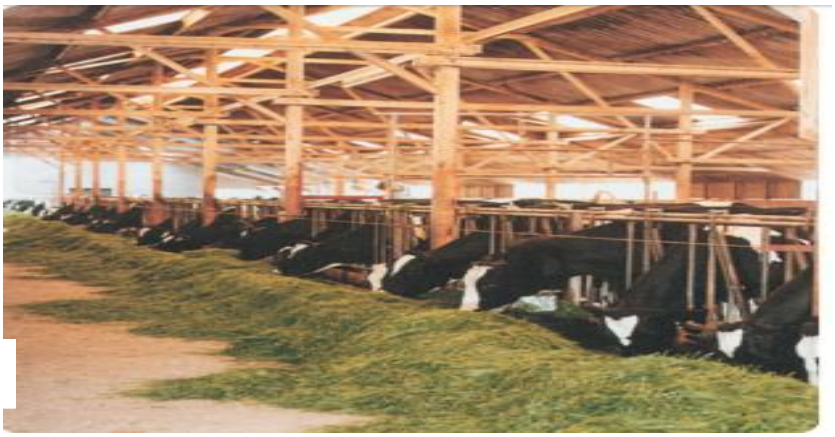


Fig. 4.4 head to head house system

Majority of dairy animals are kept by smallholder farmers under zero grazing or semi zero grazing systems. **Below is a layout of a zero grazing unit five cows?**

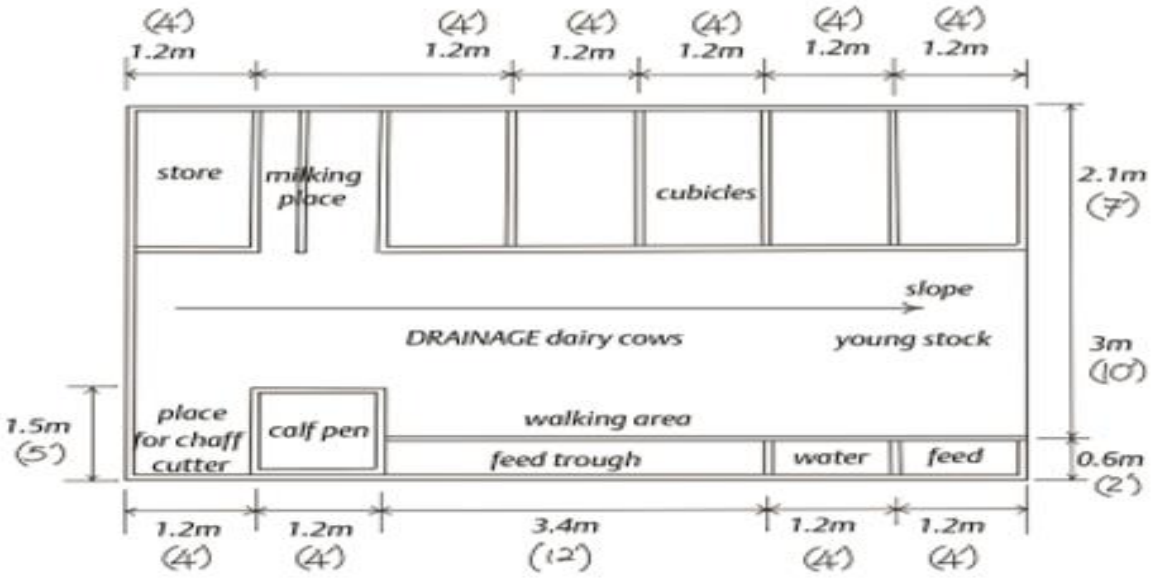


Fig4.5. Layout of a zero grazing unit for 5 cows

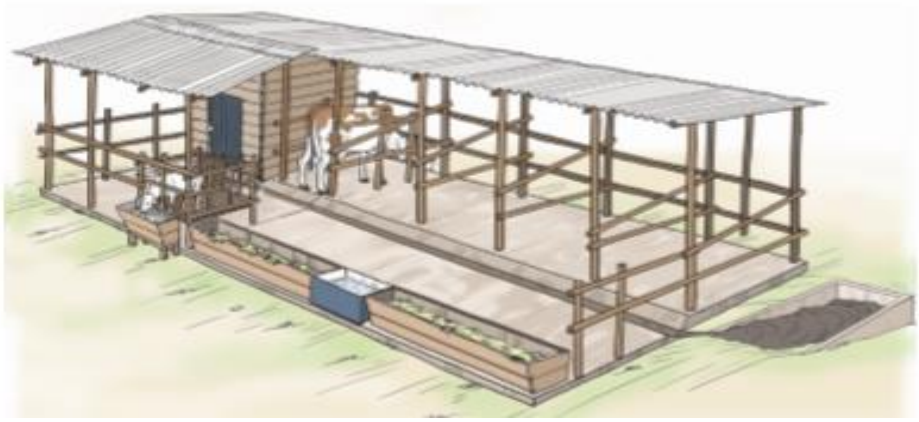


Fig 4.6. A zero grazing unit complete with a sun shade structure

Sun Shade

When constructing a shade structure, it should allow 2.5 to 3m per animal which will give the minimum desirable protection for cattle, whether it be for one animal belonging to a small holder or many animals in a commercial herd. The roof should be a minimum of 3m high to allow air movement. If financially feasible, all the area that will be shaded some time during the day should be paved with good quality concrete. The size of this paved area depends on the orientation of the shade structure. If the longitudinal axis is east and west, part of the floor under the roof will be in shade all day. Extending the floor approximately one third its length on the east and on the west, a paved surface will provide for the shaded area at all times.

If the longitudinal axis is north and south, the paved area must be 3 times the roof area i.e. 1/3 to the east, 1/3 to the west and l/3 underneath.

In deciding which orientation to build, the following factors need be considered:

1. With the east-west orientation the feed and water troughs can be under the shade which will allow the cows to eat and drink in shade at any time of the day. The shaded area, however, should be increased to 3 to 4m² per cow. By locating the feed and water in the shade, feed consumption will be encouraged, but also more manure will be dropped in the shaded area which in turn will lead to dirty cows.
2. With the north-south orientation, the sun will strike every part of the floor area under and on either side of the roof at some time during the day. This will help to keep the floored area dry. A shaded area of 2.5 to 3m² per cow is adequate if feed and water troughs are placed away from the shaded area.

3. If it is felt that paving is too costly, the north-south orientation is the best choice in order to keep the area as dry as possible.

4. In regions where temperatures average 30°C or more for up to five hours per day during some period of the year, the east-west orientation is most beneficial.

The gable roof is more wind resistant than a single pitch roof and allows for a center vent. A woven mat of local materials can be installed between the rafters and the corrugated iron roof to reduce radiation from the steel and lower temperatures just under the roof by 10°C or more.

Comparative study of loose and conventional housing system:

Parameter	**Loose housing**	**Conventional housing**
Enlargement or expansion	Easy and less expensive	Difficult and more expensive
Heat detection	Easier	Less easy
Labour saving	More	Less
Stabling costs	Less	More
Comfort to animal	More	Less
Health	More	Good
Benefit of sunlight	More	Less
Cleanliness	Less	More
Benefits of exercise due to Movements	More	Less
Efficiency and profitability	More	Less
Quality of milk	Good	Better

Standard Floor Space Requirement of Animals

Table 4.1: Floor space for cattle

S.No	Type of animal	Floor space(m^2)		Max. No. of animals per pen	Height of shed for eves
		Covered area	open area		
1	Bull	12	120	1	175cm175cm(medium & heavy rainfall areas)
3	Cow	3.5	7	50	
4	Down calves	12	12	1	220 cm (semiarid & arid regions)
5	Young calves	1	2	30	
6	Old calves	2	4	30	

Table 4.2: Floor, Feeder and Waterer Space Requirements of Dairy Animals

S.No	Type of Animal	Floor space(m2)		Feeding (Manger) space per animal (cm)	Water trough space/ animal (cm)
		Covered area	Covered area		
1	Young calves (< 8 weeks)	1	2	40-50	10-15
2	Older calves (> 8 weeks)	2	4	40-50	10-15
3	Heifers	2	4.0-5.0	45-60	30-45
4	Adult cows	3.5	7	60-75	45-60
5	Adult buffalo	4	8	60-75	60-75
6	Down calvers	12	20-25	60-75	60-75
7	Bulls	12	120	60-75	60-75
8	Bullocks	3.5	7	60-75	60-75

Following guidelines are useful for designing effective housing structures

Orientation of shelter:

Shelter provided protection to the animals from various climatic extremes i.e., rain fall, hot and cold weather, wind, snow, frost etc. The orientation of shelter to be such, so that it can give maximum protection to the animals from direct sun light and allow proper ventilation as per wind direction of the location. In coastal area, the sheds shall be oriented across the prevailing wind direction in order to protect the roof from being blown off by high wind at the same time to provide sufficient air movement in the shed. In humid region, building should be so sited as to avail the natural aeration and sunlight of the structure shall be east to west in coastal area and North to South in the dry hot area.

Slope/Gradient:

Proper and sufficient slope in the paddock is very important for maintaining clean and dry sheds.

Drain:

There should be shallow drain in open paddock for complete channel out of rain water. The common drain of the dairy farm should be sufficient sloped and with optimum width for effective drainage of dairy washing etc.

Open drain in dairy farm is preferable than closed underground drain which sometimes creates problems for proper drainage of dairy washing.

Ceiling height:

Sufficient ceiling height is pre-requisite to reduce radiation heat load. In warm and humid region the height of the shed should be about 4 to 5 meters. In hot dry climate the more ceiling height is recommended i.e., about 5 to 7 meters for elimination of radiation heat load.

Roof:

Roof should be light, strong, durable, weather-proof and bad conductor of heat.

Materials used for constructing roof generally include galvanized sheet or fiber glass sheet or tiles or thatched etc., according to the availability in the local area. Slope is generally kept steeper in heavy rainfall area. There should be provision of air circulation in the upper part of the roof Generally the eaves of the roof shall be projected out at least 50 cm away from the

pillars and in the regions where extreme climatic conditions prevails the eaves may be projected out to 75 cm from the pillars in order to afford protection to the animals from rain, hot and cold wind. The height of the eves should be about 1.8 to 2.00 meters but in heavy rainfall area height shall be as lower as possible but not lower than 1.6 meters. A provision for fan with mist/fogger cooling system could be installed to protect the animals from severe heat stress during summer months. For protecting the animals from cold stress during winter providing wind breaks on the windward side which could be considered with provision for comfortable bedding material such as tree leaves/ rubber mats or surplus/ paddy straw etc. Tunnel cooling system is advised for closed housing system.

Floors:

Floor should be hard impervious easy to clean and non-slippery. It may be of (i) Cement concrete, (ii) Brick on edge, and (iii) Stone slab flooring.

The floors of the straw store, chaff cutter shed and implements room may be brick paved whereas the floors of the milk storage and feed grinding, mixing-cum-storage room should be made of reinforcement cement concrete (RCC).

Pillars:

Pillars may be either of hard wooden post, cast iron pipes; Columns of bricks or reinforcement cement concrete (RCC). Each of them shall be placed at intervals of 2.50 to2.75 meters.

Walls:

The covered areas and the open areas of the milking cows shed, calves shed, heifers shed and the dry cows shed should be enclosed by 5 feet high brick walls which are 22.5 cm thick. The height of walls along with which mangers have been constructed inside the sheds shall be 3 feet so as to allow for comfortable feeding from outside the sheds. The walls of milking cows paddocks should have 10feet wide centrally placed gates opening towards the road and the walls of calf shed, heifer sheds and dry cows sheds should have 6 feet wide centrally placed gates opening towards the road. The gates should be made of iron or strong wood. The height of straw store walls should be 20 feet. The covered part of the calf pen / shed should have walls on three sides up to the roof with door in the wall facing the open area. The fourth side (behind the manger) may be left open in summers and a tarpaulin curtain may be hanged from the roof in winters. During winter nights calves can be folded into this room and the doors closed. During daytime the calves can move through the opened doors into the open area to have the benefit of sunshine.

Gate: The gate is dairy farm varies in sizes. The width of the gate leading from sheds to sheds to be about 3.0 to 4.0 meters for easy movement of tractors for cleaning and delivery of fodder. The gate which leads from paddock to road is to be 3.0 to 4.0 meter. The main gate of the farm premises should be bigger in width i.e. 5.5 to 6 meters for easy entrance and exit of tractors, trolleys and other heavy vehicles.

To sum up, the capacity of an animal to produce differs between species, breeds and strains as a result of genetic factors. However, a complex of inter-related factors in the animal husbandry will influence the animal's ability to utilize that capacity for growth, development and production. Animal housing design is mainly concerned with the physical environment, in particular climatic and mechanical factors, but all other factors should also be considered in order to create a good layout, where healthy, high yielding animals can be provided with correct feeding, can be easily handled and can produce without stress or suffering physical harm.

Recommended Best Practices of Dairy Animals of Housing

- provide bedding even when using mattresses
- provide flooring with good traction to prevent slipping and falling
- provide non-abrasive flooring material where long travel routes may cause excessive claw wear
- provide soft, high traction flooring in areas where cattle stand for long periods
- provide restraint facilities for ease of management and handling (e.g., use self-locking stanchions or head gates at the feed bunk)
- provide opportunities for all cattle to exercise daily, if weather permits
- be aware of behaviors that indicate an animal is feeling unsafe or fearful and rectify issues
- inspect cattle for injuries that indicate hazards in barns (e.g., hair loss, abrasions or swellings on legs, necks or other body parts)
- observe animal walking patterns and monitor gait scores to assess floors for traction and surface conditions (e.g., level, abrasiveness, obstructions)
- repair housing defects (e.g., broken stall partitions, concrete or other protrusions)
- ensure access routes to the milking parlor are free of hazards and consistently illuminated such that the cattle can see where they are going
- design facilities to allow for easy moving and grouping of animals.

4.2. Sanitation in Dairy Farm

- Sanitation is necessary in the dairy farm houses for eliminations of all microorganism that are capable of causing disease in the animals.
- The presence of organisms in the animal shed contaminates the milk produced thus reducing its self-life, milk produced in an unclean environment is likely to transmit diseases which affect human health: Dry floorings keeps the houses dry and protects from foot injury. Similarly the presence of flies and other insects in the dairy farm area are not only, disturbs the animals but also spreads deadly diseases to the animals' egg. Babesiosis, Theileriosis.

Cleaning of Animal Sheds:

- The easy and quick method of cleaning animal house is with liberal use of tap water, proper lifting and disposes all of dung and used straw bedding, providing drainage, to the animal house for complete removal of liquid waste and urine.
- The daily removal of feed and fodder left over in the manger, reduces the fly nuisance. Periodical cleaning of water through eliminates the growth of algae, bacterial and viral contamination and thus keeps the animal healthy.

Sanitizers:

- Sunlight is the most potent and powerful sanitizer which destroy most of the disease producing organism.
- Disinfection of animal sheds means making these free from disease producing bacteria and is mainly-carried out by sprinkling chemical agents such as bleaching powder, Iodine and lodophor, sodium carbonate, Washing soda, Slaked Lime (Calcium hydroxide), Quick Lime (Calcium oxide) and phenol.

Procedure:

- Remove the dung from the floor and urine channel with the help of a shovel and basket (iron) and transfer it to the wheel - barrow.
- Remove the used bedding and leftovers from the mangers in a similar way.
- Empty the water trough and scrape its sides and bottom with the help of a floor brush.
- Wash the water through with clean water and white wash it with the help of lime mixture once a week.
- Scrape the floor with a brush and broom and wash with water.

- Clean and disinfect the splashes of dung on the side walls, railing and stanchions.
- Remove the cobwebs periodically with the help of a wall brush.
- Sprinkle one of the available disinfecting agents in the following concentration. Bleaching powder should have more than 30% available chlorine. Phenol 1-2% solution. Washing Soda (4% solution).
- Allow adequate sunlight to enter in to the shed.
- Spray insecticides at regular intervals especially during the rainy season (Fly season).
- Whitewash the walls periodically by mixing insecticides in it to eliminate ticks and mites living in cracks and crevices.

4.3. Performing dairy cattle feeding

The dairy cow is like a as a machine that converts raw materials (feed and water) into milk. The raw materials are mainly plant materials which are not edible by humans but the cow is able to convert into high quality human food.

To get more milk, feed the cow on good quality feed in large quantities. The size of the factory can be compared to the size of the cow where a large factory will hold more raw materials, so will a large cow have a larger rumen.

Cattle should be provided with access to an appropriate quantity and quality of balanced nutrition that meets their physiological needs. Feeding systems should be designed to minimize agonistic behaviour.

Where cattle are maintained in outdoor conditions, short term exposure to climatic extremes may prevent access to nutrition that meets their daily physiological needs. In such circumstances the animal handler should ensure that the period of reduced nutrition is not prolonged and that extra food and water supply are provided if welfare would otherwise be compromised.

Feedstuffs and feed ingredients should be of satisfactory quality to meet nutritional needs and stored to minimize contamination and deterioration. Where appropriate, feed and feed ingredients should be tested for the presence of substances that would adversely impact on animal health.

The relative risk of digestive upset in cattle increases as the proportion of grain increases in the diet or if quality of silage is poor. Therefore, when grain is given to dairy cattle it should be introduced slowly and constitute no more than 50% of the daily diet. Palatable fibrous food

such as silage, grass and hay, should be available ad libitum to meet metabolic requirements in a way that promotes digestion and ensures normal rumen function.

Animal handlers should understand the impact of cattle size and age, weather patterns, diet composition and sudden dietary changes in respect to digestive upsets and their negative consequences (displaced abomasum, sub-acute ruminal acidosis, bloat, liver abscess, laminitis). Where appropriate, dairy producers should consult a cattle nutritionist for advice on ration formulation and feeding programmes.

Particular attention should be paid to nutrition in the last month of pregnancy, with regards to energy balance, roughage and micronutrients, in order to minimise calving and post-calving diseases and body condition loss.

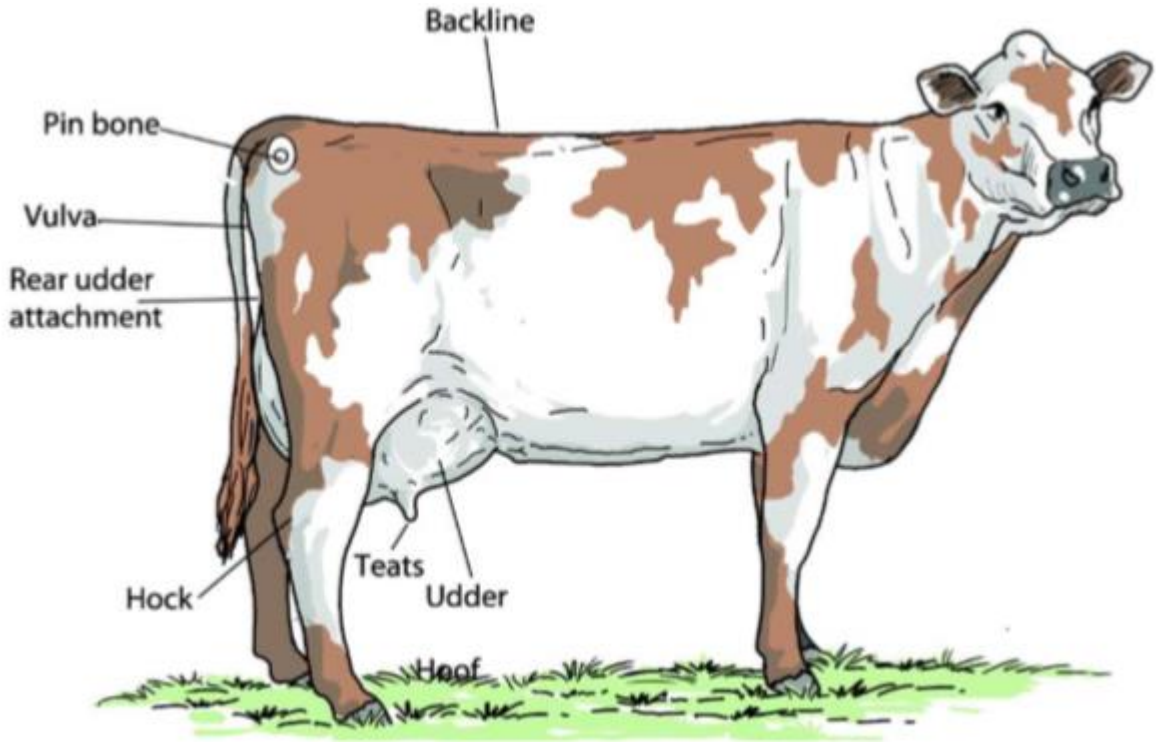


Fig. 4.7.parts of a cow

Feed is converted into milk by the digestive system (stomachs and intestines) and the mammary gland. All cows can be assumed to have a similar digestive system but the capacity of the mammary gland will vary depending on size of udder and number of milk making units (alveolar cells) which are determined by the genetics of the cow. A conducive environment is required for them to function (the cow must be comfortable and free from pain), just like the workers in a factory.

Nutritional requirements

Proper feeding is essential to ensure animals receive adequate nutrients for maintenance and production, and remain healthy and in good body condition. Dairy cattle must eat a balanced diet. Too little (or poor-quality feed) results in thin animals that cannot resist disease while giving too much feed is wasteful and does not make economic sense. Lack of essential nutrients will result in ill-health, failure to reach full production potential and sometimes death.

• **Macro ingredients**. Energy supplies the body's fuel allowing the animal to move, keep warm, stay alive and be productive. Energy feeds are the main part of the diet. Protein helps young animals to grow and develop strong muscles and enables cows to produce healthy calves and adequate milk.

• **Micro ingredients.** Minerals and vitamins are required in small amounts and fulfil a variety of functions, including forming strong bones and maintaining the reproductive system.

Types of feed Balanced diets for cattle are made of the following:

Bulk feeds: Also known as basal feeds, these are fibrous plants known as forages and include grass, hay, straw and stovers (stems and leaves of tall cereals such as maize and sorghum). They provide most of the energy and bulk an animal needs and will make up most of the diet. Most contain only low or medium levels of protein. Forage forms up to 30-70% of the diet, depending on level of productivity. Using a feed trough helps to make forage accessible without wastage.

Supplementary feeds: these are feeds with a higher concentration of energy or protein or both, i.e. more nutrients per volume or weight of feed compared to forages. Certain forages (e.g. legumes), commercial dairy concentrates and cereal by-products are high in protein. They are fed in relatively small amounts together with the bulk feeds and are most often fed to productive animals such as lactating or pregnant cows. Protein feed should not exceed 30% of total feed since proteins cannot be stored in the body and will be In addition, extra energy is (which would otherwise be used for milk production) is used to remove the extra protein (nitrogen) from the body in form of urea in the urine.

Table 4.3. **Recommended crude protein levels in dairy cattle diets**

Milk yield (kg/day)	10	15	20	25	30
% Crude protein in whole ration	13	15	16	17	18

Minerals: Dairy cattle require at least 17 minerals and three vitamins in their diet for optimal milk production, reproductive performance, and herd health. Although classical mineral or vitamin deficiency symptoms are rare, in many cases under- and overfeeding of certain minerals and vitamins does occur.

Even small imbalances or deficiencies can develop into reproductive, health, and milk production problems. As herd milk production increases, it becomes more critical to balance and fine-tune the dairy herd's mineral and vitamin feeding program. Generally, the two sources of minerals include natural feeds (forages and grains) and mineral supplements to balance the minerals present in the forages and grains. Minerals can be fed using several methods.

Table.4.4 type of nutrients

Type of nutrients	Cattle diets
Energy	Bulk forages and pastures – grass, hay, straw, stovers Cereal by-products (maize, maize bran and maize germ, Wheat, pollard, wheat bran, rice bran and rice polishing) Root crops – cassava chips Oil seed products Molasses Fat
Protein	Legume crops and forages – desmodium, sweet potato vines or callian-dra leaves Plant by-products: Mostly from extracted oil seeds (cotton seed cake, sun-flower cake, soybean cake), copra cake, groundnut cake Animal origin: Fish meal Non protein nitrogen sources (NPN): Urea, poultry litter*
Vitamins	Vitamin supplements Made in rumen by micro-organisms
Minerals	Forages Mineral licks Salt

Vitamins: Vitamins fall into two groups: fat soluble and water soluble. The water soluble vitamins are synthesized in the rumen thus only the fat soluble (A, D, E) are required in the diet. Vitamin K is not required in the ration because it is synthesized in the rumen.

Water: Although water is not a nutrient as such, it is essential for life. Water can be obtained from feed and/or drinking. Lactating cows need larger proportions of water relative to body weight than most livestock species since 87% of milk is water. The amount required depends mainly on milk yield, water content of feed, amount of feed consumed, salt content of feed and the environmental temperature. Except for high moisture content, an increase in the other factors increases water requirement. Cows will drink more water if it is availed at all times and when warm water is offered on cold days. Dairy cows suffer from a limited intake of water more quickly and severely than from a deficiency of any other dietary nutrient. Lack of water has a big effect on feed intake (especially if the feed is low in moisture) and thus on milk yield.

Balanced Ration: During formulation of dairy cow rations, the daily requirements for all the above nutrients must be taken into consideration. The available feed resources should then be mixed to meet the cow's nutrient requirements, which are dependent on bodyweight, milk yield, reproductive (pregnancy) requirements and growth. A balanced ration will consist of combined feed ingredients which will be consumed in amounts needed to supply the daily nutrient requirements of the cow, both in correct proportion and amount. A ration will be balanced when all the required nutrients are present in feed eaten by the cow during a 24hr period.

Balancing a ration for animals that are not confined (grazing) is a difficult task since grazing animals can choose how much to graze and can select while grazing to improve the quality. Under these circumstances, amount of supplementation can only be estimated depending on quantity quality of the available pasture.

When a ration is not balanced, the cow eats some nutrients in excess or in insufficient amounts. Some excesses and deficiencies, if not checked, can lead to death (eg calcium deficiency resulting in milk fever). However, some imbalances are difficult to identify because they result in some degree of loss thus not permitting the cow to exploit its genetic potential.

A properly balanced ration will therefore be a mixture of all the ingredients.
Total mixed ration (TMR) is a feeding method that helps achieve the mixing a balanced ration.

Total Mixed Rations (TMR) TMR is defined as a mixture of all diet ingredients (roughage, concentrates, mineral supplements and additives) formulated to contain specific amount of nutrients, mixed thoroughly to prevent separation and fed at free will to the cow.

To formulate a total mixed ration, the following information is required: Feeds (ingredients): Nutrient composition (can be obtained from laboratory analysis or estimated from text book values) and cost.

Practical feeding: During the formulation of rations for lactating dairy cows, the quality of the ration should be commensurate with the requirements of the cow. The requirement is directly related to the milk yield, which is in turn dependent on the stage of lactation. As such, cows in early lactation will require more nutrients compared to those in late lactation.

Since it is not practically possible to formulate a separate ration for each cow, the cows should be fed in groups (strings) with common nutrient requirements. Cows in the same stage of lactation will have almost similar requirements and can therefore the rations can be formulated according to the phase (stage) of lactation.

Phase 1: (1-70 days): During this phase, milk production increases more rapidly than feed intake resulting in higher energy demand than intake leading to a negative energy balance. This results in mobilisation and use of body reserves and loss in body weight (negative energy). The energy is mobilised from fat reserves, protein from muscle and calcium and phosphorus from bones. However, energy is most limiting.

The health and nutrition of the cow during this phase is critical and affects the entire lactation performance. The cow is expected to achieve peak production during this phase, failure to which the lactation milk yield is reduced. Excessive weight loss may be detrimental to cow's health and reproductive performance (cow may not come on heat at the optimum time) leading to long calving intervals.

Concentrates should be added to the basal diet to increase the energy and protein content as forage alone will not be sufficient. Cows that are poorly fed during this early phase do not attain peak yield and milk production drops from week 1.

At this stage, high protein content is important since the body cannot mobilise all the needed protein and bacteria protein (synthesized in the rumen by bacteria) can only partially meet requirements. A ration with protein content of 18%CP is recommended for high yielding cows. If the cow is underfed during this stage, milk production cannot recover even when balanced

rations are fed at later stages. This is attributed to the fact that cows in later stages of lactation use energy more efficiently to restore body reserves than for milk synthesis. It should be noted that cows come on first heat during this phase and regaining a positive energy balance is critical in achieving this.

Phase 2: (70-150ds): During this phase the dry matter intake is adequate to support milk production and either maintain or slightly increase body weight. Feeding should be to maintain production peak as long as possible. Decline of 8-10%/month in milk production are common after peaking. The forage quality should still be high and a CP content of 15-18%. Concentrates high in digestible fibre (rather than starch) e.g. wheat or maize bran can be used as energy source.

Phase 3: (151-305ds): During this phase feed intake and milk production decline. The feed intake meets energy requirements for milk production, restoration of body reserves and body weight increases. The body weight increase is due to replenishment of body reserves and, towards the end of lactation, due to increased growth of foetus. It has been shown that it is more efficient to replenish body weight during late lactation than during the dry period. The animals can be fed on lower quality roughage and limited amounts of concentrate compared to the other two phases.

Phase 4: (Dry Period: 305-365ds): During this phase the cow continues to gain weight primarily due to weight of foetus. Proper feeding of cow during this stage will help realise the cow's potential during next lactation and minimise health problems at calving time (milk fever and ketosis).At the time of drying, cows should be fed a ration to cater for maintenance and pregnancy but two weeks before calving, the cow should be fed on concentrates in preparation for next lactation. This extra concentrate (steaming) enables the cow to store some reserves to be used in early lactation and to adapt rumen microbial population to digest concentrates in early lactation to minimise digestive disturbances. During this phase the cow can be fed good quality forage or poor quality supplemented with concentrate to provide 12% CP.

Heifer Rearing

Raising dairy heifers begins with choice of a bull likely to produce animals with high genetic potential for milk. A well-managed dairy farm should have as many calves born every year as there are cows in the herd. Most farmers sell males calves at an early age while the females are reared as dairy replacement heifers for the herd or as heifers for sale.

Raising a high number of replacement heifers allows a dairy farmer to:

i) Obtain the best replacement heifers through strict selection criteria from wide selection. ii) Expand the dairy herd at low cost (without buying heifers or cows)

iii) Sell excess heifers to earn income.

Heifers represent the future of the herd. At the same time, they are non-productive animals incurring expenditure in terms of feed, labour and veterinary services without immediate returns. Raising heifers is a financial investment that begins to bring dividends after the first calving; therefore the goal should be to make ensure proper growth rate at minimum costs to be inseminated on time in order to realize full lactation potential later in life.

Feeding

Heifer raising is the second largest expenditure in a farm after the milking herd, with feed costs takes the largest share.

The aim should be to rear heifers to reach the desired body weight early so that they initiate puberty, establish pregnancy, and calve easily. When feeding heifers, the farmer should aim to:

I. Reduce interval between weaning and first lactation. This will increase number of calving per lifetime (more of lactations) and lead to faster genetic improvement.

II. Minimize mortality.

III .Achieve a growth rate of 0.5-0.7 kg/d.

IV. Achieve first calving at 22 to 24 months of age

V. Feeding management must ensure that heifers reach target live weights for breeding at 14-16 months of age.

Combining both adequate development and early age at calving has several advantages:

- It decreases the risk of calving difficulty.
- It improves lifetime milk production (days in lactation and milk production per day in lactation).
- It reduces rearing costs (feed, labour, etc.);
- It decreases total number of heifers needed to maintain herd size.

In most farms, heifers are normally the most neglected group in terms of feeding resulting in delayed calving. When heifers are fed as a group, the main problem becomes that the heifers

are normally of different ages and thus aggressiveness varies. When concentrate is fed to the group, the young and weak consume less compared to others. In pasture management systems, close supervision is required due to variation in pasture quality through the seasons which may affect heifer growth rates.

Heifers can be reared on good quality pasture only as their nutrient requirements are low (growth and maintenance). Supplementation with concentrate should be at 1% of body weight. Generally the amount of concentrate given to heifers should be 1 to 4 kg depending on age (size) of the heifer and forage quality. Mineral salt supplement is recommended on a free-choice basis.

While designing a feeding program for heifers, the following should be considered:

- ❑ Puberty (thus calving) is related to size (feeding) rather than age. The consequences of poor feeding are manifested in delayed calving resulting in delayed milk production.
- ❑ Feeding heifers too much energy leads to deposition of fat in mammary gland tissue displacing secretory tissue resulting in reduced milk yield. The key period in mammary gland development is between 3 and 9 months of age. During this period, mammary tissue is growing 3.5 times faster than body tissue. Heifers fed high-concentrate rations develop less milk secretory tissue in the mammary gland than heifers raised on recommended rations.
- ❑ Underfeeding heifers results in small bodied heifers which experience dystocia (difficult calving).
- ❑ Heifers calving at 24 months have a higher lactation milk yield compared to calving at an older age.
- ❑ Size of animal is related to milk yield. For twins of same genetic makeup, the heavier one produces extra milk in a lactation.

Growth rate (weight) versus age

Both under- and over-feeding heifers are undesirable during heifer rearing. Overfeeding may result in obesity, low conception rate, difficult calving and low milk production while underfeeding will result in low conception rate, poor fetal growth, difficult calving and low first lactation milk yield. It is therefore important to monitor performance of heifers, particularly the body weight change and height at withers.

Growth should be such that increase in weight is accompanied by a proportionate change in height. Growth charts allow a farmer to compare the height and weight of heifers to a standard curve that represents the average for the particular breed. This tool enables the farmer to monitor heifer performance to determine whether feeding and other management practices are adequate.

Body weight and height at withers are three important measurements used to evaluate heifer growth. The weight is estimated with a weigh band and height by graduated piece of timber as shown in the picture below.

Once the measurements are taken, they are then fitted into a growth chart which is breed specific (eg below). If the body weight falls below the band (expected), then the heifer not getting enough nutrients (energy) and vise-versa. Short heifers are an indication of low protein in the diet.

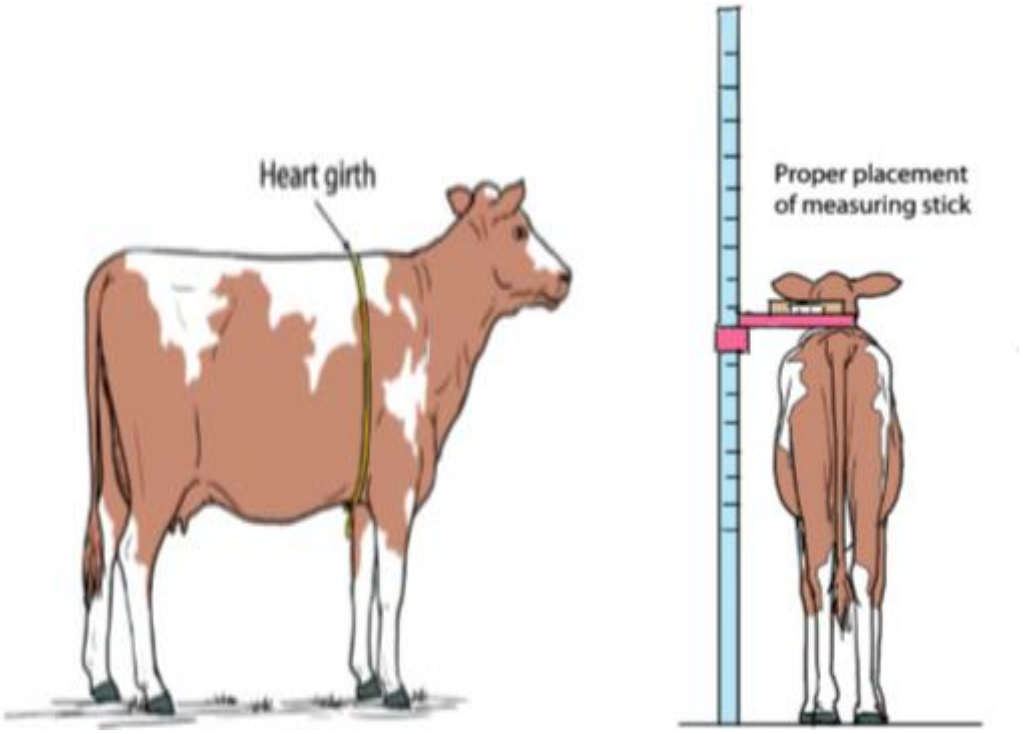


Fig 4.8 measurements for evaluation of heifer growth

Breeding Regardless of age, puberty is reached when a heifer weighs approximately 40% of her mature body weight. Breeding however, is recommended when a heifer has reached 60% of her expected mature body weight. This is normally achieved when the heifer is 14 to 16

months old. Smaller breeds may be bred one or two months earlier than large breeds because they mature faster. Heifers in good condition and gaining weight at breeding time generally show more definite signs of estrus and have improved conception rates over heifers in poor condition and/or losing weight. Over-conditioned or fat heifers have been reported to require more services per conception than heifers of normal size and weight. The table below gives a guide on when to breed heifers:

Table 4.5 **Recommended age and size for breeding and calving for different dairy breeds**

	Breeding			Calving	
Breed	**Age in Months**	**Size in kg**	**Height in cm**	**Age in Months**	**Size in kg**
Jersey	12-14	230-275	112	21-23	350-375
Guernsey	14-16	290-320	120	23-25	375-400
Ayrshire	14-16	320-350	120	23-25	420-450
Friesian	14-16	320-350	125	23-25	420-450

Steaming up

Once heifers are pregnant, feeding should be adequate to ensure proper development to avoid calving problems and poor first-lactation yield. Pregnant heifers may be maintained on good quality forage alone but concentrates should be given if the forage is of low quality.

During the last two months of pregnancy, the feeding regime can affect milk production during the first lactation. The exact amount of concentrates to feed before calving will depend on forage quality, size, and condition of the heifer. A rule of thumb the heifer should be fed concentrate at 1 percent of body weight starting about 6 weeks before calving with a ration balanced in protein, minerals, and vitamins.

Feeding concentrates allows the rumen bacteria to get used to digesting high levels of concentrate, which is very important during early lactation. If practical, concentrates should be fed in a milking parlour as this accustoms the heifer to the milking parlour. Well managed heifers will have a minimum of problems at calving, but ease of calving can be affected by plane of nutrition in two ways: i) an effect on calf size, and ii) an effect on fatness of the dam.

Fat heifers have higher rates of difficult calving because of small pelvic openings and usually a larger-than-normal sized calf at birth. Underfed or poorly grown heifers also will require more assistance at calving and have a higher death rate at calving than normal sized heifers.

4.4. Performing dairy cattle Identification

Ear-tagging, ear-notching, tattooing, freeze branding and radio frequency identification devices (RFID) are preferred methods of permanently identifying dairy cattle from an animal welfare standpoint. The least invasive approach should be adopted whichever method is chosen (e.eg minimum number of ear tags per ear, size of notch). It should be accomplished quickly, expertly and with proper equipment. In some situations however hot iron branding may be required or be the only practical method of permanent identifying dairy cattle. If cattle are branded, it should be accomplished quickly, expertly and with the proper equipment.

Freeze branding is thought to be less painful than branding with a hot iron. Both methods should be avoided as alternative identification methods exist (e.g. electronic identification or ear-tags). When branding is used, operator should be trained and competent in procedures used and be able to recognise signs of complications.

The process of uniquely identifying an animal using a marking on the body of the animal is known as animal identification. Identification of an animal is very important while recording any interventions on it for creation of a reliable and rich database.

There are various methods for identification like tattooing, branding, ear tagging etc. Ear tagging is the most common method of identification and uses a unique number with a check digit. There are no chances of the number being duplicated. If applied correctly, it does not cause any problems and remains for many years on the ear of the animal. Record the ear tag of each animal registered with it along with all the details of the animal (breed, age, whether pregnant, milk yield, owner's details, village name etc.) so that a permanent passport of the animal is created which can be transferred or traced to any location in the country.

Fig.4.9 ear tag application

Procedures how to properly Tag cattle

Step 1: Catching and Restricting Movement

Before an ear tag can be applied the animal must be caught and restrained to limit head movement and ensure accurate tag position.

Step 2: Significance of Identification Number

Numbers are given to help with cattle inventory and are necessary for recording data for different circumstances. Numbers are used on calves to identify which cow it belongs to, date of birth, vaccinations, and any other concerns

Step 3: Tag Placement

The ideal location to place an ear tag is in the middle one-third of the ear. The location should be between the rises in auricular cartilage or the ribs. Proper tag placement is also important to reduce the risk of infection.

Step 4: Proper Use of the Applicator

Before attempting to place a tag it is best to make sure that the applicators pin and the clamp are not bent, broken, and that they are aligned. Alignment is important to ensure interlocking of the tag pieces and can be checked by clamping together. After making sure that everything is aligned and placed properly application of the tag can begin.

Step 5: Placing the Tag

Next in the ear tagging process is technique. The technique can vary from person to person but there are a few essential points that should be noted. This is also when knowledge of tag placement comes in handy. It is recommended to clean the tagging site of any debris to ensure that infection does not arise. The applicator should then be placed over the tagging site with the stud to the back of the ear and the button to the front. Once everything is placed correctly squeeze the trigger quick and firm. There will be a click as the stud and button clip together. Remove tagger and ensure that the stud and button are interlocked. Once the tag has been inspected to ensure that it is placed correctly and securely tag application is completed.

Step 6: Applicator Maintenance

One of the steps is applicator maintenance. Ear tag applicators should be regularly and thoroughly cleaned with alcohol or another type of disinfectant

Step 7: Watching for Infection

Lastly, it is important to monitor tagged livestock for infection or tissue death. If noticeable pain, swelling, or discharge is developed, the tag may need to be removed.

4.5. Performing dairy cattle dehorning

Dehorning is the process of removing the horns of livestock. Cattle, sheep, and goats are sometimes **dehorned** for economic and safety reasons.

Disbudding is a different process with similar results; it cauterizes and thus destroys horn buds before they have grown into horns.

Performing disbudding at an early age where practicable, is preferred, rather than dehorning older cattle.

Pain control reduces animal discomfort during disbudding and dehorning. Local anesthetics can reduce the pain caused by the procedure, but do not provide adequate post-operative pain relief. The most popular local anesthetic is effective for two to three hours after administration. The use of analgesics in addition to a local anesthetic can minimize pain and stress in the hours that follow dehorning.

Performing disbudding at an early age where practicable, is preferred, rather than dehorning older cattle.

Thermal cautery of the horn bud by a trained operator with proper equipment is the recommended method in order to minimise post-operative pain. This should be done at an appropriate age before the horn bud has attached to the skull.

Guidance from a veterinarian or veterinary paraprofessional as to the optimum method and timing for the type of cattle and production system should be sought. Appropriate restraint systems and procedures are required when disbudding or dehorning.

Operators should be trained and competent in the procedure used, and be able to recognize the signs of pain and complications that may include excessive bleeding, sinus infection.

Where it is necessary to dehorn dairy cattle, producers should seek guidance from veterinary advisers as to the optimum method, use of anesthesia and analgesia, and timing for their type of cattle and production system.

Dehorning cattle has a number of advantages.

- ✓ It reduces the risk of bruising especially among housed animals.
- ✓ Dehorned cattle are usually quieter and less aggressive.
- ✓ Dehorned cattle are easier to handle.
- ✓ Dehorned cattle need less space at feeding troughs and in yards.

Methods of dehorning

I. Dehorning with Caustic soda: When the calf is a week or two old dehorning is easily (a cell died out by rubbing the horn with caustic soda. A ring of Vaseline should be placed around the horn bud to prevent the caustic soda from burning the adjoining skin. The calf's eyes must also be protected. The horn bud should be rubbed with a caustic stick until near bleeding. Avoid damaging the skin around the horn end. Store the caustic stick in a safe place.

II. Dehorning with hot iron

Dehorning with a hot iron should be carried out when the calf is 3 or 4 weeks old. A purpose-made cylindrical iron is needed with a hollow tip. The calf should first be injected with a suitable anesthetic in the occipital groove.

III. **Dehorning By cutting or sawing:** through the base of the horn close to the skull operators removing developed horns from dairy cattle should be trained and competent in the procedure used, and be able to recognise the signs of complications (e.g. excessive bleeding, sinus infection).

Fig.4.9. Injecting anesthetic before dehorning

Fig. 4.10.Dehorning with a hot iron

Procedure for dehorning of dairy animals using hot iron method

- ✓ Check with a needle to ensure that the area around the horn tip is numb.
- ✓ Check that the dehorning iron is red hot.
- ✓ Trim the hair around the horn bud.
- ✓ Make sure the calf is properly restrained.
- ✓ Apply the iron at right angles to the horn bud.
- ✓ Rotate the iron continuously until the bud loosens.
- ✓ Dislodge the end by digging the rim of the iron under the loosened end
- ✓ Hold the iron over the horn cavity at an angle for two or three seconds to cauterize the wound.
- ✓ Reheat the iron and repeat procedure for the other horn.

Requirements

- Pain control must be used when dehorning or disbudding.
- Bleeding control must be used when dehorning.

Recommended Best Practices

- disbud calves before three weeks of age
- adequately restrain the calf
- use a method that is appropriate for the size of horn and/or age of animal
- ensure only trained persons carry out disbudding/dehorning procedures
- use a combination of sedatives, local anesthetics and analgesics
- isolate calves following the use of caustic paste (to avoid accidental caustic burns to other animals)

4.6. Performing dairy cattle fencing

It is advised to fence the farm for security and bio safety. Fencing is recommended to avoid movement of cattle from neighboring areas into the farm and entering of wild animals. These movements may spread of contagious cattle disease. Prevention of theft is another reason for fencing the farm and applying additional security measures.

The fencing material should be cheap and locally available. The effective height of the fence for calf and adult may be 1 meter and 1.2 to 1.5 meters respectively. The fence may be made by brick wall or iron railing or iron wife. In railings/wire fencing 33.7 mm iron pipe or 5 mm iron wire may be provided horizontally and placed at 30, 60 and 100 cm for calves and 40, 80 and 120 cm height for adult cows from ground level with the support of posts made 6x4 cm angles iron pillar/5 cm (dia), ground iron pillar 10x10 cm timber pillar or brick pillar (40x30 cm) placed 2 meters apart. The provision of suitable size gates is also to be made in the fencing wall.

Planning

A good fencing plan should start with the clear identification of the expected production needs, goals, and resources. These considerations will give you the initial idea on where, when, and how permanent and/or temporary fences should be used. Consider from the very beginning the strategic location of the milking barn and laneways. It is very useful to have an aerial map of your farm with your fencing plan drawn in since people rarely build their entire fencing system at one time.

Consider what is going to be your expected **stocking rate** (i.e., animals/area) and what **grazing system** (i.e., strip versus rotational) you will be adopting to manage your **stocking density** (i.e., animals/area/time) on a daily basis. Whenever applicable, also include in the plan future ideas for herd size expansion and/or irrigation. Keep in mind that the location of the milking barn and laneways are the heart of the dairy because together they will “permanently” define the overall walking distance to pastures and the flexibility that you will have in grazing management (e.g., paddock and/or strip sizes and shapes).

Your initial fencing plan should allow for efficient water system development and should also include gates, location of fence strainers, and corner and end fence brace assemblies. This planning detail will help you keep the fence as simple to build as possible and also provide you with a materials list.

Design

Fences can be either “physical barriers” like a wooden board fence or a “psychological barrier” like an electric fence. A physical fence is usually more costly, but animals need no training for the fence to be effective. An electric fence is effective because the animals have been trained that the fence will “hurt” them with an electric shock, and the shock is sufficient to deter them from enduring the “pain for the gain” of fresh pasture. For an electric fence to be effective, the animals need to learn both that touching the wire will hurt and the “hurt” is sufficient to make it a memorable experience.

Under physical fence there are three main types of fencing that are suitable for smallholder dairy farms and cooperatives. Traditional Fences constructed from local materials are very common. They are cheap and easy to construct.

Wooden rails, poles or boards are all suitable for fencing. Boards are recommended as they result in the saving of timber but they are more expensive because of the sawing costs. Traditional fences can be of a very simple design. Care should be taken to treat the timber to avoid termite damage in areas where termites are a problem. Used motor oil is ideal for treating timber.

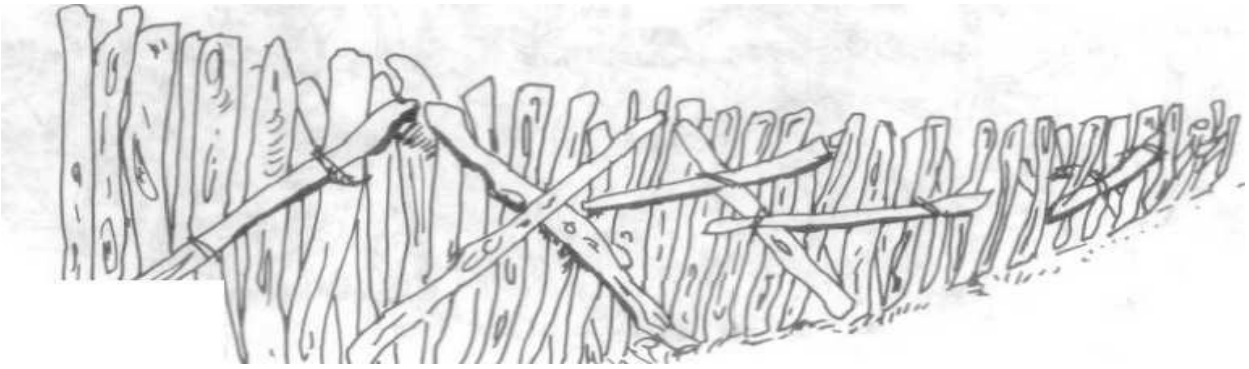


Fig.11. Traditional wooden fences

Growing fences are a very effective form of stock control. Thorny shrubs and bushes provide ideal fences and some are also useful as browse or fodder for the livestock. Establishment is easy, using cuttings which sprout in the rainy season.

Tree legumes such as leucaena, sesbania, and tree lucerne may also be incorporated into fences; the thorny bushes provide protection for tree legumes which can then be used for livestock feeding.

Fig.12. Thorny shrubs and forage trees in growing fence

Barbed wire fencing may also be suitable for larger dairy farms and cooperatives. Barbed wire is an expensive but very effective method of fencing. Posts should be placed 5m apart. The posts should be 1.5m above ground with 0.5m to 0.75m underground. Five rows of wire are adequate. Strainers must be placed at intervals of at least 200m. Plain wire may be used for internal fencing.

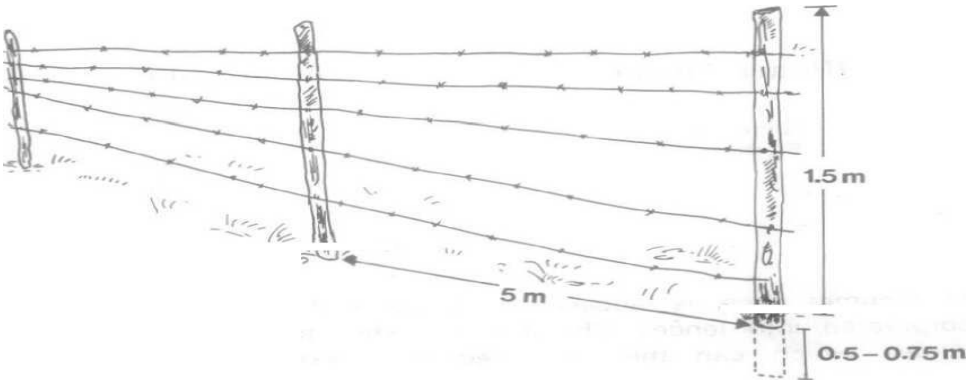


Fig.13. Barbed wire fence

Self-Check -4	Written Test

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

1. Write the advantages of Dehorning cattle.(5pts)
2. During in planning and construction of dairy cattle housing what are the points the farmers should be consider For the better welfare of the animals .(5pts)
3. Discuss the advantage and disadvantage of the two types of dairy house systems.(5pts)
4. What are the Recommended Best Practices of Dairy Animals of Housing? (5pts)

Note: **Satisfactory rating - 20 points** **Unsatisfactory - below 20 points**

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

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3._____

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4._____

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Information Sheet-5	Managing dairy cattle dry off period properly

Proper dry cow nutrition and management is important because decisions made during this period have a big impact on milk production and health during the next lactation.

The objectives of proper dry cow management are:

• Properly nourish the developing calf.

• Maintain optimum body condition.

• Prepare the mammary gland for the next lactation.

• Prepare the digestive tract for the next lactation.

• Minimize digestive, metabolic, and infectious diseases.

Purpose of a dry period

The purpose of a dry period is to allow the cow's udder an opportunity to regenerate secretory tissue and to allow the digestive system to recover from the stress of high levels of feed intake.

Length of the dry period

The optimum length of the dry period may vary from one cow to another. General recommendations are that a 45 to 60 day dry period is associated with highest lactation yield. Dry periods less than 45 days and greater than 60 days results in less production in the next lactation. Short dry periods do not allow for adequate udder involution, and long dry periods tend to result in over-conditioned dry cows. The end result in both cases is less milk in the next lactation.

Drying off the cow (ways of drying cows)

The recommended method of drying off is: The feed intake should be reduce to maintenance level by withdrawing the concentrate and for high yielder, feed on low quality forages (eg straw) to reduce milk synthesis. Reducing feed intake by 50 to 70% will drastically reduce the supply of nutrients available to the udder, causing milk synthesis to decrease.

• For low yielding cows, just stop milking. Pressure builds up in udder and milk production is cut off.

• If cow is a high yielder, practice intermittent milking i.e. skip some milking times (milk only in mornings) so as to reduce milk synthesis due to pressure build up in udder while reducing feed intake.

• Water can be temporarily withdrawn for very high yielders to reduce milk synthesis.

• After cessation of milking, treat (infuse) all the quarters with long acting antibiotics to prevent development of mastitis.

Proper conditioning

During the dry period, cows should be maintained in good body condition. The condition of the cow as she nears the dry period is the best index of how to manage her as she makes the transition from the lactating to the non-lactating group. At dry off, cows should have a body condition score of about 3.5. Cows allowed to fatten in excess during the dry period are more subject to displaced abomasum, udder edema, ketosis, and other general health problems than dry cows maintained in adequate body condition. Alternatively, cows entering the dry period in excess condition should not be put on a diet.

Feeding the dry cow

• Two months (45 and 60 days) before the expected date of calving, the cow should be dried off.

The feeding objective in this period is to ensure the cow is in good condition at the time of calving and the birth of a healthy calf.

• The feeding regime also aims at ensuring the cow produces as much milk as it is capable of during the coming lactation and prevent health problems associated with calving (e.g. milk fever) or in early lactation (e.g. ketosis).

• During the dry period, the cow requires nutrients to maintain its body, support the unborn calf and repair milk-producing cells of the udder in preparation for the coming lactation.

• During the dry period, the cow should not gain excessive amount of weight and the amount of concentrate given should be according to the condition of the animal and the quality of forage it is feeding on.

• Note that during the last two weeks of pregnancy, the cow's appetite goes down hence the amount of concentrate should be gradually increased.

• To satisfy these requirements, feeding regimes for the dry cow have also been divided into two stages as follows.

Phase 4: Onset of 60-day dry period (first 39 days):

- A good, sound dry cow program can increase milk yield during the following lactation and minimize metabolic problems at or immediately following calving.
- Forage intake should be the major source of the nutrients.
- However, inclusion of concentrates is necessary when BCS is less than 3.
- Calcium and phosphorus intake at this stage should be supplied in proportions of 60–80 and 30–40 g respectively. Always avoid over conditioning the cow.

Key management factors include:

- Observe body condition of dry cows and adjust energy feeding as necessary.
- Meet nutrient requirements and avoid excessive feeding.
- Change to a transition ration starting 3 weeks before calving.

Phase 5: The dry period (the last 21 days) transitional phase:

- Forage intake is limited because of the large volume occupied by the calf. The cows'ap petite goesdown. The amount of concentrate provided should be increased gradually so that by the time of calving,the cow will be getting at least 4 kg per day.
- The increase in concentrate feeding just before calving is referred to steaming up.
- This drycow feeding program is critical to adjusting cows, and due incalf heifers,to the la ctation rationto prevent metabolic disorders.
- Introduction of concentrate is necessary to begin changing the rumen from an all forage digestion to a mixed forage and concentrate environment.

Some suggested management strategies during this period include:

- Increase protein in the ration to between 14 and 15% on DM basis.
- Provide 3-5 kg of cocetrate to adapt rumen enviroment to fermentablecarbohadrate and stimulate normal rumen function

Steaming up

Steaming up of the cows is commencement to feeding extra ration, especially of concentrates, to late pregnant cows in an attempt to promote maximum milk production from the very beginning of the next lactation. Some of the advantages of steaming up is provision of the extra nutrient required for the accelerated foetal growth, under regeneration and for cow to improve its body condition.

Table 5.1. An example of a steaming-up schedule.

Stage (week beforre calving	Amount of dairy concentrate in diet (Kg per day)
6th week	0.5
5th week	1.0
4th week	1.5
3rd week before calving	2.0
2rd week before calving	2.5
Once week before calving	3.0-4.0

Metabolic disorders

The major metabolic disorders that affect dry cows are usually the result of nutrition and feed management problems. These disorders include milk fever, ketosis, fatty livers, retained placenta, displaced abomasum, and udder edema. Many metabolic and digestive disorders that occur at calving are interrelated. Milk fever, for instance, is associated with higher incidences of dystocia, metritis, displaced abomasum, retained placenta, and low conception rate

Self-Check -5	Written Test

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

1. Why is important managing cow during dry period? (3pts)
2. How long is the optimum length of the dry period recommended before calving? (1pts)
3. Why is important Steaming up for dry period cows? (2pts)

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

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2._____

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3._____

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Information Sheet-6	Recognizing, risk assessing and controlling potential and existing OHS hazards

Identifying hazards, undertaking risk assessment and implementing control measures are the key aspects of risk management.

6.1. Occupational Health & Safety (OHS)

OHS hazards may include moving and handling dairy animals and machinery, solar radiation, dust, and other hazardous substances (i.e. veterinary chemicals).

6.1.1. Identifying hazard

Hazards are classified into five different types. They are

I. Solar radiation:-Heat stress will delay puberty in both male and female animal and also during late gestation will adversely affect fetal growth in dairy animal and sheep.

The body heat produced by lactating animals is double that of non-lactating cows, so they are more affected by high environmental temperatures. High producers are more affected by high temperatures than low producers and the effect is especially harmful at peak lactation.

II. Moving and handling dairy animals:-Animal handling techniques can sometimes cause adverse effect on dairy animal production. Rearing cow in individual stall as compared with group pens has delayed puberty.

If handling techniques is not proper dairy animal are affected by zoonotic disease (anthrax, TB, Brucellosis, etc), sharp restrain material, housing system, unbalanced feeding system. Moving animal to new location has altered estrous cycle and delayed ovulation**.**

There are four common types of animal handling injuries:

- Animal steps on handler
- Animal slips and falls on handler
- Animal pins or squeezes handler against a barrier
- Animal kicks handler

- By employing practical experience and adhering to a few general rules, handlers can prevent most accidents and injuries.
  - Move calmly, deliberately, and patiently. Avoid quick movements or loud noises that may startle animals.
  - Do not alter the daily routine or the animals' living conditions.
  - Always leave an escape route when working in close quarters with animals.
  - Avoid startling an animal. Make it aware of your approach before getting too close to it.

III. Machinery:-Electric shock in moving animal may result accident from high tension wires of falling on the truck .This result in the death, shock and fractures on animal .

Electrocution/injury with electric shock/ can result from direct contact with live wires or anything that has been energized by these wires.

Locate your home's main electric switch, which is normally in the garage or outdoors, where the power lines enter the home. The panel box may have a flip switch or pull handle on a large circuit breaker. Shut off electricity when:

- Arcing or burning occurs in electrical devices.
- There is a fire or significant water leak.

IV. Dust:-Dung, urine (**manure**) and **waste of feed** of dairy animal become dust to the dairy and to the environment .Our dairy and equipment are contaminated and cause problem to the dairy farm due to those waste.

V. Hazardous substance (veterinary chemicals):-Many drugs, including **antibiotic**s and **pesticide**s used in the treatment of cattle diseases, are excreted into milk. Milk from treated cattle should be discarded to prevent the drugs from being taken in by humans.

VI. Disease: Anything that causes a loss of health will automatically reduce milk yield. Mastitis, milk fever, digestive upsets and infectious diseases all lower milk yield for the period of illness, and may affect lactation or lifetime production. If a cow is in poor health in early lactation, her peak yield will be lowered. Mastitis can cause a permanent reduction in milk yield due to the loss of secretary tissue. **Methods for identifying hazards: there** are many methods which are useful for identifying hazards, including:

- Conduct regular, systematic inspections of the workplace.
- Observe what hazards exist in the workplace and ask, 'what if?'
- Listen to feedback from the people performing work tasks.
- Maintain records of the processes used to identify hazards.
- Talk to your health and safety representatives.

6.1.2. Risk assessment

The second step is an assessment of the level of risk of the hazards you have identified. Collecting information and making decisions. The extent of the harm or consequence from a hazard and the likelihood of harm occurring. If your assessment is that an unacceptable risk to health and safety exists, you must introduce controls to reduce the risk to an acceptable level.

Risk assessment means the process of evaluating the risks to safety and health arising from hazards at work. When you identify a hazard, do a risk assessment. A risk assessment process means you gather information about each identified hazard consider the number of people exposed to each hazard and the duration of the exposure

It is a complete analysis of work processes and job functions. Its purpose is to mitigate or eliminate workplace hazards. A risk assessment considers the effectiveness of administrative or engineered controls that may be in place, and the frequency of exposure to hazards that cannot be controlled. It should be noted that an employer may be required to conduct a risk assessment.

Use the information to assess the likelihood and consequence of each hazard use a risk assessment table to work out the risk associated with each hazard.

6.1.3. Managing risk:

The aim of OHS risk Management is to reduce the likelihood and consequence of a workplace incident that may result in injury or disease. It is a planned and systematic process for controlling workplace health and safety hazards through examination of all aspects of the work undertaken.

Risk management is an integral part of good management practice and an essential part of good corporate governance. In order for OHS risk management to be effective, it should become part of an organization's culture. Ideally OHS risk management should not be seen as a separate activity; rather it should be embedded in an organization's processes and practices.

Risk management lies at the core of any occupational health and safety prevention program and the success of any such program depends on successful implementation of this principle for its success.

Risk is managed by the following method:-

I. Handling dairy animal: A proper handling facility is an essential investment that contributes to the success for any cattle operation. A set of working corrals for farm or farm or ranch with such accessories as an unloading and loading chute, squeeze chute with head gate, sorting chute or gate, dipping vat, scales, and holding pens with sorting gate, are important tools of the dairy cattle handling.

The handling structures facilitate the timely application of such management practices as vaccination, weaning young, identification, castration, Dehorning, worming spacing (dipping

and spraying), drenching, weaning young treating fly strike and pregnancy testing**.** The handling facilities should be located in a well-drained area that is convenient to the road way and to cattle in relation to the total operation.

II. Shade and shelters: Provide protection from the problem of **solar radiation** (heat stress) and **other weather condition**. Both natural shading provided by trees and artificial shading which constructed from different materials are protect heat stress from dairy animal.

III. Control of Veterinary Drugs: A seminar on quality control of veterinary drugs was held in different countries. Biologists, pharmacists and veterinarians responsible for the registration and control of veterinary gathered to discuss quality control, marketing authorization, and good manufacturing practices and export licensing for vaccines and drugs.

All these recommendations should help to strengthen regional cooperation in Africa, with the aim of stemming the proliferation of unauthorized veterinary drugs.

6.3. Control risks and prevent workplace

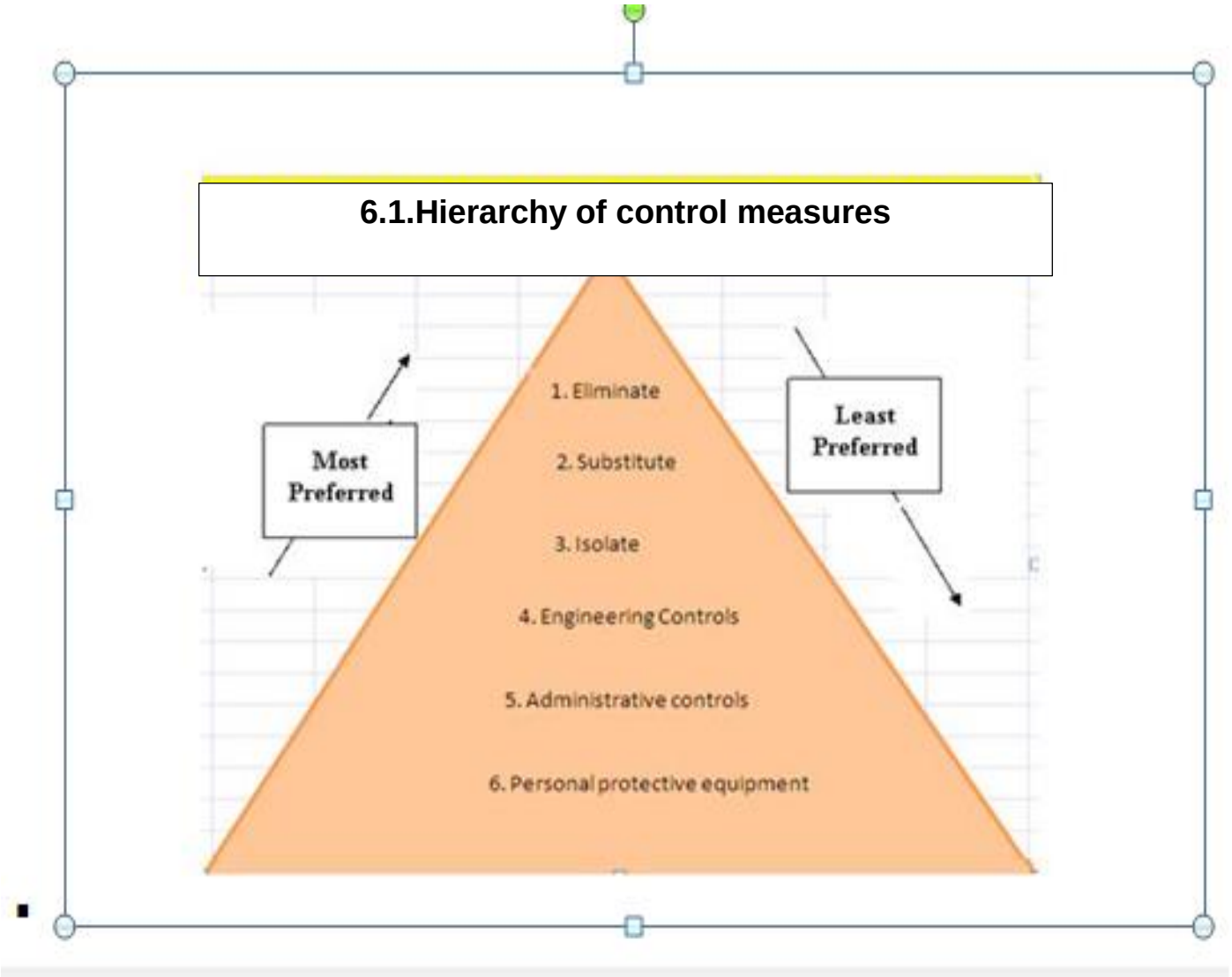
Hazard identification, risk assessment and risk control at workplace level may be defined as the systematic application of management policies, procedures and practices to the four-step process of:

-Identifying the hazard;

- Assessing the risk;

-Controlling the risk; and Monitoring and reviewing the risk management process.

Control the risks: - Actions that can be taken to reduce the potential of exposure to the hazard, to remove the hazard or to reduce the likelihood of the risk of the exposure to that hazard being realized.



Monitor and review

Means examining control measures to ensure risks are eliminated or reduced and have not caused new hazards presenting unacceptable risk.

Applies to the overall risk management process and checks the process is working effectively to identify hazards and manage risks.

Self-Check -6	Written Test

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

1. Write different types of Hazards would be happened in work place pf dairy framing. (4pts)
2. How can you managed the risk in dairy farm? (3pts)
3. Write the Methods for identifying of hazards in dairy farms. (3pts)

Note: **Satisfactory rating – 10 points** **Unsatisfactory - 10 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

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3._____

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Operation Sheet 1	Techniques For Cleaning Of Animal Sheds

Procedures for cleaning of dairy cattle shed

Step 1. Remove the dung from the floor and urine channel with the help of a shovel and basket (iron) and transfer it to the wheel - barrow.

Step 2.Remove the used bedding and leftovers from the mangers in a similar way.

Step 3.Empty the water trough and scrape its sides and bottom with the help of a floor brush.

Step 4.Wash the water trough with clean water and white wash it with the help of lime mixture once a week.

Step5. Scrape the floor with a brush and broom and wash with water.

Step 6.Clean and disinfect the splashes of dung on the side walls, railing and stanchions.

Step 7.Remove the cobwebs periodically with the help of a wall brush.

Step8. Sprinkle one of the available disinfecting agents in the following concentration.

Step9.Bleaching powder should have more than 30% available chlorine. Phenol 1-2% solution. Washing Soda (4% solution).

Step10. Allow adequate sunlight to enter in to the shed.

Step11. Spray insecticides at regular intervals especially during the rainy season (Fly season).

Step 12.Whitewash the walls periodically by mixing insecticides in it to eliminate ticks and mites living in cracks and crevices.

Operation Sheet 2	Techniques for Ear tag application of dairy cattle

Procedures for Appling of ear tag application dairy cattle:

Step 1: Catching and Restricting Movement

Step 2: Significance of Identification Number

Step 3: Tag Placement

Step 4: Proper Use of the Applicator

Step 5: Placing the Tag

Step 6: Applicator Maintenance

Step 7: Watching for Infection

Operation Sheet 3	Techniques for dehorning of dairy cattle using hot iron method

Procedure for dehorning of dairy cattle using hot iron method

Step 1.Check with a needle to ensure that the area around the horn tip is numb.

Step 2.Check that the dehorning iron is red hot.

Step 3.Trim the hair around the horn bud.

Step 4.Make sure the calf is properly restrained.

Step 5.Apply the iron at right angles to the horn bud.

Step 6.Rotate the iron continuously until the bud loosens.

Step 7.Dislodge the end by digging the rim of the iron under the loosened end

Step 8.Hold the iron over the horn cavity at an angle for two or three seconds to cauterize the wound.

Step 9.Reheat the iron and repeat procedure for the other horn.

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 8hours.

Task 1: Performing for Cleaning of Animal Sheds

Task 2: Performing for Ear tag application of dairy cattle

Task3: Performing dehorning of dairy cattle using hot iron method

Task4. Carrying out record keeping of milk yield of cows

Task5. Perform dairy animal sanitation activities, feeding, identification and dehorning

List of Reference Materials

- ICAR - National Dairy Research Institute, ERS, Kalyani, West Bengal
- Dairy Housing and Equipment Handbook, MWPS-7, MidWest Plan Service, Ames, IA.
- Banjerjee D.C. 2000. 8th ed. A text book of animal husbandry. Raju primlani for oxford and IBH, New delhi.
- Ernest L.Anathomy.2006. Dairy cattle and milk production 2nd ed. Biotech book, india
- Mudgal V.D et.al.2003. Advance in dairy animal production. 2nd revised and enlarged edition, India
- Bearden et.al. 2004 applied animal production 6th ed. USA
- https://www.infonet-biovision.org/AnimalHealth/Record-keeping#simple-table-of-contents-
- Dairy Farmers Training Manual.
- Handbook: Designing and Planning Modular Dairy Cow House (Kenya).
- https://cde.ffa.umn.edu/sites/cde.ffa.umn.edu/files/learning_about_dairy_booklet-_dairy_reference.pdf
- https://www.instructables.com/id/How-to-Properly-Tag-Cattle/
- https://cgspace.cgiar.org/bitstream/handle/10568/76005/aip_factsheet7.pdf?sequence=1&isAllowed

Dairy production

Level-III

Learning Guide-34

Unit of Competence: Perform Dairy Cattle Production Activities

Module Title: Performing Dairy Cattle Production Activities

LG Code: AGR DRP3M09 LO2-LG-34

Code: AGR DRP3TTLM 1219v1

LO 2: Determine dairy cattle body condition and production system

Instruction Sheet	Learning Guide # 34

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

- ➔ Identifying and managing types of dairy production systems
- ➔ Undertaking and recording dairy cattle body condition scoring
- ➔ Identifying dairy animals' production status
- ➔ Confirming and adjusting feeding plan and the nutritional value of pasture
- ➔ Identifying unfit animals and making written record

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:

- ♠ Identify and manage types of dairy production systems
- ♠ Undertake and record dairy cattle body condition scoring
- ♠ Identify dairy animals' production status
- ♠ Confirm and adjust feeding plan and the nutritional value of pasture
- ♠ Identify unfit animals and made written record

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 7.
3. Read the information written in the information "Sheet 1, Sheet 2, Sheet 3, Sheet4,and Sheet5
4. Accomplish the "Self-check 1, Self-check 2, Self-check 3, Self-check 4, and Self-check 5" **in page -4, 13, 19, 29 and 32** respectively.
5. If you earned a satisfactory evaluation from the "Self-check" proceed to "Operation Sheet 1 and Operation Sheet 2" **in page -33.**
6. Do the "LAP test" **in page – 34** (if you are ready).
7. Then processed to the next learning guide

Information Sheet-1	Identifying and managing types of dairy production systems

An estimated 80 to 90% of milk in developing countries is produced in small-scale farming systems. These operations are based on low inputs. Most milk produced by **smallholders** in developing countries comes from one of the following production systems:

There are many ways of keeping animals for production. The one you choose depends very much on the circumstances in your area: climate, type of vegetation, market for selling the product, availability of labour and, last but not least, local traditions. Dairy cattle can be reared in ways that vary depending on the resources available to the farmer. Three main systems: intensive, extensive and semi-intensive.

1.1. Intensive system

In the intensive system, dairy cattle are enclosed in zero-grazing units where they are provided with all their requirements for feed and water. This method is mainly practiced where grazing land is scarce. In Ethiopia it is mainly practiced in high-potential areas of urban and peri-urban farmers; the forage can be grown on farm or purchased. This system has its advantages and disadvantages.

Advantages

- ➔ The cow does not waste energy walking in search of pasture.
- ➔ It avoids diseases associated with communal grazing.
- ➔ It allows dairy farmers with no grazing land to produce milk and make money.
- ➔ The manure can be accumulated for improving soil fertility or used to generate biogas for domestic energy use.

Disadvantages

- The method is labour intensive as feeding and cleaning the unit must be done daily.
- The initial cost of putting up a zero-grazing unit is high.
- It may be difficult to detect when a cow is on heat, especially a singly housed cow. This is because when cows are housed in a group they mount each other and when in the open they show signs of restlessness by moving around.

1.2. Extensive system

In the extensive system, the cattle are reared on pasture. It is practiced where grazing land is available. In Ethiopia the grazing land mainly comprises natural unimproved grass.

Advantages

- ♠ It is cheaper than the intensive system.
- ♠ It is not labour intensive.

Disadvantages

- ➔ It requires dedicating much more land to grazing.
- ➔ Cows waste a lot of energy by walking while grazing in the field.
- ➔ It is difficult to accumulate manure for improving soil fertility in crop fields. Natural grasses can be improved by over sowing with herbaceous legumes (e.g. Trifolium) or planting grasses (e.g. rhodes grass). Over sowing is the method of choice.

1.3. Semi-intensive system

In the semi-intensive system, the cattle graze for some time during the day and in the afternoon or evening they are supplemented with other forages like napier grass. This method is a compromise between intensive and extensive systems, whereby land is not limiting as in the intensive system but on the other hand is not enough to allow free grazing throughout the day. Due to population pressure leading to subdivision of land, this system tends towards the intensive system.

Self-Check -1	Written Test

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

1. List the three types of dairy production systems. (3pts)

2. Discuss the difference advantage and disadvantage of intensive and extensive dairy production systems. (3pts)

Note: **Satisfactory rating - 6points** **Unsatisfactory - below 6 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

_____

Information Sheet-2	Undertaking and recording dairy cattle body condition scoring

2.1 Body Condition scoring

Body conditioning of dairy cows can be used to assess the feeding regimes in dairy cattle. Several systems have been suggested but the 1-5 scoring has been the most used. Body condition scoring is a method of evaluating **fatness or thinness** in cows according to a five-point scale and using the score to fine-tune or perfect dairy herd nutrition and health. Body condition influences productivity, reproduction**,** health, and longevity. Thinness or fatness can be a clue or sign to underlying nutritional deficiencies, health problems, or improper herd management. If done on a regular basis, body condition scoring can be used to troubleshoot problems and improve the health and productivity of the dairy herd. Dairy animal's condition may be assessed by weighing, condition scoring, body condition, lactation stage, milk yield, and Livestock Market Reporting System (LMRS).

Over-conditioning, or fatness, may result from poor nutrition or reproduction management. A fat cow is more susceptible to metabolic problems and infections and is more likely to have difficulty at calving. Over-conditioning usually begins during the last three to four months of lactation, when milk production has decreased, but grain and total nutrient levels have not been reduced accordingly. Other causes of over-conditioning are prolonged dry periods or overfeeding during dry periods.

Under-conditioning, or thinness, can frequently lower production and milk fat levels because of insufficient energy and protein reserves. Thin cows often do not show heat or conceive until they start to regain--or at least maintain--body weight. In feeding these animals, care must be taken to maintain production while increasing body reserves.

Body condition scoring is also useful in dairy heifer feeding management. Thin heifers may not grow rapidly enough to reach puberty by 13 to 15 months of age. They may also be too small to calve at 23 to 25 months or to carry enough weight to maintain a normal first lactation. On the other hand, fat heifers have been shown to produce less milk when they enter the milking herd, especially if they have been fat at puberty.

A. Body Condition Scoring Scale:

On a five-point scale, a score of 1 denotes a very thin cow, while 5 denote an excessively fat cow. These are extreme scores and should be avoided. The average, 3, is the most desirable for the majority of the herd. A score with a plus or minus indicates a borderline body condition. For accurate scoring, both visual and tactile appraisals are necessary. The following diagram illustrates the dairy cow's major bone and muscle groups and shows the areas of concern in scoring.

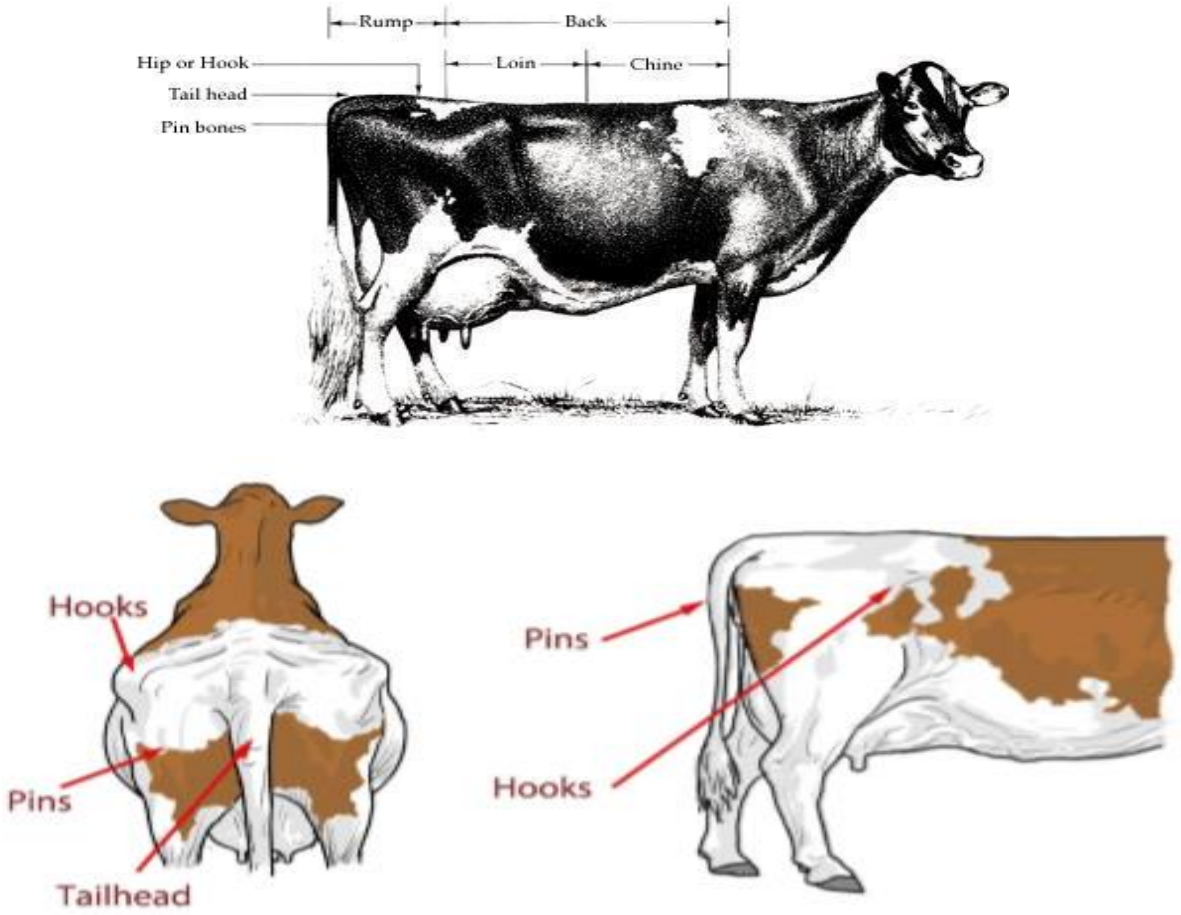


Fig 2.1.body conditioning score diagram

Score of 1

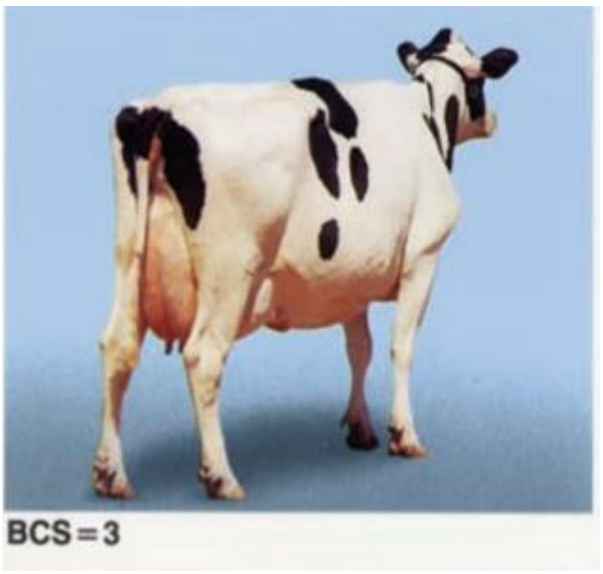
- Individual short ribs have a thin covering of flesh.
- Bones of the chine, loin, and rump regions are prominent.
- Hook and pin bones protrude sharply, with a very thin covering of flesh and deep depressions between bones.
- Severe depression below tail head and between pin bones. Bony structure protrudes sharply, and ligaments and vulva are prominent.

Score of 2

- Individual short ribs can be felt but are not prominent.
- Ends of ribs are sharp to the touch but have a thicker covering of flesh.
- Short ribs do not have as distinct an "overhanging shelf" effect.
- Individual bones in the chine, loin, and rump regions are not visually distinct but are easily distinguished by touch.
- Hook and pin bones are prominent, but the depression between them is less severe.
- Area below tail head and between pin bones is somewhat depressed, but the bony structure has some covering of flesh.

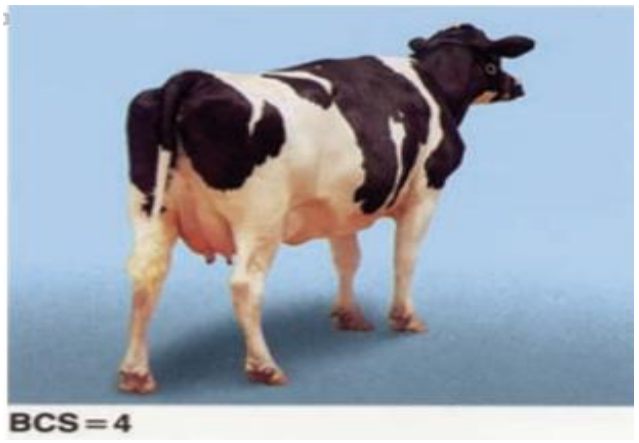
Score of 3

- Short ribs can be felt by applying slight pressure.
- Altogether, short ribs appear smooth and the overhanging shelf effect is not so noticeable.
- The backbone appears as a rounded ridge; firm pressure is necessary to feel individual bones.
- Hook and pin bones are rounded and smooth.
- Area between pin bones and around tail head appears smooth, without signs of fat deposit.



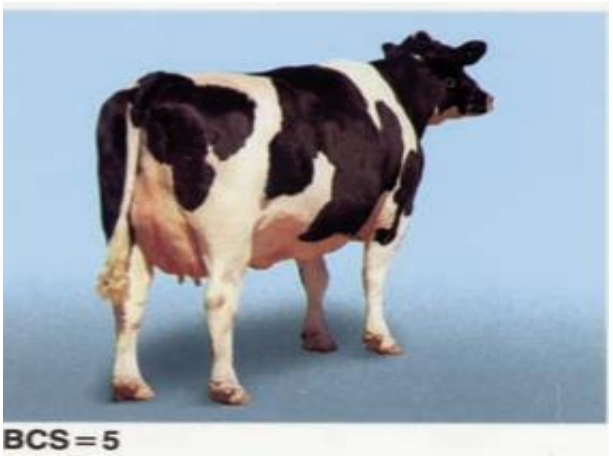
Score of 4

- Individual short ribs are distinguishable only by firm palpation.
- Short ribs appear flat or rounded, with no overhanging shelf effect.
- Ridge formed by backbone in chine region is rounded and smooth.
- Loin and rump regions appear flat.
- Hooks are rounded and the span between them is flat.
- Area of tail head and pin bones is rounded, with evidence of fat deposit.



Score of 5

- Bony structures of backbone, short ribs, and hook and pin bones are not apparent; subcutaneous fat deposit very evident.
- Tail head appears to be buried in fatty tissue



B. What to look when you condition score cows

Backbone - Is it flat or is there a ridge? Can you see or easily feel notches?

Long ribs - Can you see or easily feel the ribs? If visible how many can you see?

Short ribs - Can you see the short ribs? What do they feel like? Are the rib ends sharp or rounded?

Hip bones - Are the hip bones rounded or angular?

Rump - Is the area between the pins and hip bones, flat, sunken or hollow?

Pin bones - Are they pointed, "tap" like or rounded?

Tail head - Is there a hollow between the tail head and pin bones? Is it a deep V or shallow U shape?

Thigh - Is the area indented, flat or rounded? Is the muscle structure defined?

Dairy Body Condition Score (BCS) Chart

First view the pelvic area from the side. Check line from hooks, to the thurl, to the pins.

If the line forms a flattened V then **BCS ≤ 3.0.**

1 If hooks rounded **BCS = 3.0.**

2 If hooks angular **BCS ≤ 2.75.**

3 If pins angular **BCS < 2.75.** If palpable fat pad on point of pins **BCS = 2.50.**

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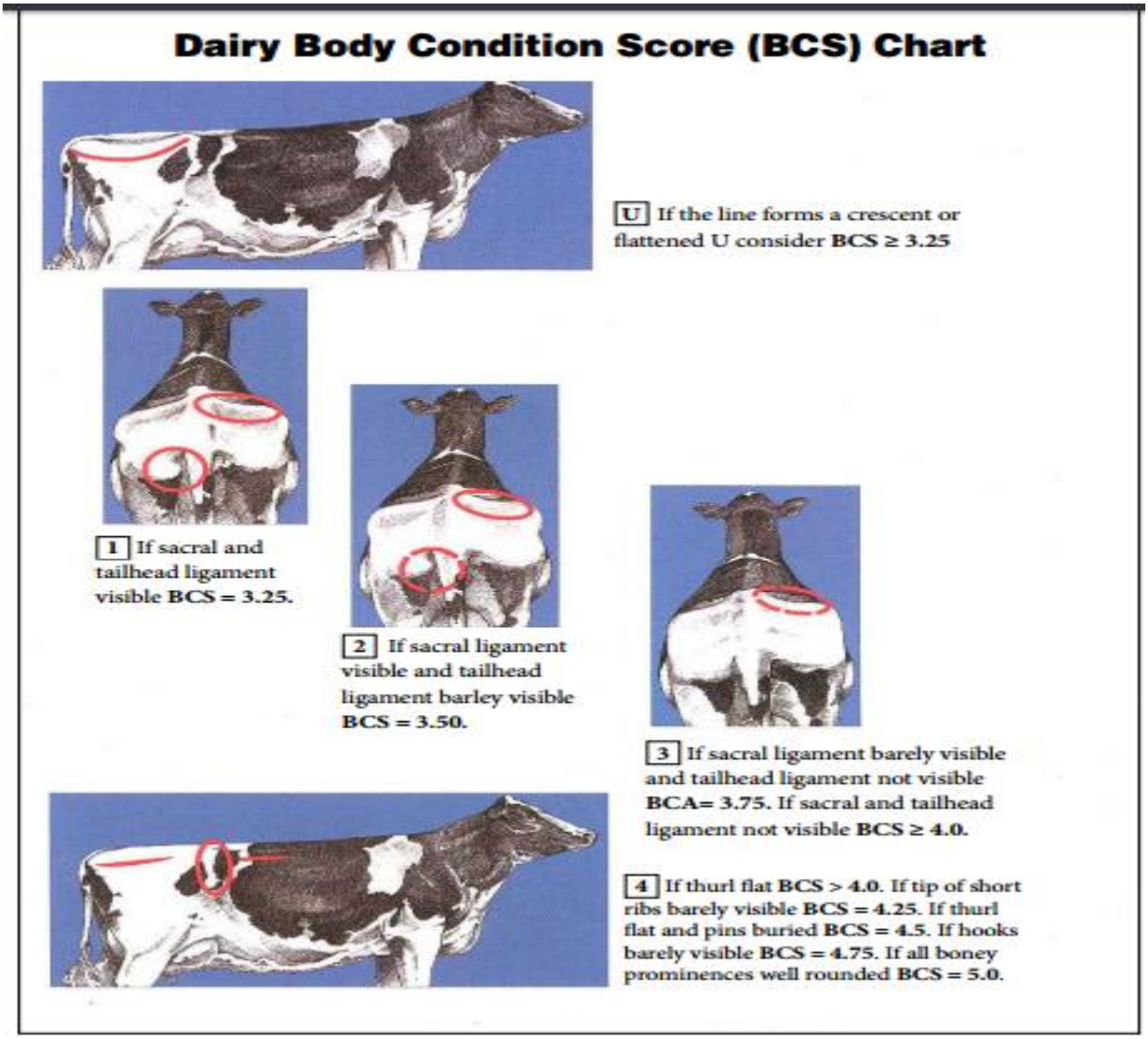
4 If no fat pad on pins **BCS < 2.50.** View the short ribs. Look for corrugations along the top of short ribs as fat covering disappears. If corrugations visible 1.2 way between tip and spine of short ribs, **BCS = 2.25.** If corrugations visible 3/4 way from tip to spine **BCS = 2.0.** If thrul prominent and saw-toothed spine **BCS < 2.0.**



C. How to Body Condition Score

- Scoring consistently requires handling cattle in order to assess **body reserves** but an overall **visual inspection is also important**.
- The scoring system is designed to cover all **cattle** but some allowance should be made for different breeds.
- The scoring method involves a manual assessment of the thickness of fat cover and prominence of bone at the tail head and loin (side) area.
- You should stand directly behind the cow to score both areas and always handle the animal quietly and carefully using the same hand.

- The tail head is scored by feeling or touch for the amount of fat around the tail head and the prominence of the pelvic bones.
- The loin (side) is scored by feeling the horizontal and vertical projections of the vertebrae and the amount of fat in-between.
- Assessment relies mainly on the tail head but is refined by the loin score if both are very different. On a scale of **1-5**, a score of **1** is extremely thin and a score of 5 is extremely fat. If possible assess the scores to the nearest half point.
- Consistency in the technique is the key to good condition scoring.

Table2.1. Desired and reasonable body condition scores of dairy cattle at critical times

Time of scoring	Desired score	Reasonable range
Calving	3.5	3.0-4.0
Peak Milk	2.0	1.5-2.5
Mid –lactation	2.5	2.0-3.0
Dry Off	3.5	3.0-4.0

Feeding based on body condition:

- Body condition gives as indication of how the animal has been fed over the preceding weeks/ months.
- The level of milk production of the dairy cow also affects it.
- To assess the body condition of dairy cows objectively a procedure culled body condition scoring may be followed.

Self-Check -2	Written Test

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

1. Why is important determine of body score of dairy cows ?(2pts)
2. Discuss the five score which have in dairy cows their characteristics?(3pts)

Note: **Satisfactory rating - 15 points** **Unsatisfactory - below 15 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

1._____

_____

2._____

_____

Information Sheet-3	Identifying dairy animals' production status

2.3. Identifying Dairy Cattle Production Status

Body Condition Scoring as a Tool for Dairy Herd Management

Body condition scoring is a method of evaluating fatness or thinness in cows according to a five-point scale and using the score to fine-tune dairy herd nutrition and health.

Body condition influences productivity, reproduction, health, and longevity of dairy cattle. Thinness or fatness can be a clue to underlying nutritional deficiencies, health problems, or improper herd management. If done on a regular basis, body condition scoring can be used to troubleshoot problems and improve the health, longevity, and productivity of the dairy herd.

Key indicator of sustainability of a dairy farming system is the reproductive and production performance of the herd or animal. The important parameters that determine cattle reproductive and productive efficiency are age at first service, Age at first calving, Calving interval, birth weight, total milk yield, average daily milk yield, lactation length and dry period. Most valuable part as far as economics of dairy cattle rearing is concerned the production performance. The production performance is including daily milk yield, total lactation yield, lactation length, and dry period. Dairy herd profitability is highly dependent on reproductive performance. Reproductive efficiency of a herd is an important component of dairy cattle productivity. Infertility and issues related to reproductive management are challenges to the productivity of the dairy farm, as measured by low calving rates and long calving intervals.

Therefore, breeds of animals in production systems should be selected on the basis of their superior performance in the local and regional environment and with consideration to local preferences as well as infrastructure, personnel (management skills), and feed resources. The trend in recent years has been to take a crossbreeding approach using non adapted breeds crossed with indigenous or to use indigenous breeds in the context of a nucleus flock or village-based selection program to accelerate genetic progress. Although this can result in slower gains in production efficiency, it is more effective in ensuring that crossbred animals have the needed survival traits and that animals possess culturally appropriate appearance traits. Precise recording is necessary if you want to improve your economic returns.

Individuals Cows of Fertility and milk production record is important in dairy cattle production statutes. If you bucket-feed your calves, you will be able to record each cow's total milk production. If you do so twice a month for each cow you milk, you will be able calculate the total milk production of each cow from calving until drying off. Knowing the number of days you milked her, the total milk production can be calculated (= daily milk production x number of days of milking).

More relevant economically is to know the average daily milk production per calving interval (= total milk production / calving interval (days)).

The best cow is the cow with the highest average daily milk production per calving interval.

Table3.1. Monthly milk production records for each lactation

Cow name: ---------- Sire name: ----------

Date of birth: ---------- Dam name: ----------

Milk production							
Month	Lactation						
	1	2	3	4	5	6	7
1							
2							
Total							

Individually cow records of different breeds of dairy cows are listed below:

Table3.2. Dairy Cattle Breeds

Holstein	
• Makes up 94% of the provincial herd. • Originated in the Netherlands, it is the largest of all dairy breeds. • Superior milk production averages 8,900 litres per cow per year. • Average test for fat is 3.8% and 3.2% for protein. • Black and white with distinct markings, sometimes red and white.	
Jersey	
• Makes up 4% of the provincial herd. • Originated in Island of Jersey, Channel Islands, and Britain. • Averages 6,000 liters per cow per year. • Average test for fat is 4.8% and 3.8% for protein. • Fawn or brown, shading from light to dark, some with distinct white markings.	
Ayrshire	
• Makes up less than 1% of the provincial herd. • Originated in Scotland. • Averages 6,700 liters of milk per cow per year. • Average test for fat is 3.9% and 3.3% for protein. • White with dark red or brown with distinct markings.	

Brown Swiss	
• Makes up less than 1% of provincial herd. • Originated in Switzerland. • Averages 7,900 liters of milk per cow per year. • Average test for fat is 4.1% and 3.5% for protein. • Dark brown to silver gray in colour.	

2.3.1 Principles of Dairy Cattle Selection

Dairy producers face a major task when selecting replacement heifers and choosing which cows in the current herd to keep or to sell. Maximizing milk production is the primary goal of dairy producers. When a producer selects females for his or her herd, the decision may affect the operation's long-term success in the dairy industry because of the longevity and genetic influence of the dairy cow and her offspring.

Dairy Cow Unified Score Card

The dairy breed associations and dairy producers developed the Dairy Cow Unified Score Card in. Producers should use the score card to help evaluate and select cows for production. It compares cows to an ideal cow, which is given a score **of 100 points**; they are then classified according to their scores. The classifications are as follows:

Excellent - 90-100 points
Very Good - 85-89 points
Good Plus - 80-84 points
Good - 75-79 points
Fair - 70-74 points
Poor - Less than 70 points

The Dairy Cow Unified Score Card looks at five major traits for classification. **These traits are frame, dairy character, body capacity, feet and legs, and udder.**

Frame (15 points): The skeletal parts of the cow, except the feet and legs, are evaluated in this category. Dairy cattle should be tall and long-bodied with a straight, strong back; a long, level rump; and a long, clean neck.

Dairy character (20 points): Dairy character provides a prediction of future milk production through the evaluation of milking ability. Dairy cattle should have wide, flat ribs and be lean in appearance, with sharp withers.

Body capacity (10 points): Body capacity is an evaluation of the volume of the cow. It determines the amount of feed the animal is able to consume, which affects milk production. Dairy cows should be long, deep, and wide through the barrel and chest floor.

Feet and legs (15 points); Looking at the feet and legs allows an individual to evaluate skeletal soundness, or the ability of the cow to move easily.

Udder (40 points); the udder is the most important part of the dairy cow. Udders are evaluated for milk production and productivity over time. The cow's udder size, cleft, balance, and teat placement should be considered.

Self-Check -3	Written Test

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

1. Why is important dairy cattle selection in the dairy farm?(3pts)
2. What are the five major traits for classification dairy cattle? (3pts)

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

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

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

_____

Information Sheet-4	Confirming and adjusting feeding plan and the nutritional value of pasture

4.1. Confirming and adjusting Feeding planning of dairy animals

The objective of feeding dairy cows should be to attain a high level of milk production. Roughages alone cannot provide all the required nutrients, especially in early lactation. Concentrates are therefore included to supplement roughages.

For getting the best results from dairy farming, the feeding of animals needs planned, scientific, practical as well as economical approach. Achieving highest production or choosing most nutritious feed and fodder or purchasing cheapest of feeds is not necessarily most profitable, and for best returns proper balance of all these factors has to be maintained. Ration formulation is an exercise between nutrients required for animals and what is available from feeds and considering their cost**.**

Feeding plans enables to judge if an animal is receiving the proper amounts of nutrients according its production

Feeding plans are only a means of monitoring the feeding. The production of the animals should always be observed

Milk production cycle of a dairy cow can be divided into three stages:

- Dry period which normally occurs in the last two months of pregnancy
- Early lactation – in the first two months after calving
- Mid and late lactation

High returns when supplementing with concentrates normally occur when it is done during early lactation. The cow achieves her peak milk yield at around 4 – 6 weeks after calving. This peak yield determines to a large extent the total milk yield of the cow in a given lactation period. Attaining an early peak milk yield results in more milk production even if the cow is not adequately fed later in the lactation cycle. On the contrary a cow that is fed poorly during early lactation has low total milk yield even if fed adequately during the rest of the lactation period. Feeding the cow prior to calving and during early lactation is therefore crucial.

Feeding the dairy cow during lactation

There are main stages in the lactation cycle of the dairy cow:

1- Early lactation (14-100 days)

2- Mid lactation (100 to 200 days)

3- Late lactation (200-305 days)

1- Early lactation: Nutrient Requirements of Dairy Cows in Early-lactation

Early lactation usually refers to the first 100 days of lactation. At the beginning of this phase, cows will achieve peak milk production (during the second month of lactation for Holstein cows), feed intake is lagging and cows are usually losing weight. At the end of early lactation, peak dry matter will be achieve and no weight losses occurring.

Rations for lactating dairy cows are usually formulated based on protein (e.g. CP) and energy (e.g. net energy for lactation) requirements. However, to achieve maximum production, dairy rations should be balanced for **effective fiber**, **non-structural carbohydrates, ruminal undegraded protein, soluble protein**. Dairy rations are usually formulated to maximize microbial yield and for requirements for ruminal undegraded amino acids. General guidelines for nutrient requirements for dairy cows at different stages of lactation.

Monitoring dry matter intake during early lactation:

Feed intake is the key factor in maintaining high milk production. Cows should be encouraged to maximize their intake during early lactation. Each additional kg of dry mater consumed can support 2-2.4 kg more milk. Feed intake by the dairy cow is influenced by many factors including level of production, forage quantity and quality, feed digestibility, feed processing, feeding frequency, consistency of ration ingredients etc.

Table9. Guidelines for dry matter intake (kg) for lactating dairy cows

Time	1st lactation	2nd lactation
Week 1	14	16 (2.5% BW)
Week 2	15-16	19 (2.9% BW)
Week 3	17	21 (3.4% BW)
Week 4	18	22 (3.6% BW)
Week 5	18-19	24 (4% BW)

Maintaining good rumination is essential in early lactation. Thus it is important to feed at least 40% of the ration dry matter as forage. About half of the forage should have a particle length of at least 2.6 cm to effectively stimulate chewing. High quality forage should be fed during this period to improve dry matter intake. Neutral detergent fiber and acid detergent fiber levels should be set at 28 and 19%, respectively to maximize intake

- Major ration changes should be avoided. To avoid any digestive problems (e.g. acidosis, depressed intake), concentrates should be added gradually at a rate of about 0.5 to 0.7 kg/day for the first two weeks.

- Protein is very critical during early lactation as the amount of body protein that can be mobilized is very limited compared with body fat. Thus in early lactation, a dietary protein content of 17-19% is recommended. About 35-30% of dietary protein should be ruminal undegraded protein while 30% should be soluble protein. A guideline is to feed 0.5 kg of a 34 to 50% protein concentrates for every 5 kg of milk produced above 20 kg of milk.

In general, roughages provide nutrients for maintenance and about 7 kg milk per day. Give the cow 2 – 2.5 kg dairy meal per day during the last month of pregnancy. Always check the body condition of the animal by adjusting the level of feeding appropriately.

Feeding during mid and late lactation:

When the cow has reached its peak milk yield, milk production will decline gradually with advancing lactation stage. At this stage the cow should be fed according to the milk production. The quantity of concentrates to be fed depends on the types of forages the cow is offered.

On average the farmer is advised to feed 1 kg dairy meal for every 1½ kg milk produced above 7 kg milk per day. A more refined rule when using napier grass is to feed according to the following:

- Roughage – young, dark green leafy napier grass – (about 3ft tall): 1 kg dairy meal for every 1½ kg milk above 10 kg for breeds like Friesians, Guernseys and Aryshire and above 8 kg for smaller breeds like Jerseys and first calvers.

- Roughage – stemmy napier grass: 1 kg dairy meal for every 1½ kg milk above 6.5 kg milk for heavy breeds and above 4.5 kg for smaller breeds and first calvers.

Roughage – poor quality or very little roughage available: 1 kg dairy meal per 1½ kg milk above 2.5 kg of milk for heavy breeds and above 1.5 kg milk for smaller breeds and first calvers

Feeding the dry, pregnant cow:

A dry pregnant cow in the last two months of pregnancy utilizes the feed for:

- Growth of the calf
- Restoring body weight lost during the previous lactation
- Catering for reserves for the next lactation

The aim of feeding the dry pregnant cow is to get her in good condition at calving so that she can produce a good calf and still have some reserves to produce milk. Body reserves are normally converted into milk during early lactation. These reserves are critical as the intake of roughage is usually low during this period and supplements often do not meet the supply of nutrients required by the cow. In contrast over feeding the dry pregnant cow fattens her and this should be avoided to prevent calving difficulties especially for Friesians.

Recommendations for Feeding Plan:

- The animal requirements should be worked out in terms of DCP and TDN for maintenance and production or both
- For animals in early lactation and particularly those which produce more than 10 litres of milk, it is necessary to include sufficient amount of concentrate
- Efforts should be made to meet the requirements of the animals through roughages i.e. dry and green, as much as possible.
- While formulating ration sufficient quantity of clean and cool water, as well as salt and minerals for the animal should be provided.
- Dry matter intake is generally around 2.5 % of body weight and may come up to 3.5 to 4.0 percent in high producing animals.
- While formulating ration the balance of nutrients should be looked into.

- The total ration which the animal should eat should supply sufficient protein, energy as well as minerals and keep anti nutritional factors in limits

Time-Wise Schedule of Feeding Dairy Animals:

Time	Animal classes	Feeding (+)	
4to 5AM	Milking cows	Concentrate	Roughage
6 to 7AM	Do	Half of daily amount (prior or milking)	Green folder
8 to 8:30	Dry ,calves and preg.cows	-	Green folder and dry
8:30 to 9:30	Harvesting and hauling of green fodder	Daily amount full	Green folder and dry
9:30 to 10:30	Distribution to animals		Green folder
2:30to 3PM	Milking cows	Half of daily amount (prior or milking)	Green and dry
4to 5PM	Dry ,calves and preg.cows	-	
5 to 6PM	Milking cows	-	do

Preparing Nearly Balanced Concentrate Feeding Schedule Based on Digestible Nutrients Required By Different Groups of Milking Cows on the Farm:

1. Determining Average Quantity of Green Fodder Consumed Per Adult Livestock Unit Per Day:

(a) Generally there is practice of feeding green forages free of choice {ad-lib) to supply enough bulk to dairy animals.

(b) Of the total nutrients required by the animal the part of it is supplied by forages and balance of these by concentrates.

(c) In a particular week or month when a specific green fodder is being fed to the animal in herd, the average quantity of fodder consumed daily per adult animal (livestock unit) is calculated by dividing the total amount of fodder by total number of livestock unit as follows (Assuming there is a herd of 51milking cows and their followers).

Assumption:

(a) Total average quantity of fodder consumed by the herd is 18 qt./day.

(b) Total livestock unit = 51.

Therefore, Average amount of fodder consumed by an adult livestock unit = 34.5 kg/day.

Source =FAO, 2010 Tropical livestock unit (TLU) = cattle 0.7

Class of animals	Numbers	Equivalent livestock unit	Total livestock unit
1.Milking cows	40	0.7	28
2.dry cows	15	0.7	11
3.pregnant heifers	10	0.7	7
4.Calves	20	0.2	4
5.bulls	1	1	1
total			51

2. Determining the Amount of Digestible Nutrients Supplied through Roughage (Kg):

Assumed that sorghum was the fodder containing 1% DCP and 15% TDN

Fodder	Amount	DCP	TDN
Sorghum	34.5 kg	0.345	5.1

Amount of Concentrates Required Meeting the Requirements of Nutrients of Cows:

Cows Groups Based on Milk Yield	Nutrients	Requirement (kg)		Total	Nutrients Supplied by fodder 34.5 (kg.)	Balance of nutrient by conc.	Concentrates (kg.) (15% DCP & 70% TDN)		
		Maintenonce	Production				Total	AM	PM
1 kg	DCP	0.254	0.045	0.299	0.345	—		—	—
	TDN	3.03	0.316	3.346	5.175	—	0.5*	0.25	0.25
2 kg	DCP	0.254	0.090	0.344	0.345	—	0.5*	0.25	0.25
	TDN	3.03	0.632	3.662	5.175	—	—	—	—
3 kg	DCP	0.254	0.135	0.389	0.345	0.044	0.5*	0.25	0.25
	TDN	3.03	0.948	3.978	5.175	—	—	—	—
4 kg	DCP	0.254	0.180	0.434	0.345	0.089	0.6	0.30	0.30
	TDN	3.03	1.264	4.294	5.175	—	—	—	—
5 kg	DCP	0.254	0.225	0,479	0.34'5	0.134	0.9	0,45	0.45
	TDN	3.03	1.580	4.610	5.175	—	—	—	—
6 kg	DCP	0.254	0.270	0.520	0.345	0.175	1.2	0.60	0.60
	TDN	3.03	1.896	4.926	5.175	—	—	—	—
7 kg	DCP	0.253	0.315	0.569	0.345	0.224	1.5	0.75	0.75
	TDN	3.03	2.212	5.242	5.175	0.067	—	—	—
8 kg	DCP	0.254	0.360	0.614	0.345	0.269	1.8	0.90	0.90
	TDN	3.03	2.528	5.558	5.175	0.383	—	—	—
9 kg	DCP	0.254	0,405	0.659	0.345	0.314	2.1	1.1	1.0
	TDN	3.03	2.844	5.874	5.175	0.699	—	—	—
10 kg	DCP	0.254	0,450	0.704	0.345	0.359	2.4	1.2	1.2
	TDN	3.03	3.160	6.190	5.175	1.015	—	—	—

Cropping Scheme for 51 Crossbred Cows and Followers

(I) Determining the Strength of the Herd In Terms of Total Livestock Units for a Herd of 50 Cows and Followers.

Total livestock units approximately would be = 51 as explained above.

One livestock unit will require green fodder approx. 35 kg/day. Therefore, fodder required for 51Units = 35 X 51 = 18 qt.

Say 18 qt./day being roughage.

One year requirement 18 x 365 days= 6570 qt.

Fodder available from the farm =4520qt.

Needed =2050qt.

.

Some balanced rations suggested fir different class of dairy animals per day

Animal	Body weight range (kg.) approx.	Fodders (kg)		Concentrates (kg)		Composition
		Dry	Green	Mainte-nance	Other purpose	Concentrates %
Milch cow	250-400	4-5	12-15	1.0	@ 1 kg for every 3 kg milk	Groundnut cake = 20 Cotton Seed = 40 Wheat barn = 20 Gram husk = 15 Min-Mix = 5 OR Mustard cake = 30 Barley gain = 35 Wheat bran = 20 Rice Polish = 10 Min-Mix = 5 OR Groundnut cake = 25 Barley = 30 Pulse chuni = 20 Wheat bran = 20 Min-Mix. = 5
She buffalo	300-450	5-6	15-18	1.5	1 kg for every 2.5 kg milk	
Cow bull	450-650	5-6	18-24	1.5	0.5 for service	
Buffalo bull	500-650	5-6	20-25	1.5	0.5 for service	
Bullocks	350-500	5-6	15-18	1.5	0.5 for normal 1.0 for heavy work	
Heifers						
(a) Pregnant	200-300	3.4	10.12	1.0	0.5	
(b) Breeding	150-200	2-3	8-10	0.5	0.5	
(c) Other	below 150	1.5-2	6-8		0.5	

Recommendations for Feeding Plan:

- The animal requirements should be worked out in terms of DCP and TDN for maintenance and production or both
- For animals in early lactation and particularly those which produce more than 10 litres of milk, it is necessary to include sufficient amount of concentrate
- Efforts should be made to meet the requirements of the animals through roughages i.e. dry and green, as much as possible.
- While formulating ration sufficient quantity of clean and cool water, as well as salt and minerals for the animal should be provided.
- Dry matter intake is generally around 2.5 % of body weight and may come up to 3.5 to 4.0 percent in high producing animals.
- While formulating ration the balance of nutrients should be looked into.
- The total ration which the animal should eat should supply sufficient protein, energy as well as minerals and keep anti nutritional factors in limits

4.2. Nutritional value of pasture for dairy cattle production

It is commonly believed that the contribution in milk production due to genetic factors of animal is about 25%. A greater sustainability of production is produced by better feeding. Pasture can be a major source of feed for dairy cows but there are some limitations to its use. Energy and protein supplies are the most essential components in animal nutrition and, in many tropical countries, these components are often the critical limiting factors to animal production.

The nutritive value of pasture can be expressed by its intake and digestibility. This can understand the nutrients in interpreting the in terms of crude protein, metabolisable energy and fibre contents of the pasture. Most of the tropical grasses (either native or improved pastures) have metabolisable energy values ranging from 7.0 to 11.0 MJ/kg DM when cut between 2–8 weeks .and energy concentrations for natural forages were found to be similar (7.1 to 10.1 MJ ME/kg DM). Broadleaved species and ferns appear pastures to have higher metabolisable energy values and their crude protein and crude fibre was superior to natural grasses. Based solely on the metabolisable energy available from the existing forage on offer estimated the potential milk production of Friesian- cows in mid-lactation to be 12–16 kg/cow/day depending upon the types of pastures.

Protein content varies with age, part of the plant and species. Most of the tropical pastures have crude protein contents ranging from 7 to 12% for grasses and more for legumes like Leucaena, which has 25% protein content. Protein content of tropical pastures decreases rapidly as growth progresses. Pastures can be influenced by Stages of maturity, species, soil fertility and variety. Maturity and desiccation cause nutrient decline and lead to insufficient nutritive value in dry seasons.Some examples are as follows: alfalfa,18–25%; corn leaves and 6–14%.

Fig.4.1. examples of pastures

Self-Check -4	Written Test

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

1. Write the three stage of Milk production cycle of a dairy cow and why important categories is in three stage. (5pts)

2. Develop the Recommendations for Feeding Plan dairy cattle in different physiology. (5pts)

Note: **Satisfactory rating – 10points** **Unsatisfactory - below 10points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

_____

Information Sheet-5	Identifying unfit animals and making written record

The comfort and humane treatment of sick, injured or cull animals are priorities. An effective Herd Health Management Program will identify sick or injured animals early and enable the development of protocols for the treatment or timely culling (fattening for slaughter, immediate slaughter or euthanasia) of those animals. Of special concern are downers (non-ambulatory animals) or severely debilitated animals. Prompt decision-making and action are vital to ensure the welfare of special needs animals.

Animal owners, veterinarians and laboratories are required to immediately report the presence of an animal that is infected or suspected of being infected with a reportable disease to District Veterinarian. Control or eradication measures will be applied immediately. Reportable diseases are listed in the Health of Animals Act and Regulations and are usually of significant importance to human or animal health. Anthrax, Bovine Spongiform Encephalopathy and Rabies are examples of reportable diseases applicable to cattle.

Requirements

- Cattle that are sick, injured, in pain or suffering must be provided prompt medical care or be euthanized.
- Appropriate authorities must be advised of any suspect or confirmed cases of reportable disease. If animals are culled, drug withdrawal times must be observed.
- Animals must be able to breathe freely and not suffer unnecessary discomfort.

Recommended Best Practices

A. have sheltered, segregated and well-bedded sick pens for cattle that are sick, injured or recovering from surgery

B. monitor sick, injured or recovering animals at least twice daily

C. consult with the herd veterinarian regarding treatment

D. identify decision trigger points for culling including:

• When to stop treating an animal if it is not responding

• The point past which, if an animal is not meeting target requirements (e.g., milk production), it is to be culled.

Good Culling Management Practices

The overwhelming majority of cattle are marketed in good health and physical condition. New enforcement of rules prohibits the slaughter of any animal that cannot walk (non-ambulatory). Some compromised cattle should not enter intermediate marketing channels because of concerns about animal well-being. Instead, these cattle should be sold directly to a processing plant or humanely euthanized, depending upon the severity of the condition, processing plant policy.

Any animal at risk of becoming non-ambulatory ("going down") because of condition or injury should be evaluated and a decision made to provide for individual transport, slaughter, rehabilitative care on the farm or humane euthanasia. Cows should be voluntarily culled, allowing time for good decision making, and marketed in a timely manner. When removing dairy animals from the herd, a decision about whether the animal should be marketed or humanely euthanized would include considerations about the animal's well-being, future marketability and economics. These decisions are particularly important in an involuntary culling situation where limited time is available to wait for a decision to be mulled over.

Self-Check -5	Written Test

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

1. Write the Good Culling Management Practices in dairy farm. (3pts)

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

List of Reference Materials

- For The Care And Handling Of Dairy Cattle
- Dairy Animal Care Quality Assurance
- Https://Raganandmassey.Com/2016/10/13/Evaluate-The-Nutritional-Value-Of-Your-Pasture/
- Animal Care Manuals
- Feeding Dairy Cattle In East Africa
- Http://Www.Fao.Org/3/T0413e/T0413e11.Htm

Dairy production

Level-III

Learning Guide-35

Unit of Competence: Perform Dairy Cattle Production Activities

Module Title: Performing Dairy Cattle Production Activities

LG Code: AGR DRP3M09 LO3-LG-35

Code: AGR DRP3TTLM 1219v1

LO 3: Detect heat in female animals

Instruction Sheet	Learning Guide # 35

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

- Carrying out estrus inducement and detection procedures
- Securing and providing Mating areas
- Using mating procedures and handling techniques

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 estrus inducement and detection procedures
- Securing and providing Mating areas
- Using mating procedures and handling techniques

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 7.
3. Read the information written in the information “Sheet 1, Sheet 2 and Sheet 3
4. Accomplish the “Self-check 1, Self-check 2 and Self-check 3” **in page -7, 10 and 20** 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 -21.**
6. Do the “LAP test” **in page – 22** (if you are ready).
7. Then processed to the next learning guide

Information Sheet-1	Carrying out estrus inducement and detection procedures

1.1. Estrus Synchronization

Synchronization is dependent on manipulation of hormonal events occurring during normal estrous cycle.

Estrous (heat) synchronization in dairy cattle involves manipulating the females' estrous cycle so they can be bred at about the same time.

It is achieved via premature leuteolysis using prostaglandins (PG) or simulation of corpus leuteum (CL) function by administering progesterone followed by abrupt withdrawal.

- This technology is known as estrus synchronization and is useful in large groups of cows.
- Estrus synchronization provides advantages to producers because all cows can be inseminated at the same time and all should calve around the same time.
- Estrus synchronization sometimes for ease of management, it is desirable for a group of animals to calve at the same time necessitating that animals come on heat at the same time.
- Some producers use an artificial version of the natural hormone prostaglandin to induce estrus.
- To achieve this, the animals are synchronised using hormones.

2 injections of Lutalyse 11 days apart will cause the cow to come into estrus regardless of her current stage in the estrous cycle.

There are several advantages to consider when following an estrous synchronization protocol, including:

1) Shortening the calving interval, which allows females (especially heifers) to conceive earlier in the breeding season;

2) more effectively using AI and embryo transfer to reduce time and labor in detecting estrus (heat); and

3) Producing a more uniform calf crop with similar ages.

Fig. Inducing Estrus material

Embryo transfer: This is a process through which an embryo is harvested from one cow and transferred to another cow to complete the pregnancy.

The process involves super-ovulation of the donor genetically superior cow (cow injected with hormone to stimulate development of many eggs), insemination of cow with high quality semen, synchronization of estrous cycle of donor and recipient cows, flushing out the embryos from donor cow and transfer of embryo to recipient cow.

1.2. Heat detection

Heat detection is critical to heat synchronization and breeding programs, particularly artificial insemination and embryo transfer programs. Effective heat detection is often the most limiting factor in an artificial insemination program.

Heat detection can also be used to monitor onset of puberty in heifers, regularity of estrous cycles in breeding age females, and breeding effectiveness of natural service sires via returns to heat in the cow herd.

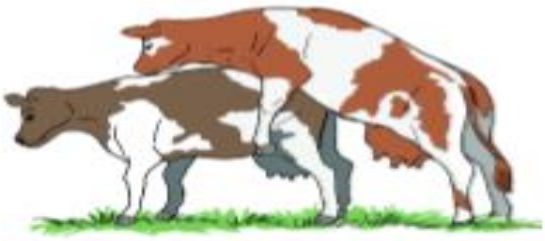
Heat detection efficiency (rate): is the percentage of eligible cows seen or detected in heat. Eligible cows are cows eligible for insemination. Heifers have reached puberty if they have resumed normal estrus function (cycling) after calving (typically 40 days or more post calving), are free of reproductive disorders or reproductive tract infections, and are open. A heat detection rate of 80 to 85 per cent should be attainable.

Heat Signs and Detection Methods

This is an extremely important exercise as a missed heat translates into a wasted 21 days while efficient heat detection makes it possible to serve the animal at the right time. The average heat interval is 21 days with a range of 18 to 24 days. Duration of heat is 24 to 36 hours in exotic and crossbred cows.

Several methods are used to detect heat. The most commonly used by farmers are behavioral signs and physical changes.

Early heat	Standing heat	After heat
• Increased nervousness/ restlessness • Mounting other cows • Swollen vulva • Licking other cows • Sniffing other cows and being sniffed • Reduced feed intake	• Standing to be mounted • Clear mucus discharge • Sharp decline in milk production • Tail bent away from the vulva • The animal may stop eating	• Dried mucus on the tail • Roughened tail head • The animal refuses to be mounted • Streaks of saliva or signs of leaking on her flanks
Early signs: Watch the cow closely	Best signs: Take the cow for service	Late signs: Keep record



(a) Standing to be mounted: The positive sign of heat is standing to be mounted. The cow in heat stands to be mounted and does not move away

(b) Licking: Both cows may be in heat

(c) Mounting head to head: The cow mounting is in heat

Fig.1.2 (a) to (c): Behavioral signs of heat in cows

Several methods of heat detection can be implemented. Some involve using heat detection aids. Several different methods can be combined to improve heat detection rates and accuracy. These **include** visual observation, heat mount detectors, tail head markers (paint, chalk, crayon, and paste), chin-ball markers, detector animals, and electronic heat detection devices.

Table1.1. Timeline for Heat Signs in Cattle

Timeline for Heat Signs in Cattle			
	Coming into Heat (8 hours)	**Standing Heat (18 hours)**	**Going out of Heat (14+ hours)**
Heat Signs	-Stands and bellows -Smells other cows -Headbutts other cows -Attempts to ride other cows but will not stand to be mounted -Red, moist, slightly swollen vulva -Clear mucous discharge from vulva	• Stands to be mounted • Rides other cows • Bellows frequently • Nervous and excitable	• Attempts to ride other cows but will not stand to be mounted • Smells other cows • Clear mucous discharge from vulva

The most important Aids to oestrus detection are:

I. Vasectomised or teaser bulls - These are surgically prepared bulls which are intact but will not impregnate the cow (teaser bulls have their penis deviated such that they will mount but cannot deposit semen in the cow). Animal with nutritional deficiencies (eg Calcium and Phosphorous mainly during the dry season) may exhibit silent heat (no behavioural signs), which can be detected by vasectomised bulls.

II. Records – can be used to predict date of expected heat.

III. Pressure sensitive (commercially available) mount detectors. They are glued to the rump (back) of the cow suspected to be on heat and are activated by pressure of mounting of the cow by others.

IV. Detection of ovarian changes: Use commercial kits to detect fall in progesterone levels in milk.

When should you observe heats?

A good manager knows that heat detection must be done daily and accurately.

Early morning, noon and late evening observations for 20 minutes each are necessary to observe more than 90 percent of the heats in a herd. **During hot weather**, watch animals earlier and later each day. However, **during cool weather**, the middle of the day is generally the best time to watch. Cows tend to be more active on dirt or pasture and should be watched for heat activity while off concrete surfaces. Also, carefully watch cows the first 30 minutes they are turned out to pasture or an exercise lot. Activity is low during feeding and milking times.

Table1.2. When Cows Show Heat

When Cows Show Heat	
Time	**Cows showing heat signs, per cent**
6 am to noon	22 per cent
noon to 6 pm	10 per cent
6 pm to midnight	25 per cent
midnight to 6 am	43 per cent

When should an animal in heat be bred?

Highest conception occurs if animals are bred 4 to 14 hours after onset of heat. With good heat detection, time of breeding should follow the AM-PM rule. An animal in heat in the AM should be inseminated that PM. An animal in heat in the PM should be bred the next AM.

Self-Check -1	Written Test

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

1. What is estrus synchronization?(2pts)
2. What is the main advantage of estrous synchronization dairy cows?(3pts)
3. List methods of heat detection can be implemented in dairy cows. ?(2pts)

Note: **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

_____

3._____

_____

Information Sheet-2	Securing and providing Mating areas

Good management is important for a successful heat detection program. Animals must have clearly readable, unique identification. An adequate area and equipment for heat detection must be available. This may include binoculars or the ability to approach cattle very closely. Night time observations may require artificial lighting, such as security lights, flashlights, or lanterns. Record keeping supplies such as paper, writing utensils, and clocks are important, along with a well-organized recordkeeping system. Persons detecting heat must be well trained in heat detection and recording. Instruct all persons detecting heat to record cow or heifer ID, time of observation, and all signs of heat observed. Record all heat periods detected, even if the cow or heifer will not be bred on that heat. Then breeding wheels, calendars, or heat expectancy charts can be used to help predict future heats.

A good management program of breeding areas should be:

- Provides the environment, housing, and care that permit animals to reproduce, and maintain good health provides for their well-being.
- Well-trained and motivated personnel can often ensure high-quality animal care, even in institutions with less than optimal physical plants or equipment.
- Provide a secure environment that does not allow escape of or accidental entrapment of animals or their appendages between opposing surfaces or by structural openings.
- Are free of sharp edges or projections that could cause injury to the animals.
- Allow observation of the animals with minimal disturbance of them.
- When the cow showing a good sign of heat, there should be enough space (crush) which is sufficiently strong to restrain any cattle likely to be derived in it; that cattle should not be able to damage themselves while in it and that it should provide the necessary facilities for handling the animals, using the minimum labor.

Some key points in mating dairy animals:

Mating heifers at too low live weights will lead to reduced fertility and more calving difficulties. Mating pure or crossbred Friesians weighing less than 260 kg will lead to more calving difficulties, as will mating Zebu dairy-type or Jersey heifers at less than 200 kg.

- Catch up' feeding after mating often results in heavier calves at birth, over conditioned heifers and more calving problems, with little improvement in milk yield during the first lactation.
- A herd of 100 cows generally requires the rearing of 20 to 30 heifer replacements each year. Bulls (or semen) must be selected on 'ease of calving' to reduce potential calving difficulties.
- Natural mating of heifers is easier than artificial insemination (AI) and running heifers with a bull for 9 weeks can lead to good pregnancy rates, provided the heifers are actually cycling.
- AI will provide greater scope for selection and genetic improvement in the dairy herd, but it requires a higher level of skill in heat detection and insemination. Natural mating is often required after AI to further increase conception rates.
- Sexed semen can produce 90% heifer calves in a well-managed breeding program. However, in addition to its considerably higher cost, conception rates are lower than with conventional semen (40% versus 50% with virgin heifers).

The key factors to consider when planning mating and calving down of dairy heifers

1. Provide good, clean calving down area
2. Ensure each calf gets sufficient good-quality colostrums
3. Live weight at mating
4. Advantages and disadvantages of natural mating
5. Use bull or AI?
6. Detecting heat
7. Advantages and Importance of 'ease of calving' sires
8. Requires 25–30% replacement heifers each year
9. Treat naval cord and identify newborn calves
10. Age at mating

Self-Check -2	Written Test

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

1. Write the key factors to consider be when planning mating and calving down of dairy heifers.(4pts)
2. What are the important Aids to estrus detection of dairy cows? .(3pts)
3. When should you observe heats of dairy cows probably? (3pts)

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

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

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

_____

3._____

_____

Information Sheet-3	Using mating procedures and handling techniques

Breeding the dairy cow:

Raising cattle for milk production requires close attention to breeding them so that they produce the most milk possible. This will require some planning, close observation and recording of mating and regular recording of the daily milk production of all of the cows in the herd. A suitable **recording sheet** for recording the reproductive activity of cattle is important.

Heifers of the small, local cattle breed should be able to be mated at about 200 kg. And calve at about 350 kg. Heavier breeds such as Friesians, should first join at about 270 kg. And calve when they weigh 450 kg.

There are **four** important considerations in **breeding** for milk production.

- Selecting the best cows
- Selecting the best bull
- Calf castration and selecting the best replacement bulls and heifers.
- Achieving the best breeding efficiency.

1. **Selecting the Cow**

All cows can produce some milk either for sale or for family consumption. There are some dairy bred cows and cross bred dairy cows (for instance Friesian and borna breed) to be found in smallholder dairy herds, this are often the descendants of cattle introduced by government missions for their own dairy herds. They should be selected as the nucleus for starting a dairy herd. If you have this cattle type already, you can either begin to produce milk from them by feeding them better and using them as the beginning of a dairy herd and keeping them until they are replaced by better milk producing heifers or cows. Then these older, starting animals should be sold. There is a classical description of the triangle-shaped dairy cow which can be used for selection if there are enough dairy heifers around for you to choose. The best heifers and cows for you to start with are those which are quiet in temperament and which have some evidence of dairy blood. If there are none of these, start with quiet local animals with a history of successful breeding, and use a dairy bull over them to produce upgraded offspring.

A good type of dairy cow: Note the **triangular shape and straight top line** of the body, the small, refined head, large udder and milk veins and well-spaced teats.

To start a dairy herd, the first cows should have these characteristics:

- be of obvious dairy stock i.e. crossbreeds,
- preferably already having calved and therefore demonstrating that they can produce calves
- have a good udder and teats
- have a quiet and handle able temperament
- be as close as possible in shape and appearance to the cow in the photograph above.

2. Selecting the Bull

The bulls which are generally available on most small farms are unlikely to be useful for upgrading your present cows for dairy production. The safest and most efficient way to obtain a breeding bull is to sell (or castrate) all of the existing bulls on your farm, and replace them with a good dairy type bull from a respected private, school, church or government breeding farm, If you cannot get a pure-bred, you should use one which has at least half dairy blood.

You should be able to produce two calves fathered by this bull from any of your mature cows before he is sold, when he should be sold or traded to another farmer after three years to prevent him mating his own daughters. Keeping him longer so that he sires offspring from his daughters may result in those offspring having defects which make them unhealthy or unsuitable for production. If you have a choice of bull breed from the farms, it would be better to alternate the breed each time you buy a new bull.

In addition to gaining the advantage of milk production from the daughters, a dairy bull will also increase the carcass value of the cattle you sell for beef.

In selecting and using a dairy breeding bull, you should:

- ♠ select a good bull from a known source (a government breeding farm),
- ♠ make sure he is sound, not lame and can serve properly,
- ♠ castrate all other bulls you have,
- ♠ prevent outside bulls from coming onto your farm and mating with your cows,

- do not allow the bull to mate with his daughters and replace him after about three years,
- select a replacement bull of a different breed [if available],

3. Organizing the Mating

You can number the bull with the cows and heifers all year round. This will simplify' your management, But:your cows will produce calves all year round and some will calve during the season when the feed is of poor quality and so will probably not milk well without being fed concentrates, and You will probably not know when each cow was mated, so you will not know when she will calve, nor will you know whether she is pregnant or not until she is almost ready to calve. This means that if there is something wrong with her (or the bull) you might not know until almost a year later,

If you are on the farm all the time or you have good helpers who are observant and interested, it is better to keep the bull confined in a small bull paddock, and detect the cows which are ready to be mated by observing the cows and heifers every day to see if they show signs of oestrus. Cows which are seen to be in oestrus can then be taken to the bull and the mating observed and recorded.

The advantages of this breeding system are:

- You can take good care of the bull and make sure he doesn't become injured in the field. He is also quieter and much easier to manage.
- You will know if a cow is showing breeding activity and you know the breeding dates if she is joined. From this you can predict her calving date, thus, you can keep accurate records,
- You can anticipate her next mating time and be ready to join her again if she does not conceive the first time,
- You can quickly tell if you have a problem in the herd of cows continually return to the bull for several months without becoming pregnant,
- You can quickly identify cows or heifers which have reproductive problems

The disadvantage of this system is:

- you need a separate pen for the bull
- you must observe the cows and heifers every day

4. Signs of Oestrus

If your cattle are quiet and easy to handle (and all dairy cows and bulls on small farms should be), you can take the cow to the bull and leave her loose in the bull paddock, or you can tie her up to a tree with a rope or halter, and lead the bull to her and allow him to mount. You will know she is ready to be mated when she shows:

- bellowing and perhaps walking up and down a fence line,
- streams of clear mucus coming from the vulva,
- mounting or mounted by other cows,
- if she is running with other cows, her tail may be slightly raised and the hair on the top of the base of the tail may be roughened and standing up,
- if she is milking, her milk production may suddenly fall a little.

Heifers may not show these oestrus signs as strongly as cows. So it is preferable to keep heifers and cows separate, and introduce the bull to the heifer paddock every day after the time when you think they are old and big enough to mate. You should then record any mating that occurs. Often if the heifers are old and big enough to mate but for some reason are not showing signs of oestrus, the presence or sight of a bull will cause them to come into oestrus a few days later.

Oestrus occurs every 18-21 days and lasts for about 18 hours. A cow or heifer will continue to come into oestrus every 18-21 days until she is successfully mated and becomes pregnant. If you see a cow in oestrus in the morning, it is best to have her mated to the bull at that time, and again in the afternoon of the same day. Once a cow becomes pregnant she will not usually come again into oestrus until after she has calved. A very small percentage of heifers will come into oestrus and accept the bull even though they are already pregnant, but this characteristic is not particularly important, particularly if you keep good records.

Targets for heifer mating programs

A series of targets for heifer mating programs for Friesians which can be used as guidelines for tropical dairy systems. These are:

- Begin mating at 13–15 months of age with heifers weighing 375–410 kg, with hip height of at least 127 cm and wither height of at least 122 cm.

- ♠ Strive to achieve 70% first service conception, or 7–12% less with sexed semen.
- ♠ Inseminate at least 80% of the heifers within the first 21 days of mating.
- ♠ 85% of the heifers should be pregnant within three heat cycles.
- ♠ Test all heifers to confirm pregnancies (some animals – typically 3% – will abort after pregnancy testing).

Breeding can be achieved through natural service or artificial insemination, and irrespective of the method, the aim should be to achieve increased chances of conception.

Natural service: This is where the cow is taken to a bull and left for some time for the bull to serve. **The advantages of this method are:**

- ➔ The cow has an opportunity to be served more than once; this increase the chance of conception.
- ➔ The semen is fresh and of good quality since there is no handling.
- ➔ Where the farmer does not own a bull, cost of service is lower compared to A.I.

Natural service has the following disadvantages:

- ♠ Rearing a bull is not economical especially to a small holder farmer
- ♠ There is risk of spreading breeding diseases.
- ♠ There is risk of inbreeding if the bull is not changed frequently
- ♠ There is no opportunity to select the type of bull the farmer wants.

Increasing the chances of conception through natural service:

- ♣ Take the cow to the bull as soon as it is detected to be in heat and leave it for at least twelve hours.
- ♣ Young inexperienced heifers should be mated with old experienced bulls
- ♣ Young inexperienced bulls should be given to old experienced cows.
- ♣ The bull should be kept fit and in good health particularly the legs and feet.

Artificial Insemination: Artificial Insemination popularly referred to as AI is one of the breeding methods that has contributed to the development of the dairy sector. The process of artificial insemination starts with a healthy bull, that is disease free and producing ample quantities of high quality semen. The fertility of the cow is also important, the competency of the inseminator and a clean environment. Farmers are encouraged to use semen from proven bulls which is obtained from AI centers and registered service providers.

Benefits of Artificial Insemination

- Prevention of venereal diseases
- Indefinite preservation of genetic materials of low cost enabling wide testing and selection of bulls
- Enhances genetic progress as best bulls are used widely nationally and internationally
- Small scale farmers through AI can access good bulls cheaply
- One is able to select the bull of interest.
- When handled properly, there is no chance of spread of breeding diseases.
- It is easy to control inbreeding.
- A.I. is the best method of improving the genetic make-up of local breeds because it enables semen from the very best bulls to be widely available.
- It is cost effective since the farmer does not have to rear a bull.

Disadvantages of AI

- It requires very accurate heat detection and proper timing of insemination for greater chances of conception.
- The inseminator must be trained on the technique.
- It requires high investment in equipment.

8-step guide to artificially inseminating a dairy cow

1. Positioning the cow

The chance of AI success is greatly increased when the cow is relaxed; it should stand on a level surface with plenty of grip. The cow should also be appropriately restrained.

Fig. positioning of the cow

2. Thawing the straw

Before thawing the straw, check the water temperature; it should be at 35C, or as instructed by the semen company. After withdrawal, wipe it dry and place it in the gun, 3.which should have been pre-warmed by rubbing between the hands. Only thaw one straw at a time.

3. Preparing the cow

- Clean the cow's vulva with a paper towel and put on a full-arm glove and lubricant.
- Insert your arm into the cow, by forming a cone with your fingers while keeping the tail aside with your other hand.

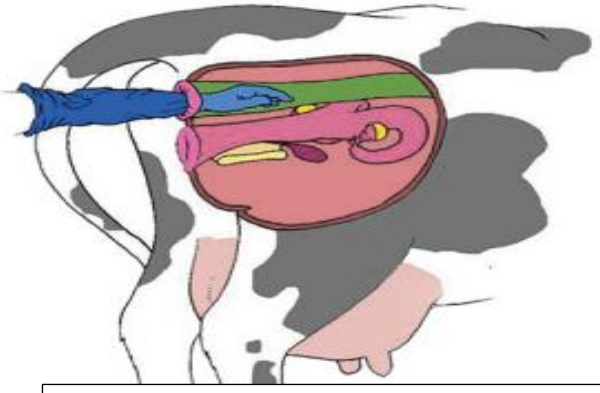


Fig. cleaning of the rectum

4. Finding the cervix

The initial landmark is the cervix and this should be located before inserting the gun.

5. Inserting the AI gun

After locating the cervix, use the elbow to exert downward pressure on the vagina. This will part the lips of the vulva, in preparation for the AI gun. The lips should be wiped clean, with the gun inserted past the vestibule and into the vagina.

6. Lining up the AI gun

Line up the gun with the cervix and pass it through the canal, manipulating the cervix back over the tip of the gun.

7. Reaching the cervix

Once the gun is just through the cervix, you should feel a release in resistance to the gun. The semen should be deposited into the short chamber of the uterine horns, which are located on the other side of the cervix.

8. Maintaining equipment

Do not reuse sheaths; splitting straws increases the risk of disease spread and can reduce pregnancy rates.

Factors affecting rate of conception:

1. **The fertility chain**

Successful conception is dependent on several factors, which form a fertility chain. The concept of the chain is that it is only as strong as the weakest link. Therefore all the links in the chain should be strong enough to strengthen the whole chain, as one weak link results in no conception.

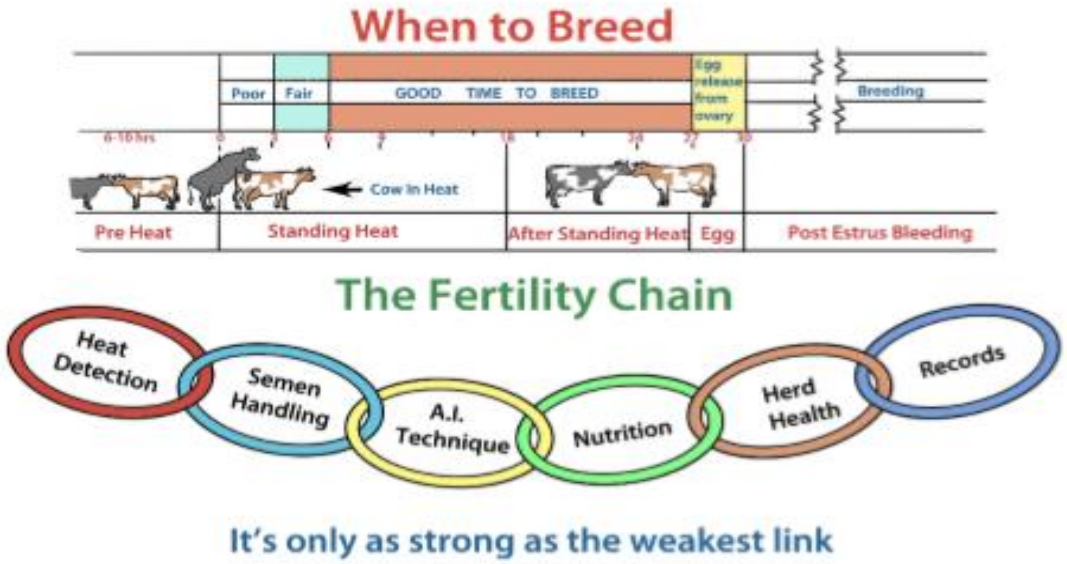


Fig. the fertility chain

2. Heat detection and time of service: This depends on whether natural service or artificial insemination is used. A cow in 'standing heat' stands for mounting by bull or another cow.

3. Semen quality and handling

To maintain a good dairy herd, the farmer must use semen of proven bulls all the time. The semen must be obtained from agents or service providers registered by the veterinary department. AI can spread disease if attention is not paid to the health status of the bull. All bulls at approved AI centers are constantly being screened for any disease to ensure that semen collected from them is safe and disease free. The spermatozoa should be fertile, of good concentration, high motility and of normal morphology (structure).

4. A.I. Technique

Farmers should only use registered inseminators who are competent and know how to handle semen and apply proper AI techniques. Handling semen involves retrieving semen from the tank without damaging what remains in the tank, thawing and loading an AI gun and successfully inseminating the cow with semen that is still alive and viable.

5. Nutritional factors.

Nutrition is the single most important factor that affects cow fertility than any other factor. Low protein and low energy intake causes delayed puberty, silent heat and infertile ovary. Vitamin A and D are heavily involved in reproduction and their deficiency affects conception and pregnancy. Overfeeding results in fatty ovaries, low hormonal secretion hence low conception rate. Note that today's fertility is a reflection of the cow's environment and management during the previous two or three months. Also decisions made today can affect a cow's fertility for several months to come.

6. Normal health of female genital tract.

The cow should be maintained in good health condition. Any disease of the female reproductive tract affects conception rate. The uterus should be treated before insemination if it is suspected to be diseased.

Self-Check -3	Written Test

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

1. Let's one farmers need to establish new dairy farm, so what is the first thing should be consider the cows have characteristics.(5pts)
2. What are the criteria should be using for selecting and using dairy breeding bull.(5pts)
3. What is the advantage of natural breeding over the AI breeding? (5pts)

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

_____

3._____

_____

Operation Sheet 1	Techniques to artificially inseminating of a dairy cow

Procedures for artificially inseminating a dairy cow

1. Positioning the cow
2. Thawing the straw
3. Preparing the cow
4. Finding the cervix
5. Inserting the AI gun
6. Lining up the AI gun
7. Reaching the cervix
8. Maintaining equipment

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within -4 - hour.

Task1. Performing artificially inseminating of a dairy cow

Task 2. Carry out estrus detection of dairy cows

List of Reference Materials

- Manual for Estrous Synchronization Superovulation and Embryo Transfer
- https://www.fwi.co.uk/livestock/livestock-breeding/8-step-guide-artificially-inseminating-dairy-cow

Dairy production

Level-III

Learning Guide-34

Unit of Competence: Perform Dairy Cattle Production Activities

Module Title: Performing Dairy Cattle Production Activities

LG Code: AGR DRP3M09 LO4-LG-36

Code: AGR DRP3TTLM 1219v1

LO 4: Coordinate and monitor milking operation

Instruction Sheet	Learning Guide # 36

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

- ♣ Confirming efficiency and effectiveness of milking operation
- ♣ Following milking operation procedures
- ♣ Determining and carrying out Milking procedures and milk record keeping
- ♣ Deciding dairy cattle milk composition and source of constituents
- ♣ Carrying out hygiene and sanitation of working area and equipment

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:

- ➢ Confirm efficiency and effectiveness of milking operation
- ➢ Follow milking operation procedures
- ➢ Determine and carry out milking procedures and milk record keeping
- ➢ Decide dairy cattle milk composition and source of constituents
- ➢ Carry out hygiene and sanitation of working area and equipment

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 7.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet4, and Sheet5
4. Accomplish the “Self-check 1, Self-check 2, Self-check 3, Self-check 4, and Self-check 5” **in page -6, 14, 17, 21 and 25** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet2 and Operation Sheet 3” **in page -25.26 and 27 respectively**
6. Do the “LAP test” **in page – 28** (if you are ready).
7. Then processed to the next learning guide

Information Sheet-1	Confirming efficiency and effectiveness of milking operation

Efficient production and harvest of high milk is the goal of most dairy farms .high quality milk consists of milk that is visually appealing, free of adulteration and that meets specific quality standards for somatic cell count (SCC) and bacteria. The highest quality milk usually has a SCC of less than 200,000/ml.

Milking procedures must be monitored for efficiency and effectiveness. Incomplete milking is very dangerous to the cow as it may cause mastities and loss to the owner as it may cause total yield reduction. Inappropriate milking procedures are also very devastating to the farm in general. Therefore, always check different milking methods for effectiveness. Avoid using faulty machines. Repair all machinery according to manufacturer's instruction and controls must be marked clearly. Check cleanliness of equipments, milking personnel and milking area.

In the effective management of a milking parlor there are a myriad of considerations to document, from parlor construction, to specifications of the milking parlor's design, to the steps outlined in the training regimen implemented by the management of the dairy. Essential for a proper milking system is all equipment necessary to collect, cool, and store milk. Also essential is proper performance of all protocols from proper hygiene, to diligent maintenance of equipment, to consistent, safe and thorough milking of all cattle. All play a role in the most vital of processes on a dairy farm, and all are necessary to ensure effective, safe, efficient harvest of milk and maintenance of optimal cow health. The following are should be consideration for effective and efficient operation of milking.

Parlor Configuration

For reasons of hygiene and ease of maintenance, a parlor/freestall milking system is desirable over previously dominant tie stall and flat barn set ups. Advantages offered by a parlor/dry lot system include lower initial building costs compared to other more archaic styles of farm, concentration of milking equipment and production equipment in their respective buildings for easier supervision and maintenance, the need for labor intensive daily cleaning of a tie stall barn is averted, as well as the ability to produce high quality milk with less trouble.

Others points include that milking parlors should also slope at least 1-4% or greater in order to facilitate effective drainage of waste, backflush and dirt.

Milking Hygiene

Where milking procedures are concerned, hygiene is key. Under ideal hygienic conditions it is possible to achieve a reduction in the new infection of disease.

To achieve these results, the following procedures be recommended as essential for usage in dairy parlors.

- ♠ Smooth rubber gloves must be worn at all times both to prevent the spread of infection from the cow to the milkers, and vice versa.
- ♠ Services on the hands are ideal carriers for stubborn bacteria even if hands are washed between sides of cattle, and the unhygienic state of human skin results in unsanitary spread of bacteria between milkers and animals.
- ♠ Gloved hands should be rinsed with disinfectant between strings if at all possible, and changed whenever a cow with mastitis is encountered.
- ♠ Washing of the teats with pre-dip is absolutely essential to proper milk hygiene.

Listed below is the Dairy Extension Service's list of best practices. These practices represent **a good general guideline of accepted milking practices on a modern dairy farm.**

1. Observation of Cow Cleanliness. Is there manure on the udder and teats?
2. Observation of Parlor and Equipment Cleanliness.
3. Are employees using gloves?
4. Proper use and coverage of Pre-dip. Test proper coverage with "Paper Towel Test"
5. Length of time dip is on teat before drying. (Follow Label most 15-30 seconds) 6. Is the employee stripping each teat vigorously and getting good milk flow?

7. Is a strip cup being used? This can help to detect early cases of mastitis and decrease change of pathogen spread.

8. Is CMT test being performed on animals that are suspected to have an infection? 9. Is water being used to clean udder? No Water should be used. Aids in bacteria growth.

10. What is the milking preparation procedure? Dip-Strip–Dry–Apply (Dry must be the last step before application of unit)

11. Are teats being thoroughly dried (including teat ends) before unit attachment? (Clean Dry Towels) Test teat end cleanliness with “Alcohol Swab Test”.

12. Are teats farthest away from milking being dried first? (reduce risk of recontamination).

13. What is the time from first contact with the teat until the unit is fully attached? This is referred to as Lag Time. Should be between 60-90 seconds.

14. Are units properly adjusted to squarely hang under the udder?

15. Are employees properly using the automatic take offs? (Should not be switching to manual).

16. What is the length of time from until attachment to unit removal? This is referred to as “Unit On Time.” This should be 3.5 to 5 minutes in length with proper milking stimulation.

17. Observe teat ends of damage or tops of teats for purple ring.

18. Are employees getting proper post dip teat coverage? Use the “Paper Towel Test”.

19. Are all employees following the same procedure. Consistency is very important.

20. Observe milk filter post milking for dirt or mastitis.

Most important for effective and complete milking out of cows as stated by all of the above authors is effective pre-dipping and stripping to stimulate the release of the hormone oxytocin and the milk ejection reflex. The cow is in nature stimulated by the suckling of the calf. The pre-dipping step acts as a substitute for this act by providing a similar sensation as well as anti-bacterial protection. Once milk letdown is stimulated the teat ends will be open and it is imperative that any bacteria present near the mouth of the streak canal and teat opening are eradicated to prevent contamination and infection. Two-thirds of the teat must be covered in a pre-dip solution as a general goal to ensure a decent zone of inhibition between the teat opening and any remaining bacteria. The same is true of post dip once applied. Post dip is absolutely imperative as the cow is most vulnerable to infection as she leaves the parlor to return to dry lots or free stalls as her teat ends will be wide open and prone to infection (see fig. 1 for potential pathways of infection). Post dipping with an Iodine will drastically reduce the incidences of infection. Complete milking out of a cow’s udders is also essential.

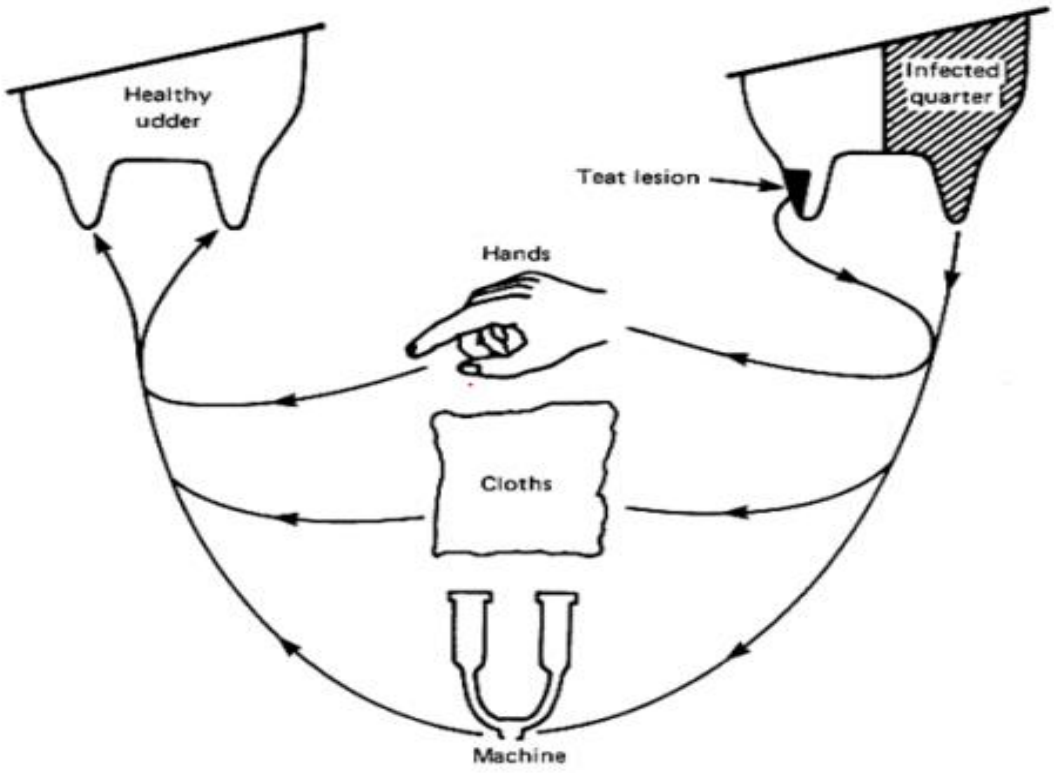


Figure 1: Pathways effecting spread of mastitis bacteria

Monitoring milk quality

Milk quality should be checked starting from the first drop up to the total milk collected. Measure PH and temperature of the whole milk. Monitor for the fulfillment of all procedures for producing quality milk. Producing quality milk is profitable to the producer, consumer and the cow as well. Stick to industry standard requirements if there are any.

Supervise cost of milking operation

Monitor costs to ensure operations are completed and maintained within budget. Slow milking procedures are risky. It causes loss of stimulation of the cow and consequently reduced yield. Such situations are costly to bear. Labor efficiency should be checked and adjustments must be made to fit to the budget limit.

Self-Check -1	Written Test

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

1. What are a good general guideline of accepted milking practices on a modern dairy farm?(3pts)
2. Why is important monitoring of milk quality in dairy farm?(3pts)

Note: **Satisfactory rating - 6 points** **Unsatisfactory - below 6 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

_____

Information Sheet-2	Following milking operation procedures

The milking procedure is the first step in obtaining clean milk. At the farm this starts with ensuring the cow to be milked is healthy.

The cow

The cow should be well fed with a diet well balanced with forage and concentrates to ensure high production of good quality milk. Feeding very high amounts of concentrates and low amounts of forages results in milk with low butter fat. On the other hand feeding too little concentrates leads to low milk yield. An unhealthy cow will feed less and produce less milk. Cows should always be kept healthy and clean as sick animals can transmit diseases like tuberculosis and brucellosis to milk consumers. If a cow is suspected to be sick, a qualified veterinary practitioner should be contacted immediately. Milk from a cow that is being treated with antibiotics should not be consumed or sold until the withdrawal period is over. Farmers are encouraged to vaccinate their animals against brucellosis. Animals should also be checked periodically for all types of contagious diseases and treated promptly in case they are infected. Mastitis is an inflammation of the mammary glands in the udder caused by infection with disease-causing bacteria which can be controlled by observing general hygiene and proper milking procedure.

The milkers should:

- be healthy and clean
- Maintain short nails and hair (for ladies, cover the head when milking)
- Never smoke during milking time
- Milk quickly and completely without interruption

The environment

- A milking shed (parlor) which can be permanent or movable should be constructed. It should be located away from any smells.
- The floor of shed should be clean and dry and if possible have a cement floor for ease of cleaning.
- The shed should be cleaned after every milking and animals kept off outside milking time.
- Equipment

- Use seamless aluminum or stainless steel cans for milking and storing milk. Plastic container is difficult to clean.
- Clean utensils immediately after milking or after emptying milk: rinse with cold water, scrub with a brush using hot water with detergent then rinse with cold water. Place upside down on a rack and dry in the sun.
- Store utensils in a safe, clean and well ventilated room.

Fig.2.1 milk cans

Milking procedure considerations

Cow preparation and timing are important when designing procedures to maximize quality milk production in an efficient manner. The goal is to milk clean, dry, stimulated teats at every milking. There is no one best way to prep cows, but from a cow's perspective, the routine should be the same no matter the hour of the day or who is milking. Procedures need to be simple and designed with employee input to fit management, labor and the cow's natural response. People produce milk, not cows.

When designing a milking routine, enable employees to produce quality milk by:

1) Working with them to develop a routine they can perform consistently

2) Providing cows with a clean, stress-free environment so udders are as clean as possible when presented for milking

3) Minimizing milking interval fluctuations Milking procedures should:

- stimulate milk let down
- reduce microbial contamination in milk
- maintain optimal residual milk without over milking

- decrease milking time
- reduce the spread of contagious and environmental microorganisms

Many factors must be considered when practicing effective milking hygiene, including:

1) **Cow cleanliness.** Singe or clip the hair of udders and clip the switch or dock tails to improve udder cleanliness, milk quality, parlor throughput and milkers attitudes.

2) **Wash pens.** If wash pens are used, they must contain enough sprinkler heads and be adequately sized (15 square feet per cow) to minimize stress and increase cow cleanliness.

3**) Drip pens.** Cows must be dry when the milking machine is attached in order to achieve long-term udder health. Full-sized drip pens allow teats to air-dry and reduce the need for further drying in the parlor.

4) **Gloves**. Wear gloves during milking to decrease the spread of microorganisms.

5) **Teat dips**. Use a proven germicidal teat dip before and after milking to reduce both contagious and environmental forms of mastitis. Dip may be applied by spraying or dipping as long as coverage is complete. Ensure adequate contact time (varies by product) to effectively disinfect teats.

6) **Fore stripping.** Removing two or three streams of milk from each quarter encourages milk letdown, eliminates microorganisms in first milk, and aids in clinical mastitis detection.

7) **Teat drying**. Use an individual towel (preferably cloth) to effectively dry teat sides and ends. Cloths should be laundered and dried after each use. Check teat cleanliness with an alcohol pad or by shining a flashlight directly on the teat skin.

8) **Timing**. A minimum of 12 to 15 seconds of manual stimulation of the teats is required for sufficient nerve stimulation to ensure adequate oxytocin release and good milk ejection response. To take full advantage of oxytocin release, attach units within 45 to 90 seconds from the beginning of the udder preparation process.

9) Protect open teat ends. Provide fresh feed for cows returning from milking to encourage cows to stand while teat ends close. This practice also allows more time for teat dip to remain in contact with teats, thus increasing the teat dip's efficacy. Germicidal barrier teat dips also protect open teat ends from environmental contamination.

10) Milking intervals. Time in between cow milking is the "milking interval." Cows being milked two times daily should be milked every 12 hours; three times daily should be milked

every eight hours; and four times daily, every six hours. Maintaining proper and consistent intervals will increase milk yield and improve udder health.

Practical aspects of milking

There are two types of milking: 1. Hand and machine milking

Hand milking is a labour intensive system in which capital investment, running costs, labour productivity and milking performance are minimal. Clean milking clothes, buckets, udders and hands are essential for good hygienic quality milk. Milk synthesis and secretion is continuous unless interfered with by pressure -from the filling of the gland cistern (this explains why more milk is extracted by frequent emptying (milking) to ensure pressure does not built up). The ejection of milk from alveolar lumen is under influence of oxytocin (hormone).

Steps: The cow is brought to the milking parlour as calmly as possible. Frightening the animal at this stage has a negative effect on milk let down due to release of adrenaline (hormone) which has a negative effect on milk letdown.

1. **Feed the cow it's production ration** (this is optional depending on the feeding system) - This calms the animal and stimulates milk letdown.
2. **Restrain animal** - tie hind legs above hock joint in the form of a figure 2.2. A loose knot should be used to safeguard both animal and man (applicable only for hand milking).
3. **Wash hands with soap and clean water before milking**. Dry hands with towel.
4. **Test for mastitis using a strip cup** - strip first few rays of milk into strip cup from each quarter and observe for any abnormalities. If mastitis is detected, the cow should be milked last.

Fig2.2. using strip

5. **Wash udder with warm clean water with disinfectant using a clean towel**. Warm water also stimulates milk let down. Dry udder using a dry towel.
6. **Apply milking jelly** - prevents cracking of teats and eases milking (for hand milking only)
7. **Milk quickly and completely by squeezing the teat, do not pull**. Milking each cow should take 7–10 minutes at most.

8. **Use clean containers for milking**.

9. **After milking**: Strip the animal - getting last drops of milk from udder to avoid incomplete milking (can lead to mastitis).

10. **After milking dip the teats in a teat dip** (disinfectant to ensure that bacteria do not gain entry through the teat sphincter which is loose immediately after milking).

Note: It is recommended that the animal remain in a standing position for at least one hour to ensure the teat does not come into contact with the ground while the sphincter is still loose.

2. Machine milking procedure

A machine for harvesting milk from the udders of cows. Milk harvest requires cooperative effort between: The animal and the operator.

A properly designed, installed, maintained, and operated milking machine will:

- Remove milk from the animal quickly and gently
- Not contribute to poor udder health
- Not degrade milk quality from the time of removal to delivery
  - ✓ Be easy to clean and sanitize

Steps follows during harvesting of milk by using machines:

Step1.

Start by providing animals with a clean, low-stress environment. An animal that is fearful or stressed releases adrenaline. Adrenaline inhibits oxytocin release, and reduces the action of oxytocin in the mammary gland. Cows are creatures of habit and should be brought to the parlor in the same fashion at every milking. The next few steps address preparing the udder for milking. Variations in the milking process do not matter as long as the end results are clean, dry teats and the release of oxytocin.

Step2.

Stripping teats serves as an important stimulation for oxytocin release and also allows for clinical mastitis detection. Some cows will have mastitis and never show symptoms, but abnormal milk is a sign of infection. It's important to remember that we want to strip the milk onto the floor, and never into paper towels or hands. If the milk is contaminated with bacteria, bacteria can easily spread from hands to other teats or animals.

Step3: When applying sanitizing solution (pre-dip), the objectives are good coverage and proper contact time. Contact times vary with the product, so refer to the label. Ensure the teat ends are properly sanitized.

Fig. strip cup

Step4.

The final step in the preparation process is to remove the pre-dip and dry the teats. To prevent the spread of mastitis-causing bacteria from one cow to another, always use a clean towel (paper or cloth) for each animal. Milking wet, dirty teats increases the standard plate and coliform counts in milk, both of which are indications of poor milk quality and milking parlor hygiene.

Step5/6.

To get the most out of milk letdown, attach milking units within 60 to 90 seconds after first stimulation for optimal oxytocin release. Remember, stimulation for milk letdown can begin when the cows enter the parlor or when the teats are stripped, so it is important to have a consistent routine. At this point, it's important to properly align the milking unit under the cow when attaching the teat cups.

Fig. milking by using machine

Step7.

When using automatic take-off machines, ensure they are adjusted properly to remove at low milk flow. If takeoff is done manually, always remember to shut off the vacuum prior to removing the milking unit.

Fig .takeoff the machine from the cow

Step8.

Dip or spray every teat after milking with an effective post-dip product, ensuring total coverage of teats. The teat ends are still open at this point, allowing easy access of bacteria into the udder. This post-application is her best defense against invading, mastitis-causing bacteria. It is also advisable to have fresh feed available to cows when they return to their pen after milking. Cows should stand for 30 to 60 minutes to allow the muscles surrounding the teat opening to close the teat end. It is important cows return to a clean environment, for example, clean, well-bedded free stalls.

Self-Check -2	Written Test

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

1. What the factors must be considered when practicing effective milking hygiene? (3pts)
2. Write the methods of milking systems in dairy farm.(2pts)

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

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

Score = _____

Rating: _____

Name: _____ Date: _____

Answer sheet

1._____

_____

2._____

_____

Information Sheet-3	Determining and carrying out Milking procedures and milk record keeping

Milking is the process of removing milk form udder. This process requires experience and skill. It is important that a cow milked at a faster rate at regular interval. Proper milking is enjoyable to the cow and profitable to the owner. This could be achieved if milking is programmed in coordinated steps. Milking schedule depends on the organization's milking policy as different milking schedules need different resource inputs.

Milking time: milking can be done twice or three times a day. But this interval must be regular. A sudden change in the time of milking affects the total yield.

How long is the milking time required for both hand milking and machine?

The recommended time for milking cows of both methods from cleaning the teats up to end of milking are listed.

- To be effective, the pre-dip solution must remain in contact with the teats for at least 30 seconds for both hand and machine milking.
- Only the teats should be wetted and then thoroughly wiped with a dry single service towel. Pay particular attention to teat ends. Alcohol swabs may be used as a test of teat cleanliness.
- Attaching the milking unit in machine milking should be attached within 60 to 120 seconds after first stimulation. This time allows the milk letdown reflex to occur and maximizes milking performance.

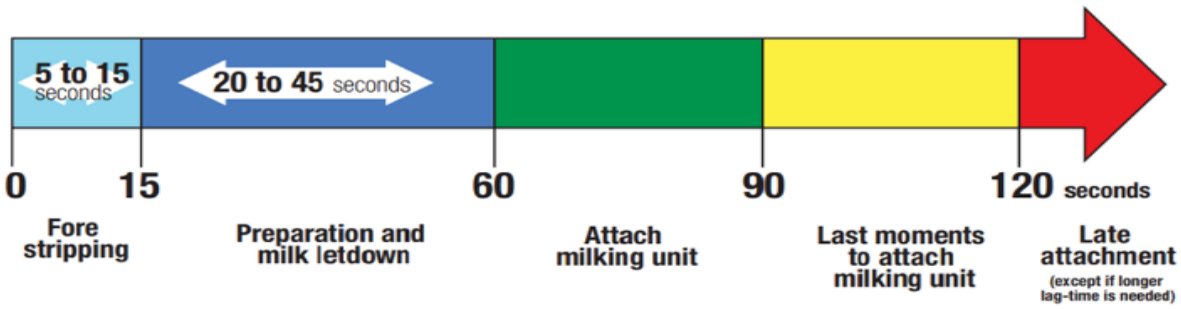


Fig. time needed for pre-milking in machine milking

- End of milking: Complete milking should take from 4-6 minutes per cow for most cows in machine milking .Observe the milk flow carefully or use milk flow indicators to determine the ideal moment for shutting off the milking unit. While in hand milking should be take 7-10minutes. **Avoid over milking**.

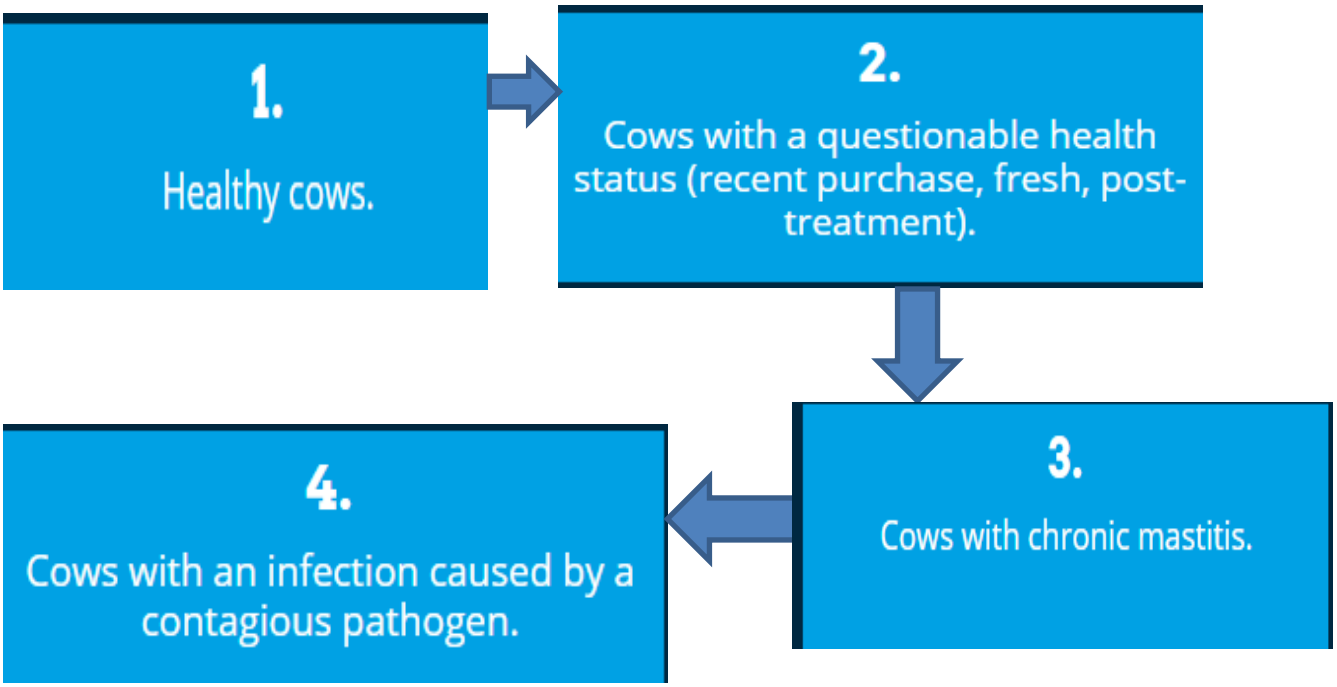
Milking order: clean cow should be milked first. A suggested order

- First calf heifers free of mastitis
- Older cows free of mastitis
- Cows with history of mastitis but not showing the symptoms
- Cows with quarters producing abnormal milk

Recommendations milking procedures:

- All operators responsible for milking should always follow a consistent routine and go through the recommended steps in the proper order.
- First, wash and disinfect your hands thoroughly and put clean gloves on.
- Disinfect your hands regularly during milking to avoid contamination.
- Provide a clean, low-stress environment for the animals.

Suggested milking order to avoid the spread of mastitis –causing bacteria.



Self-Check -3	Written Test

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

1. How long is the milking time required for both hand milking and machine?(2pts)
2. Write the recommendations milking procedures of dairy cows.(2pts)

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

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

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

_____

Information Sheet-4	Deciding dairy cattle milk composition and source of constituents

4.1. Composition and source of constituents

Milk composed of water, lipid (fatty material), protein, Sugar, minerals, vitamins, enzymes and some body cellular materials. The average composition of cow's milk, is presented in table 1

There is a great deal of variation in composition of milk between different breeds of cows and between individual cows within breeds. Figures indicating the average composition of milk from each of the breed are presented in table 2. Variation in the composition of milk may be inherited.

Table 1. Approximate average composition of the milk of cows

Main constituent	Range (%)	Mean (%)
Water	85.5 – 89.5	87.0
Total solids	10.5 – 14.5	13.0
Fat	2.5 – 6.0	4.0
Proteins	2.9 – 5.0	3.4
Sugar (Lactose)	3.6 – 5.5	4.8
Minerals	0.6 – 0.9	0.8

Table 2. Approximate composition of milk of the five major dairy breeds.

Breeds	Fat	Protein	Solid not fat
Ayrshire	4	3.5	9
Brown swiss	4	3.5	9
Guernsey	4.9	3.7	9.4
Holestine	3.6	3.2	8.7
Jersey	5.4	3.8	9.4
Borana	6.01	4.05	16.02

4.2. Factors affecting milk composition

The quantities of the main milk constituents can vary considerably depending on the species (cow, goat, and sheep), its breed (Holstein, Jersey and Zebu), stage of lactation, the animal's feed, age and health status. Herd management practices and environmental conditions also influence milk composition. The factors affecting of milk composition are:

1. Genetic

Milk composition varies considerably among breeds of dairy cattle: Jersey and Guernsey breeds give milk of higher fat and protein content than Shorthorns and Friesians. Zebu cows can give milk containing up to 7% fat.

The potential fat content of milk from an individual cow is determined genetically, as are protein and lactose levels. Heredity also determines the potential milk production of the animal. However, environment and various physiological factors greatly influence the amount and composition of milk that is actually produced. Herd recording of total milk yields and fat and SNF percentages will indicate the most productive cows, and replacement stock should be bred from these.

2. Interval between milking

The fat content of milk varies considerably between the morning and evening milking because there is usually a much shorter interval between the morning and evening milking than between the evening and morning milking. If cows were milked at 12-hour intervals the variation in fat content between milking would be negligible, but this is not practicable on most farms. Normally, solids-not-fat content varies little even if the intervals between milking vary.

3. Stage of lactation

The fat, lactose and protein contents of milk vary according to stage of lactation. Solids-not-fat content is usually highest during the first 2 to 3 weeks, after which it decreases slightly. Fat content is high immediately after calving but soon begins to fall, and continues to do so for 10 to 12 weeks, after which it tends to rise again until the end of the lactation.

4. Age: As cows grow older the fat content of their milk decreases by about 0.02 percentage units per lactation. The fall in solids-not-fat content is much greater.

5. Feeding regime

Underfeeding reduces both the fat and the solids-not-fat content of milk produced, although solids-not-fat content is more sensitive to feeding level than fat content. Fat content and fat composition are influenced more by roughage (fibre) intake. The solids-not-fat content can fall if the cow is fed a low-energy diet, but is not greatly influenced by protein deficiency, unless the deficiency is acute.

6. Disease

Both fat and solids-not-fat contents can be reduced by disease, particularly mastitis.

7. Completeness of milking

The first milk drawn from the udder is low in fat while the last milk (or strippings) is always quite high in fat. Thus it is essential to mix thoroughly all the milk removed, before taking a sample for analysis. The fat left in the udder at the end of a milking is usually picked up during subsequent milking, so there is no net loss of fat.

Self-Check -4	Written Test

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

1. What are the Factors affecting of milk composition dairy cows? (5pts)

2. List the milk composition of dairy cows (5pts)

Note: **Satisfactory rating – 10 points** **Unsatisfactory - below 10points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2._____

_____

Information Sheet-5	Carrying out hygiene and sanitation of working area and equipment

I. Ensure milking is carried out under hygienic conditions

1. **Ensure housing environment is clean at all times: A** high standard of cleanliness should be maintained at all times in housing areas to decrease soiling of the udder and so protect udder health. **The housing area should:**

• be designed to provide good drainage and ventilation and to avoid animal injury;

• be of suitable size and designed to cater for the size of the animal and the herd; and

• have adequate loose bedding which is maintained in a hygienic condition. All stalls and beds should be kept clean and dry (e.g by replacing the bedding frequently). Regularly clean or scrape passage ways to remove manure.

2. Ensure milking area is kept clean: The milking area should be designed to allow it to be kept clean and tidy. **It should:**

- be easy to clean
- have a clean water supply
- have waste handling facilities, and
- Have sufficient temperature regulation, ventilation and light. Construct holding yards to enable a high standard of cleanliness to be maintained.

3. Ensure the milkers follow basic hygiene rules: The milkers should:

- wear suitable and clean working clothes;
- keep hands and arms clean especially when milking;
- cover cuts or wounds; and
- not have any infectious disease transmissible via milk.

4. **Ensure milking equipment is cleaned & when necessary, disinfected after each milking:** Establish a routine to ensure milking equipment is clean before each use. If mobile milking equipment is used, this may mean cleaning between each use. Use chemicals approved for the cleaning and/or disinfecting of milking equipment. Use water of suitable quality heated to the required temperature. Milk contact surfaces should be disinfected as required and in accordance with national recommendations and regulations.

II. Ensure milk storage area is clean and tidy

Milk should be stored away from the milking area. The milk storage area should:

- be clean and clear of accumulated rubbish, any products or chemical substances not in constant use and any feedstuffs;
- have hand washing and drying facilities; and
- be easy to clean and have pest control practices in place.

III. Ensure milk storage equipment is adequate to hold milk at the specified temperature

The storage equipment should be capable of holding milk at the required temperature until collection, and be constructed of materials that do not taint the milk. Bulk tanks should be built to recognized standards and milk refrigeration systems should have a regular maintenance and service programme to prevent breakdowns. The bulk tank should be equipped with a thermometer to check the temperature of the milk and appropriate records kept of storage temperatures. Ensure that all of the equipment is working properly.

IV. Ensure milk storage equipment is cleaned and when necessary, sanitized after each milk collection

To ensure milk storage equipment is clean before use, clean and, when necessary, sanitize it after each milk collection. Milk contact surfaces should be sanitized as required in accordance with national recommendations and regulations.

V. Cleaning and sanitation of milk transportation equipment

Transport of larger quantities of milk requires insulated bulk tankers. These are very expensive and require special additional equipment like pumps which should also be thoroughly cleaned by the “cleaning-in-place” (CIP) method.

Milk transportation equipment should be properly cleaned and sanitized because milk provides an ideal medium for growth of bacteria. Select detergents and sanitizers that will not corrode the material from which the equipment is made. Cleaning and sanitizing are complementary processes.

Self-Check -5	Written Test

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

1 what is the recommended milk storage area should be considers.(3pts)

Note: **Satisfactory rating – 5 points** **Unsatisfactory - below 5points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

Operation Sheet- 1	Techniques for hand milking practices

Procedures for hand milk of dairy cows

1. Feed the cow its production ration (this is optional depending on the feeding system)
2. Restrain animal - tie hind legs above hock joint in the form of a figure
3. Wash hands with soap and clean water before milking. Dry hands with towel.
4. Test for mastitis using a strip cup - strip first few rays of milk into strip cup from each quarter and observe for any abnormalities. If mastitis is detected, the cow should be milked last.
5. Wash udder with warm clean water with disinfectant using a clean towel. Warm water also stimulates milk let down. Dry udder using a dry towel.
6. Apply milking jelly - prevents cracking of teats and eases milking (for hand milking only)
7. Milk quickly and completely by squeezing the teat, do not pull. Milking each cow should take 7–10 minutes at most.
8. Use clean containers for milking.
9. After milking: Strip the animal - getting last drops of milk from udder to avoid incomplete milking (can lead to mastitis).
10. After milking dip the teats in a teat dip (disinfectant to ensure that bacteria do not gain

Operation Sheet # 2	Machine milking

Step1. Start by providing animals with a clean, low-stress environment.

Step2. Stripping teats serves as an important stimulation for oxytocin release

Step3: applying sanitizing solution (pre-dip).

Step4. The final step in the preparation process is to remove the pre-dip and dry the teats.

Step5. To get the most out of milk letdown, attach milking units within 60 to 90 seconds after first stimulation for optimal oxytocin release.

Step6. Take-off machines, from the cow teats

Step7. Dip or spray every teat after milking with an effective post-dip product, ensuring total coverage of teats.

Operation Sheet # 3	**Techniques for general milking practices on a modern dairy farm.**

Procedures for milking practices of modern dairy farm

1. Observation of Cow Cleanliness. Is there manure on the udder and teats?
2. Observation of Parlor and Equipment Cleanliness.
3. Are employees using gloves?
4. Proper use and coverage of Pre-dip. Test proper coverage with “Paper Towel Test”
5. Length of time dip is on teat before drying. (Follow Label most 15-30 seconds) 6. Is the employee stripping each teat vigorously and getting good milk flow?
7. Is a strip cup being used? This can help to detect early cases of mastitis and decrease change of pathogen spread.
8. Is CMT test being performed on animals that are suspected to have an infection? 9. Is water being used to clean udder? No Water should be used. Aids in bacteria growth.
10. What is the milking preparation procedure? Dip-Strip–Dry–Apply (Dry must be the last step before application of unit)
11. Are teats being thoroughly dried (including teat ends) before unit attachment? (Clean Dry Towels) Test teat end cleanliness with “Alcohol Swab Test”.
12. Are teats farthest away from milking being dried first? (reduce risk of recontamination).
13. What is the time from first contact with the teat until the unit is fully attached? This is referred to as Lag Time. Should be between 60-90 seconds.
14. Are units properly adjusted to squarely hang under the udder?
15. Are employees properly using the automatic take offs? (Should not be switching to manual).
16. What is the length of time from until attachment to unit removal? This is referred to as “Unit On Time.” This should be 3.5 to 5 minutes in length with proper milking stimulation.
17. Observe teat ends of damage or tops of teats for purple ring.
18. Are employees getting proper post dip teat coverage? Use the “Paper Towel Test”.
19. Are all employees following the same procedure? Consistency is very important.
20. Observe milk filter post milking for dirt or mastitis.

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 8 hour.

Task1.Performingof hand milking practices

Task2. Performing of Machine milking system of dairy cows

Task3. Performing of general milking practices on a modern dairy farm.

Task4.Carrying out hygiene and sanitation of working area and equipment

Task5.Determine of dairy cow milk composition and source of constituents

Task 6.Carrying out dairy milk record keeping

List of Reference Materials

- Gaunt, S. N. 1980. Genetic variation in the yields and contents of milk constituents. *In: Factors Affecting the Yield and Contents of Milk Constituents of Commercial Importance*. P. C. Moore and J. A. F. Rook (Editors). Internat. Dairy Fed. Doc. 125.
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