DAIRY PRODUCTION

Level II

Learning Guide -52

Unit of Competence:- Perform milking operations

Module Title:- Performing milking operations

LG Code: AGR DRP2 M14 LO1-LG-52

TTLM Code: AGR DRP2 TTLM 1219v1

LO 1: Determine requirements

Instruction Sheet 1	Learning Guide 52

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

- Identifying and clarifying production requirements
- Identifying and complied requirements for the maintenance of milk quality
- Determining resources and equipment requirements
- Maintaining equipment and materials.

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 clarifying production requirements
- Identify and complied requirements for the maintenance of milk quality
- Determine resources and equipment requirements
- Maintain equipment and materials.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 1 to 7.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check **1,2,3,4” in page -. 7,14,22,29** respectively
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Identifying and clarifying production requirements

1.1. Introduction

The main source of milk production in Ethiopia from the cow (Table 1) but small quantities of milk are also obtained from goat and camel in some region particularly in pastoralist areas.

Four major systems of milk production can be distinguished in Ethiopia, these are:

a. Pastoralism
b. Highland Smallholder
c. Urban and pre-urban (small and medium dairy farms in backyards in and around towns and cities).
d. Intensive dairy farming.

a) Pastoralism

Even though, information on both absolute numbers and distribution vary, it is estimated that about 30% of the livestock population are found in the pastoral areas.

The pastoralist livestock production system which supports an estimated 10% of the human population covers 50-60% of the total area mostly lying at altitudes ranging from below 1500 m.a.s.l. pastoralism is the major system of milk production in the low land. However, because of the rainfall pattern and related reasons shortage of feed availability milk production is low and highly seasonally dependent.

b) The highland smallholder milk production

The Ethiopian highlands possess a high potential for dairy development. These areas occupying the central part of Ethiopia, over about 40% of the country (approx. 490.000 km^2) and are the largest of their kind in sub-saharan Africa (Tedla et al, 1989). In the highland areas agricultural production system is predominantly substance smallholder mixed farming, with crop and livestock husbandry typically practiced within the same

management unit. In this farming system all the feed requirement is derived from native pasture and a balance comes from crop residues and stub grazing.

The majority of milking cows are indigenous animals which have low production performance with the average age at first calving is 53 months and average calving intervals is 25 months. Cows had three to four calves before leaving the herd at 11-13 years of age, the average caw lactation yield is 524 liters for 239 days of which 238 liters is off take for human use while 286 liters is suckled by the calf. But also a very small number of crossbred animals are milked to provide the family with fresh milk butter and cheese. Surpluses are sold, usually by women, who use the regular cash income to buy household necessities or to save for festival occasions (Mugerewa). Both the pastoralist and smallholder farmers produce 98% of the country milk production (MOA, 1985 E.C).

c) Urban and peri-urban milk production

This system developed in and around major cities and towns which have a high demand for milk. The main feeds sources are agro-industrial by products (Oil Seed Cakes, Bran, etc) and purchased roughage.

The system comprises small and medium size dairy farms located mainly in the highlands of Ethiopia. Farmers use all or part of their land for home grown feeds.

Generally, the primary of the production system is to sale milk as a means of additional cash income.

d) Intensive Dairy Farming

This is a more specialized dairy farming practiced by state sector and very few individuals on commercial basis. Most of the intensive dairy farms are concentrated in and around Addis Ababa and are basically based on exotic pure bred stock. The urban, peri-urban and intensive dairy farmers are produce *2%* of the total milk production of the country .

1.2. Dairy Development

Dairy development is generally associated with technical changes to improve milk yield per cow. However, it should be noted that:

- The use of exotic cattle is a rapid and potentially sustainable path to higher productivity, even for small-scale resource-poor farmers and in warm, semi-arid or humid climates. However, there have been many repeated failures of such schemes for obvious, but often ignored, reasons.
- National and local breeding strategies need to address the realities of climate and disease risk to increase the likelihood of successful crossbreeding programs.
- Fodder technology should be an integral part of any dairy development program, particularly if it incorporates importation of high genetic merit stock.

1.3. Identify dairy production requirements

Milk production costs differ from country to country, from one producer area to the next, and among production economies. Determining production costs is therefore a delicate matter and should be done on a case-by-case basis. Extrapolating from the figures obtained can only produce approximate results.

A certain amount of data are needed on the context of the dairy farm or business to be coasted:

- Geographical context
- Economic climate
- Available farmland
- Staff
- Products other than milk
- Herd size and composition
- Fodder system
- Animal housing and milking systems.

The gross margin produced by the activity “milk production” can be expressed in terms of:

- number of dairy cows

- ha of fodder area
- number of laborers'
- available capital.

The choice of which ratio to use will depend on the individual farm situation, i.e. on its own limiting factors.

A livestock producer with a fixed installation which he does not wish to modify will be more apt to select “number of dairy cows”. He may indeed have a fixed amount of labour to work with the herd, for which reason he wishes to maintain a constant number of animals.

A livestock producer with a limited amount of land is more apt to choose “hectares of fodder area”, though he may modify the herd size if he is willing to make new investments.

If available labor is the limiting factor, the farmer will try to get the maximum gross margin per labor unit available on the farm.

Available capital is the limiting factor for many farmers. In this case gross margin will be compared to the capital invested.

If a government wishes to develop dairy production, then, it should establish a farm-gate milk price which will make dairy production more profitable in terms of the ratio chosen by the farmer than other possible farming activities in that area. The cost price of one liter of milk is therefore not the main criterion for a milk producer. He ought rather to look at the gross margin in terms of the specific limiting factor of his own farm.

What we usually see in the developing countries is that fodder cropland and dairy potential are so underexploited that any effort to intensify production and adapt resources to stock requirements initially entails reduction of costs per unit of milk produced. Logically then, by simultaneously intensifying fodder production and dairy production, the cost of producing milk begins to drop as production rises, significantly pushing up gross margin.

1.4. Clean milk production requirements.

Clean milk may be defined as milk comes from healthy. Possessing good flavor, devoid of dirt and containing relatively small number of bacteria an essentially free from pathogen.

Clean milk should not be confused with cleaned milk which simply means milk that has been passed through a strainer or a clean cloth to remove visible extraneous materials

Clean milk production is always profitable for producer, manufacturer and consumer due to the following reason.

A. Producer interest.

1. It renders protection against disease like, septic sore throat, which is essentially of human nature. But can become established in cow's udder. Similarly mastitis milk can easily contaminate other healthy animals.

Diseases like typhoid fever, dysentery, etc. are transmitted to the milk by direct contamination through human contact. As such producer must allow be careful about maintaining of hygienic condition in their farm.

2. Unless due attention regarding cleanliness is perfectly observed the milk is likely to get contamination by other microbes through body dust of the animal or through water or through other agencies consequently the life of un processed row milk will definitely be shortened. The producer will find it difficult to dispose his products at time consuming distant place

B. By manufacturer

A good row materials is always for finished product it enables the manufacturer to produce high quality products a factor which in turn increases the sale and consumption of milk products the margin of profit will be more.

C. Consumer interest

1. It provides better keeping quality and chance of spoilage are minimized
2. It gives them guarantee against milk borne infectious disease like typhoid, diarrhea etc.

Self-Check -1	Written Test

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

Part I choose the best answer

1. which one is Characteristics of pastoralist dairy production (2 points)

A. Human population cover 50-65% B. Major production is milk

C. Shortage of feed D. All

Part II Give short answer

2. Write the four major systems of milk production can be distinguished in Ethiopia?(3 points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

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Information Sheet-2	Identifying and complied requirements for the maintenance of milk quality

2.1. Definition of milk quality

Good-quality raw milk has to be free of debris and sediment; free of off-flavours and abnormal color and odor; low in bacterial count; free of chemicals (e.g., antibiotics, detergents); and of normal composition and acidity. The quality of raw milk is the primary factor determining the quality of milk products. Good-quality milk products can be produced only from good-quality raw milk.

2.2. Importance of quality milk

Milk is still one of the staple foods worldwide. Milk quality is crucial for the best taste and for both a high technological and nutritional value. Therefore, the quality of the milk at the time of takeover in the dairy is controlled immediately (ingredients of raw milk, such as fat and protein, as well as bacterial count, cell count, antimicrobial residues and dilution). Proper raw milk quality forms the basis for the production of high-quality dairy products. Due to its great economic importance, the price that a farmer can obtain for the milk he delivers depends to a large extent on their quality characteristics. The production of high-quality milk is not only crucial for taste and image, but also plays an important role in further processing. An essential prerequisite for high quality milk is that it is produced by healthy cows. This also meets the expectations of consumers.

2.3. Quality testing

The hygienic quality of milk is of crucial importance in producing milk and milk products that are safe and suitable for their intended uses. To achieve this quality, good hygiene practices should be applied throughout the dairy chain. Among the causes of small-scale dairy producers' difficulties in producing hygienic products are informal and unregulated marketing, handling and processing of dairy products; lack of financial incentives for quality improvement; and insufficient knowledge and skills in hygienic practices.

Milk testing and quality control should be carried out at all stages of the dairy chain. Milk can be tested for:

- Quantity – measured in volume or weight;
- Organoleptic characteristics – appearance, taste and smell;
- Compositional characteristics – especially fat, solid and protein contents;
- Physical and chemical characteristics;
- Hygienic characteristics – hygienic conditions, cleanliness and quality;
- Adulteration – with water, preservatives, added solids, etc;
- Drug residues.

Fig. Quality test

Examples of simple milk testing methods suitable for small-scale dairy producers and processors in developing countries include taste, smell, and visual observation (organoleptic tests); density meter or lactometer tests to measure the specific density of milk; clot-on-boiling testing to determine whether the milk is sour or abnormal; acidity testing to measure the lactic acid in milk; and the Gerber test to measure the amount of fat in the milk.

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2.4. Milk testing and quality control

Figure 1. milk quality test process

2.4.1. What is milk quality control?

Milk quality control is the use of approved tests to ensure the application of approved practices, standards and regulations concerning the milk and milk products. The tests are designed to ensure that milk products meet accepted standards for ***chemical composition and purity as well as levels of different micro-organisms.***

2.4.2. Why have milk quality control?

Testing milk and milk products for quality & monitoring that milk products, processors & marketing agencies adhere to accepted codes of practices costs money. There must be good reasons why we have to have a quality control system for the dairy industry in Kenya.

Figure 2. Quality control

The reasons are:

i)To the Milk Producer.

The milk producer expects a fair price in accordance with the quality of milk she/he produces.

ii) The Milk Processor.

The milk processor who pays the producer must assure himself/herself that the milk received for processing is of normal composition and is suitable for processing into various dairy products.

iii) The Consumer.

The consumer expects to pay a fair price for milk and milk products of acceptable to excellent quality.

iv) The Public and Government Agencies.

These have to ensure that the health and nutritional status of the people is protected from consumption of contaminated and sub-standard foodstuffs and that prices paid are fair to the milk producers, the milk processor and the final consumer.

All the above-is only possible through institution of a workable quality testing and assurance system conforms to national or internationally acceptable standards.

Figure 3. milk quality

Milk testing and quality control is an essential component of any milk processing industry whether small, medium or large scale. Milk being made up of 87% water is prone to adulteration by unscrupulous middlemen and unfaithful farm workers.

There are various ways and methods of monitoring milk quality, with the key ones described briefly below. Many of the methods are relatively inexpensive, with little needed in the way of equipment. Other methods may require more expensive equipment, but are more accurate and quicker.

Factors affecting Milk quality

- Adulteration,

- Milk Hygiene
- Temperature
- Disease problem (commonly Mastitis)

Common milk quality test

1. Organoleptic (sense) tests

The organoleptic test permits rapid segregation of poor quality milk at the milk receiving platform. No equipment is required, but the milk grader must have good sense of sight, smell and taste. The result of the test is obtained instantly, and the cost of the test are low. Milk which cannot be adequately judged organoleptically must be subjected to other more sensitive and objective tests.

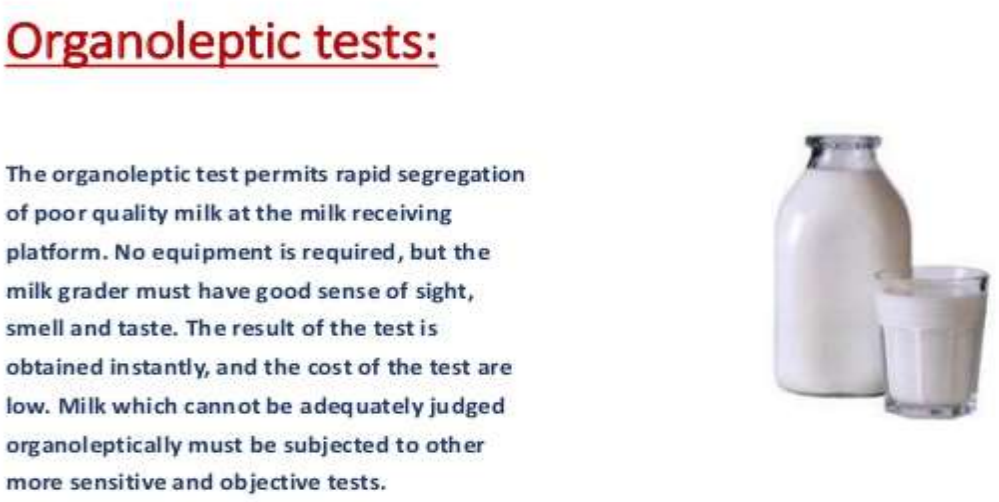

Figure 4. Organoleptic test

2. Clot on Boiling (C.O.B) Test

The test is quick and simple. It is one of the old tests for too acid milk (pH<5.8) or abnormal milk (e.g. mastitis milk). If a milk sample fails in the test, the milk must contain many acid or rennet producing microorganisms or the milk has an abnormal high percentage of proteins like colostrums milk. Such milk cannot stand the heat treatment in milk processing and must therefore be rejected.

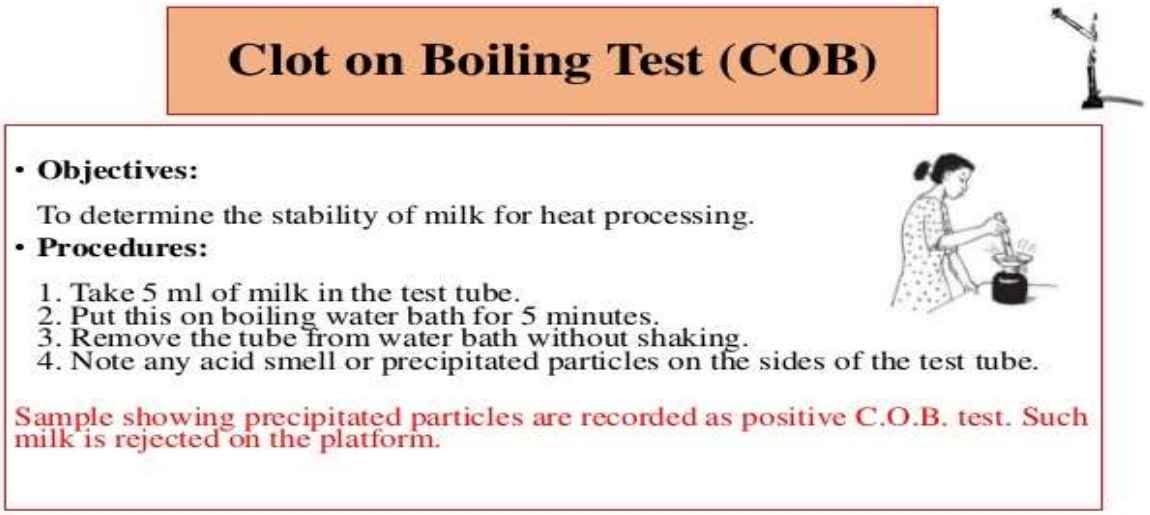

Figure 5. Clot on boiling

3. The Alcohol Test

The test is quick and simple. It is based on instability of the proteins when the levels of acid and/or rennet are increased and acted upon by the alcohol. Also increased levels of albumen (colostrums milk) and salt concentrates (mastitis) results in a positive test.

Figure 6. Alcohol test

4. Acidity test

Bacteria that normally develop in raw milk produce more or less of lactic acid. In the acidity test the acid is neutralized with 0.1 N Sodium hydroxide and the amount of alkaline is measured. From this, the percentage of lactic acid can be calculated. Fresh milk contains in this test also "natural acidity" which is due to the natural ability to resist

pH changes .The natural acidity of milk is 0.16 - 0.18%. Figures higher than this signifies developed acidity due to the action of bacteria in milk sugar.

Figure 6. Acidity test

5. Lactometer or density test

During the organoleptic inspection the milk appears to be too thin and watery and its colour is “blue thin”, it is suspected that the milk contains added water. The lactometer test serves as a quick method to determine adulteration of milk by adding water. The test is based on the fact that the specific gravity of whole milk, skim milk and water differ from each other. With a lactometer the specific density of milk is measured. At 15 ºC the normal density of the milk ranges from 1.028 to 1.033 g/ml, whereas water has a density of 1.0 g/ml. So when the lactometer reads a value closer to 1.0, probably water has been added to the milk. If possible the lactometer reading can be combined with the fat test. The density of fat is lower than that of milk. So in case the results of the fat test are low and the found density is still high (e.g. 1.035), then the milk might have been skimmed. If the results of the fat test are low and the density is low (e.g. 1.025), then water might have been added to the milk. Always read the temperature of the milk first; the lactometer reading varies according to temperature.

Figure 7. Lactometer or density test

Self-Check -2	Written Test

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

Part I Give short answer

1. What is milk quality?

2. Why have milk quality control?

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

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Information Sheet-3	Determining resources and equipment requirements

3.1. Resource and equipment requirements

- Milk harvesting equipments
- Milk cooling and refrigeration equipments
- Emergency power supply
- Yard washing equipments
- Steady and continuous water supply, hot water services
- Teat dip and teat spray equipments
- Feeding equipments
- Fly control system
- Waste management system equipment
- Dairy herd drenching equipments

The machinery and equipment required depends on the level of mechanization desired and the scale of operation. However, some machinery and equipments are essentially required such as the chaff cutter machine, milking pails, milk cans and minor implements. On farms maintaining more than 20 milch animals, machine milking may be economical and more convenient as compared to hand milking. Installation of fans and mistess cooling devices in animal sheds for protection against heat stress is also a must if one wishes to keep high yielding crossbred cows. Dairy farms with 50 or more milch animals may also require a milk cooler, electricity generator set and a utility vehicle for the procurement of farm supplies and marketing of produce besides a tractor with implements for the cultivation of fodder crops and their harvesting, transportation chaffing, processing etc.

3.1. Milking barn or milking area

An approved milking area shall be provided to permit normal sanitary milking operations.

a) Work areas shall have a minimum of ten (10) foot candles of light properly distributed

for both day and night milking.

b) The milking area shall be well ventilated to minimize odors and prevent excessive condensation.

c) Floors and gutters shall be kept clean, in good repair, graded to drain, and constructed of concrete or other impervious materials.

d) Bedding shall be permitted in the milking area if kept clean and manure is removed daily. Bedding shall be relatively dust free.

e) The milk area ceiling shall be dust tight to prevent the entry of dust from feed stored overhead.

f) Walls and ceilings shall be kept clean and in good repair. It is recommended that the milking area be completely enclosed. Feed shall be stored in a manner not to increase the dust content of the air or attract flies in the milking area.

3.2. Cow yard and cattle housing area

a) The cow yard shall be graded to drain as well as local conditions will permit.

b) Cow yards which are muddy due to recent rains shall not be considered in violation of this section.

c) The cattle housing area shall be free of excessive manure, soiled bedding, and waste material to prevent the soiling of cows' udders.

d) All manure removed from the milking area shall be stored to prevent access of cows to the accumulation. Manure shall be stored to minimize fly breeding.

3.3. Milk house or milk room.

There shall be a conveniently located milk house or milk room in which the cooling, handling, and storing of milk; and the washing,

sanitizing, and storing of equipment and utensils

shall be done. Milking areas with milk house and milk room facilities combined in an operation that have been given approval prior to the effective date of this administrative regulation, will be acceptable for as long as the combined facility is operated in a sanitary manner.

Figure 8. Milk house

a) The floor shall be constructed of concrete and well drained.

b) The walls and ceilings shall be constructed of relatively smooth, easily cleanable material. A light colored material is recommended.

c) A drain through the floor or wall shall be provided. The drain shall not be located under the can cooler or bulk tank. The drain may discharge to the surface of the ground if waste from the drain does not pool or cause an insect breeding problem.

d) The milk house space shall be large enough to meet the following requirements:

⇒ . Walkways and working areas shall be a minimum of thirty (30) inches wide;

⇒ The bulk tank shall be kept a minimum of eighteen (18) inches from the walls on all sides, except tanks that extend through the wall; and

⇒ There shall be a minimum of six (6) inches between the lowest point of the bulk tank and the floor.

e) Artificial light shall be provided with a minimum 100 watts capacity. The light fixture shall not be located over the bulk tank. Flood lights are recommended near the ends of the bulk tank.

f) Ventilation shall be sufficient to prevent odors and condensation.

g) The milk house shall be kept clean and free from unnecessary articles and used only for purposes permitted by the cabinet. Only insecticides and rodenticides approved for use in the milk house shall be stored in the milk house. Insecticides and rodenticides shall be stored to prevent contamination of milk, milking equipment, sinks, or cleaning supplies.

h) All outer openings shall be screened or protected against the entrance of insects and rodents. Outer doors shall open outward and be self-closing, except doors between the milk room and milking area may open either way or both ways and shall be self-closing. If

during the winter months a screen door is taken down, the milk house door may open inward if it is self-closing. Bulk tank installations shall have an approved hose port properly constructed through the outer wall for milk pickup operations.

i) Running water under pressure shall be provided. Water heating facilities conveniently available to supply hot water to the milk house shall be provided for all bulk tank installations. A supply of water shall be available to the milk room for all can shippers.

j) A two (2) compartment wash and rinse vat shall be provided; if milking equipment is cleaned in place, a single compartment wash vat will be acceptable.

k) A concrete slab at least four (4) feet by four (4) feet shall be located outside the milk house under the hose port.

l) The milk house shall be supplied with approved brushes, cleaners, and sanitizers to properly clean and sanitize equipment and utensils.

m) If approval is given by the cabinet, the can cooler may be stored in a suitable place away from the milk house in order to be easily accessible to the can hauler.

3.4 Utensils and equipment :-Include;

⇒ Milk harvesting equipment
⇒ Milk cooling and refrigeration equipment
⇒ Emergency power supply
⇒ Yard washing equipment
⇒ Waste management system equipment
⇒ Feeding equipment
⇒ Dairy herd drenching equipment
⇒ Hot water service
⇒ Fly control system

❖ Utensils, and other equipment used in the handling of milk shall be maintained in good condition. Milk equipment shall be free from rust, open seams, milk stone, or any unsanitary condition. Milk equipment shall be washed, rinsed, and drained after each milking, stored in suitable facilities, and sanitized immediately before use.

Self-Check -3	Written Test

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

Part I Write and discus the below

1. What are the resource and equipment that are required for milking?(5pts)

2. Utensils and equipment included ?(5pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

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Information Sheet 4	Maintaining equipment and materials.

4.1. Maintaining requirements for milk quality

Milk from health cow, having good flavor, free from dirt and filth, contains relatively small number of bacteria and essential free from pathogens is clean milk. Clean milk production is always profitable for producers, manufacturers and consumers. Therefore, producing quality milk requires the following activities.

1. **Herd health:** the dairy animal must be free from pathogens and should be periodically checked in every year for all of contagious diseases
2. **Clean animal:** the milkier must clean the flanks and udder of cows just before milking to prevent entry of dirt into the milk
3. **Clean surrounding:** milking area should be clean and dust free
4. **Control of flies:** fly control measures must be arranged as they may carry contagious disease like typhoid, dysentery etc.
5. **Milker's cleanliness:** must be free from infectious diseases. Should keep personal hygiene, wear clean cloths, trimmed nails and cover hair. Never spit around or talk while milking. The milker must cover cuts and wounds.
6. **Clean utensils:** all milking equipments and containers must be clean and free from pathogens
7. **Straining:** is done to remove sediments and other foreign materials. Use clean dry cloth to maintain quality of the milk.
8. **Feeding:** should be done an hour before milking. During milking give the animal some concentrate which is less dusty and to keep the cow busy.
9. **Cool and store milk properly**

Hygiene requirements and cleaning systems used for milking equipments

Milking management should aim at minimizing microbial, chemical and physical contamination. Milking management covers all aspects of the process of obtaining milk

form cow quickly and effectively, while protecting health of the cow and quality of milk. The suggested practices for milking are

- Ensure milking routines do not injure cows or introduce contaminants into milk
- Ensure milking is carried out under hygienic conditions
- Ensure milk handled properly after milking

Self-Check -4	Written Test

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

1. List down at list five(5) milk quality requires activities? 5pts

2. Write the suggested practices for milking? 5pts

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

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Operation sheet-1	Organoleptic (sense) tests

Techniques to test Organoleptic test:

1. Open a can of milk.
2. Immediately smell the milk.
3. Observe the appearance of the milk.
4. If still unable to make a clear judgment, taste the milk, but do not swallow it. Spit the milk sample into a bucket provided for that purpose or into a drain basin, flush with water.
5. Look at the can lid and the milk can to check cleanliness.

Operation sheet-2	Clot –on – boiling test

Techniques to test Clot –on – boiling test

1) Use Apparatus
2) Boiling water bath (a 600 ml beaker on a gas or electric heater is adequate)
3) Test tubes
4) Timer (a watch or clock is adequate).
5) Place about 5 ml of milk in a test tube (the exact amount is not critical) and place the test tube in boiling water for 5 minutes.
6) Carefully remove the test tube and examine for precipitate.
7) The milk is rejected if any curd forms.

Operation sheet-3	Alcohol test

Techniques to test Alcohol test

1. Put equal volumes of milk and 75% alcohol in a test tube.
2. Invert the test tube several times with the thumb held tightly over the open end of the tube.
3. Examine the tube to determine whether the milk has coagulated. If it has, fine particles of curd will be visible.

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 hours.

Task 1. Organoleptic (sense) tests
Task 2. Clot –on – boiling test
Task 3. Alcohol test

References

Marshall, R.T. (1992) Standard Methods for the determination of Dairy Products. 16th ed. Publ. American Public Health Association.

Richardson, G.H. (1985) Standard Methods for the examination Dairy Products 15th edition, American Public Health Association, Washington

Smith, P. W. 1981. “Milk Pasteurization” *Fact Sheet Number 57*, U.S. Department of Agriculture Research Service, Washington, D.C.

DAIRY PRODUCTION

Level II

Learning Guide -53-

Unit of Competence:- Perform milking operations

Module Title:- Performing milking operations

LG Code: AGR DRP2 M14 LO2-LG-53

TTLM Code: AGR DRP2 M14TTLM 1219v1

LO 2: Implement milking procedures

Instruction Sheet 1	Learning Guide 53

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

- Determining Milking schedule
- Checking and adjusting Water supplies
- Implementing Milking procedures
- Implementing Occupational Health and Safety (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 –**

- Determine Milking schedule
- Check and adjust Water supplies
- Implement Milking procedures
- Implement Occupational Health and Safety (OHS) hazards

Learning Instructions:

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Information Sheet-1	Determining Milking schedule

1.1. Milking schedule

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.

1.1.1. **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

1.1.2. **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

Milking programme is made up of the following milking schedules and milking policy

The most important factor in milking is

1. Time of milking: milking should be done twice or thrice a day, but at regular interval. The interval should be as equal as possible in case of twice a day milking. Abrupt changes in the time of milking affects the total yield.

2. ***Milking order:*** Cows that have mastitis or history of chronic mastitis are a source of infection to non infected cows. Hence, it is well to milk clean cow first. A desirable milking order in a herd is;

a) First, calf heifer that have been free of mastitis.

b) Older cows that have been free of mastitis.

c) Cows that have been a previous history of mastitis, which no longer show symptoms

d) Cows with quarters, producing abnormal milk.

3. Preparing the cow and the milkier: the milkier and the animal liking for each other

- The animal should not be excited or beaten before milking: otherwise she may hold up the milk.
- At the onset of milking the udder and the teat should be washed with any antiseptic lotion or boiled neem leaves and then dries it with clean cloth.
- The milkier should wear caps and must trim their nails regularly.
- Blowing nose and even talking should be avoided while milking.

4. Feeding during milking: to keep the animal busy at the time of milking, it is a good practice to feed a portion of the concentrate mixture at milking time.

5. After washing the animal practice dry hand milking

6. Use the full-hand method followed by stripping.

7. Do milking quickly, gently and completely.

Self-Check -1	Written Test

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

1. What is a desirable milking order in a herd ? 5pts

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

1

- _____
- _____
- _____
- _____

Information Sheet-2	Checking and adjusting Water supplies

2.1. Checking and adjusting Water supplies

For effective milking giving good yields of high quality milk, fast milk removal and to minimize mastitis, good milking machine maintenance is required. Maintenance routines should be provided by the manufacturers of the equipment.

These will include

- simple checks to be made immediately before each milking
- checks at weekly and monthly intervals
- an annual check of the complete plant by a trained technician.

FAULTS FOUND MUST BE CORRECTED

Otherwise the checks are of no value.

Maintenance

The basic layout and operation of milking machines is normally straight-forward and similar for all standard milking machines. However, it is important that a correct maintenance routine is followed. Faulty milking machines can result in poor milk let down, slow milking, milk of high bacterial count and mastitis. Maintenance is a responsibility of the person regularly using the equipment with simple checks made at each milking and more detailed ones at weekly or less frequent intervals.

Self-Check -2	Written Test

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

1. What is a maintenance routines should be provided by the manufacturers of the equipment.? 5pts

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

1

- _____
- _____
- _____

_____

Information Sheet-3	Implementing Milking procedures

3.1 Milking systems

There are two types of milking systems. The choice of the system depends on the level of operation, economic efficiency and number of cows to be milked

- Hand milking
- Machine milking

3.2. Milking procedures

Requirements: clean water, towel, strip cup, teat dip, bucket, milking machine/if possible/

A. Milking first – calf heifers

Machine milking procedures

Training first-calf heifers to milking is an important management skill on a dairy farm. The way a fresh heifer is handled during the first days after her first calf is born determines her attitude towards the milking procedures for the rest of her life. She can be a calm and easy to milk or an “outlaw” nearly impossible to milking.

Requirements/ equipments needed/

- Milking machine
- Parlor or stanchion
- Water hose or bucket of water / continuous water supply/
- Paper towel
- Strip cup
- Halter
- Teat dip, sanitizer
- Rope

Step by step procedures

1. Assemble all the necessary equipments: equipments must be clean and sanitized

2. Move the fresh heifer into the parlor /stanchion. Avoid shouting
3. Wash the udder, teats/ especially teat ends should be thoroughly washed with warm(110^{O}F) sanitizer solution/
4. The udder should be thoroughly massaged and dried with an individual towel for each heifer
5. The first milk from each quarter should be striped in to a strip cup and discarded or can be striped directly to the floor and hosed with pressurized water. If milk is abnormal / contains clot, flakes, blood, serum/ should be milked in a separate container and discarded. It is better if stripping is done before washing then washing follows

B. Milking experienced cows

1. Provide stress free environment
2. The rest procedures similar to fresh heifer milking /see the steps 1 to 5 above/
3. The milkier or the milking machine should be adjusted under the cow so that it is at right angle to the floor of the udder
4. Remove the milking machine up on completion of milking. The vacuum should be turned off and the machine removed
5. Immediately after the milkier are removed, the teats should be dipped in an effective teat dip solution. This removes the last drop of milk from the end of the teats and helps to reduce new infections of mastitis, helps to keep the teats pliable and guards against chapping and sunburn
6. All milking equipments must be thoroughly cleaned, sanitized and properly stored immediately after milking. Follow the approved procedures for the equipments used and satisfy requirements of the milk market regulations if there is any

Cautions

The machine should be removed immediately after milk out of the udder or when the milk ceases to flow. Over milking is thought to be one of the major causes of mastitis.

Immediately after milking when the cow is returned to the housing area take care that she is not exposed to extreme cold or wind; the udder, and particularly the teat ends might

freeze. To prevent this, the cow udder and teats should be thoroughly dry before she leaves the milking parlor

Hand milking procedures

The process of hand milking starts with the same procedures as does machine milking.

1. Place a milk bucket under the cow's udder instead of the machine
2. Milking is done by hand pressure applied at the upper portion of the teat with the thumb and first finger. The pressure traps the milk in the teat
3. The teat is squeezed against the palm of the hand by the remaining three fingers, with pressure first applied by middle finger then follows the other fingers, this causes milk to squirt from the canal
4. When the milk is squeezed out of the teat, the pressure applied by the finger is released and the milk is free to flow from the cistern of the udder to the teat. Then apply the above procedure to the teat to remove the milk. Continue this process until the cow is milked out.
5. If the teas are very short use only the thumb and first two fingers. With extremely short teats, stripping may be necessary. Striping – milking by applying pressure with the thumb and first finger at the top of the teat as in step 2
6. Immediately after milking, the teats should be dipped in an effective teat-dip solution

Caution

The milkier should be prepared to protect himself: a cow may kick because of an injury teat, a sore on teat, rough handling, or meanness. If the cow persists in kicking use restraining method.

Self-check 3	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. Write factors affecting milk quality /9pts/
2. Write down milking procedures /6pts/
3. Describe milking order /4pts/
4. What are the milking systems? /2pts/
5. What are the requirements to collect clean milk?/4/

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

1._____
_____

2._____
_____

3_____
_____

4._____
_____

5_____
_____

Information Sheet-4	Implementing Occupational Health and Safety (OHS) hazards

4.1 Implementing safe work place practices according to OHS

Safe systems and procedures for:

- The operation and maintenance of machinery and equipment including hydraulics and guarding of moving exposed machine parts
- Livestock handling including zoonosis and leptospirosis control
- The protection against electrical hazards
- Handling hot water and protection from scalds
- Outdoor work including protection from solar radiation
- Use of relevant personal protective equipment \
- Use chemical and biological agents

Self-check 4	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are the requirements to collect clean milk?/4/

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

1._____
_____
_____
_____

Operation Sheet 1	Milking procedures

Techniques to Milking procedures

1. Prepare all the necessary equipments and materials. Make sure that all the equipments are clean and sanitized.
2. Put on clean clothes/apron/ and cover hair
3. Move the animal into the milking area /parlor/
4. Do not shout/disturb the animal during milking
5. Prepare warm water
6. Strip the first drop of milk from each quarter into a strip cup or onto a floor. Check for color of a drop of milk.
7. Wash the udder and tips of the teats thoroughly with warm water and sanitizer solution /110^0 F/
8. The udder should be thoroughly massaged and dried with and individual towel for each cow
9. Put the machine/or bucket under the cow
10. No eating, smoking and talking in the milking room during this process
11. Remove the machine or the bucket upon the completion of milking. In case of machine milking the vacuum should be turned off and the machine removed
12. Immediately after milking, the teats should be dipped in an effective teat dip solution.
13. All the milking equipments should be thoroughly cleaned, sanitized and properly stored

Operation sheet-2	Perform hand milking

Techniques to Perform hand milking

1. Identify all milking material, tools and equipment
2. Wear PPE
3. Create silent environment
4. Provide concentrate feed to the cow for good milk letdown
5. Restrain the cow in number 8 position
6. Clean milking utensils (equipment)
7. Washing hands
8. Clean teats with warm water
9. Dry teat by towel
10. Check for mastitis using strip cup
11. Milk using both hands; squeeze properly the teats with full hand.
12. Filter/sieve/ milk
13. Record the amount of milk from each cow
14. Cool the milk to store in time

Operation sheet-3	Organoleptic (sense) tests

Techniques to test Organoleptic test:

6. Open a can of milk.
7. Immediately smell the milk.
8. Observe the appearance of the milk.
9. If still unable to make a clear judgment, taste the milk, but do not swallow it. Spit the milk sample into a bucket provided for that purpose or into a drain basin, flush with water.
10. Look at the can lid and the milk can to check cleanliness.

Operation sheet-4	Clot –on – boiling test

Techniques to test Clot –on – boiling test

8) Use Apparatus
9) Boiling water bath (a 600 ml beaker on a gas or electric heater is adequate)
10) Test tubes
11) Timer (a watch or clock is adequate).
12) Place about 5 ml of milk in a test tube (the exact amount is not critical) and place the test tube in boiling water for 5 minutes.
13) Carefully remove the test tube and examine for precipitate.
14) The milk is rejected if any curd forms.

Operation sheet-5	Alcohol test

Techniques to test Alcohol test

1. Put equal volumes of milk and 75% alcohol in a test tube.
2. Invert the test tube several times with the thumb held tightly over the open end of the tube.
3. Examine the tube to determine whether the milk has coagulated. If it has, fine particles of curd will be visible.

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 hours.

Task 1. Milking procedures
Task 2 Perform hand milking
Task 3. Organoleptic (sense) tests
Task 4. Clot –on – boiling test
Task 5. Alcohol test

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DAIRY PRODUCTION

Level II

Learning Guide -54-

Unit of Competence:- Perform milking operations

Module Title:- Performing milking operations

LG Code: AGR DRP2 M14 LO3-LG-54

TTLM Code: AGR DRP2 TTLM 1219v1

LO 3: Assess dairy animal health

Instruction Sheet 1	Learning Guide 54

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

- ❖ Implementing Handling practices
- ❖ Taking Milk samples
- ❖ Maintaining dairy animal health records

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 –**

- ❖ Implement Handling practices
- ❖ Take Milk samples
- ❖ Maintain dairy animal health records

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 1 to 7.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check **1,2&3**, ” **in page -.,3,9&17respectively**
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Implementing Handling practices

1.1. Practice good hygiene during milking

GUIDELINE

Do not dip clusters or hands unless you have rinsed them first because progressive contamination of the bucket leads to a soup of bacteria.

1 Avoid splashes or sprays of milk aerosol. Never get milk on your hands.

Gloves should always be used when searching for or dealing with clinical cases of mastitis. Good milkers learn to avoid getting milk on their hands.

2 Use running water and disinfectant solution to remove infected milk from gloves, liners and other equipment.

Rinsing with running water for about 30 seconds provides a physical wash. Then dipping in a disinfecting solution such as 1% Iodophor provides a sanitizing effect.

3 Draft out clinical cases where possible, and milk them last. Run a separate mastitis herd if you can.

4 Use a separate cluster for clinical mastitis cows milked with the herd and clean thoroughly between each cow.

- ✓ Mark the cluster with some red tape to remind all people
- ✓ Milking that it is only to be used for mastitis cows.
- ✓ Rinse and then sanitize the cluster after milking each mastitis cow.

5 Consider identifying high cell count cows and milking them last, preferably by running a separate herd.

Self-check 1	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are importance of milk handling practice ?/4/

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

1._____
_____
_____
_____

Information Sheet-2	Taking Milk samples

2.1 Introduction

If you want to know the details of all the milk collected, you would have to test all the milk from each producer every day, or even milk from each animal. This is impractical because of cost, time involved and inconvenience. In order to reduce cost and time, sampling procedures are designed.

Preservation methods and storage and transport of samples. The chapter concludes with a description of periodic, random and composite sampling in order to reduce the costs of sampling and testing.

2.2.Sampling equipment

The basic kit needed is:

(i) An agitator,

(ii) A dipper,

(iii) Sample containers and

(iv) A sterilizer.

Agitators

Agitators (also called plungers) for mixing milk need to be large enough to produce adequate mixing. In view of the different shapes and sizes of containers, no specific design of agitator can be recommended for all purposes, but the design should be such that damage of the inner surface of the container is avoided during mixing.

Dippers

A dipper of the shape and size shown in figure 3 is suitable for collecting samples. The capacity of the sample containers shall be such that they are almost completely filled by the sample taken by the dipper.

Sample containers

- Sample containers should adequately protect the sample and not affect the test results.

- Appropriate materials include glass, some metals (e.g.stainless steel) and some plastics (e.g. polypropylene).
- The containers should preferably not be transparent, but if they are transparent they should be stored in a dark place.
- Containers and closures should be dry, clean and either sterile or suitable for sterilization by one of the methods described below.
- The shape and capacity of the containers depend on the particular requirements of sampling, and could be e.g.100, 150 or 250 ml.
- It is desirable to avoid air space by filling the bottles to the top, leaving however sufficient space to allow for expansion of the rubber stopper.
- Containers other than plastic bags should be securely closed either by a suitable stopper or by a screw cap of metal or plastic material. If stoppers are used, they should be made from non-absorbent, odourless material.

2.3. Sterilizing of sampling equipment

Sampling equipment has to be clean and sterilization is required for microbiological testing. Disposable plastic equipment also needs to be sterile. Sterilization can be performed by one of the two following methods:

A. Exposure to hot air at 170-75 °C for not less than 2 hours.

B. Exposure to steam at 121 ± 1 °C for not less than 20 minutes in an autoclave.

After sterilization by method A or method B, sampling equipment should be stored under sterile conditions. If, in a particular situation, sterilization by method A or method B is not possible, methods C, D or E below can be used. These methods are to be regarded as secondary methods only, and sampling equipment has to be used immediately after sterilization:

C. Exposure to a suitable flame working surfaces of the sampling equipment come into contact with the flame.

D. Immersion in at least 70% *(V/V)* ethanol solution.

E. Ignition with 96 % *(V/V)* ethanol. (**CAUTION:** 96 % ethanol is hygroscopic its concentration may change over time).

After sterilization by method C, D or E, sampling equipment should be cooled under sterile conditions or, in the case of method D, be rinsed with the ethanol solution before sampling

2.4. Sampling procedure

- Sampling should be performed by an authorized, properly trained, person.
- That person shall be free from any infectious disease.
- Sampling for microbiological examination shall always be undertaken by an experienced person.
- Samples for microbiological examinations should be taken before other examinations, and using aseptic techniques and sterilized equipment and containers.
- It is important to obtain representative samples of the product.

The following procedure can be followed for sampling of raw milk:

1) Wash and dry hands, keep hands clean during sampling operation.
2) Mix milk thoroughly, by inverting, stirring or plunging the container for at least 5 minutes. If the volume is small, it can be poured to and from one product container to another of the same volume. Any milk fat adhering to the neck and under the shoulder of the can shall be well mixed with the remainder of the milk. Milk churns (fat separates) easily at 26.5 to 29.50C and agitation near this temperature should be avoided.
3) Check milk temperature and record it on the sample container label.
4) Take the sample as soon as possible after mixing. Make sure the size of the sample is sufficient for all necessary tests.
5) Seal each sample container airtight immediately after filling.
6) Label the samples with all the necessary information (see below).
7) Place sample in sample case and cool the sample when necessary.
8) Rinse equipment used for sampling after use.
9) Samples should be taken in duplicate.

2.5. Sample labels

Samples should have a label attached with the following information:

- Identification of the product
- Nature of the product
- Identification number
- Name / signature of the person responsible for taking the samples

(1) Insert description of the sample of milk taken, e.g. whole milk, skimmed milk, etc., as the case may require.

(2) Insert name and description of the person by whom the sample was taken.

If necessary, additional information may be included, such as:

- Purpose of sampling;
- Mass or volume of the sample;
- Unit from which the sample was taken;
- Condition of the product;
- Storage conditions at the moment of sampling;
- Preservatives added.

2.6. Preservation of samples

Under some circumstances, it may not be possible to test the sample immediately and a preservative may be needed. Preservatives should normally not be added to samples intended for microbiological or sensory examination, only for chemical and physical analysis. Make sure you mix the milk and preservative well. Preservatives may be added to some dairy product samples, provided that:

- The preservative does not interfere with subsequent analyses;
- The nature and quantity of preservative are stated in the sampling report and, preferably, indicated on the label.

Preservatives should preferably be:

- Easily dispersed in milk;
- adding color to indicate presence;
- Stable during storage;
- Non-toxic;
- Disposable without causing pollution, and

- Low cost.

Some examples of preservatives are:

- Sodium / Potassium Dichromate (e.g. 1 % strength)
- Bronopol
- Formaldehyde
- Hydrogen Peroxide

Storage and transport of samples

- The condition of the sample should not be affected during storage and transport. During storage and transport, precautions should be taken to prevent exposure to off-odors, direct sunlight and other adverse conditions.
- The storage temperature after sampling should be reached as quickly as possible and should be between 0 and 4 °C.
- Samples should be transported to the testing laboratory immediately after sampling.
- Transport time should be as short as possible, preferably within24 hours.
- It is desirable that samples of milk are delivered for testing on the same day they are taken for chemical examination.
- Generally, the samples should be examined within 4 hours of collection.
- The result of analysis of any sample, if the temperature of sample has exceeded 7.0°C during a storage period of 4 hours, may be unreliable.
- At a storage temperature of 0 to 4 °C, no detectable increase in bacterial counts will normally occur within 24 hours

Self-check 2	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are the equipment for sampling ?(4pts)
2. Write the procedure of sampling? (5pts)
3. What is the importance of milk preservation? (6pts)

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

1. _____
_____
2. _____
_____
3. _____
_____
4. _____
_____
5. _____

Information Sheet-3	Maintaining dairy animal health records

3.1. COMMON DISEASES OF DAIRY CATTLE

3.1.1 CALF SCOUR

The most common disease of calves is scouring. It accounts for the greatest proportion of calf deaths.

Signs:

A calf with scour will show the following symptoms:

- The eyes will appear dull and sunken.
- The calf will be listless.
- The calf's temperature may be abnormally high.
- The calf will suffer from diarrhea which may be yellow or chalky-white.
- **Causes :**
- **Calf scour can be caused in three ways**.

❖ **Infection**

- Infection from micro organisms is common and is the most serious cause of calf scour. The infection usually enters through the mouth but may also enter through the naval cord. If the faces are chalky-white with a very offensive smell the scour is usually caused by infection. This is commonly known as 'white scour.'

❖ **Nutritive**

- Calves which drink too much milk at one time may suffer from scour. With very young calves the milk will collect in the rumen, curdle and result in scouring. Feeding cold milk or milk that is not fresh can also result in scouring.

❖ **Mechanical**

- Some calves drink their milk too rapidly and scour as a result. Calves may also have 'hair balls' in their stomachs. This arises from sucking other calves and often results in scouring and sometimes in death.
  - **"Hair balls" may result from sucking or licking.**

- **Treatment**
- **The simple treatment for calf scour is as follows:**
  - Isolate the calf from the rest of the herd immediately.
  - Stop milk feeding.
  - Feed with clean, boiled water for 24 hours. A total of 2 to 3 liters should be given in 4 feeds. The water should be given at body temperature.
  - For the second and third days feed half the normal milk ration with water. Sugar or glucose should be added for energy if available.
  - If the signs of scour have disappeared; the calf can be returned to its normal diet on the fourth day.
  - I f scour signs persist or if the calf does not show much improvement veterinary assistance should be sought if possible.
- **Prevention**
- **Good husbandry and management practices are the key to preventing calf scour.**
  - Make sure that the calf receives a sufficient supply of colostrums in the first few days of life.
  - For the first two weeks of life feed the calf little and often - three times a day is the minimum.
  - The calf house should be clean, well ventilated and draught free. If possible, calves should be penned individually for the first few weeks.
  - If bucket feeding, the milk should be fresh and warm.
  - Infected calves must be isolated and sheds where infected calves have been housed should be thoroughly disinfected.
- Proper hygiene and feeding practices will, in most cases, avoid calf scour.

  - **MASTITIS**
- Mastitis is an inflammation of the cow's udder caused mainly by bacteria such as streptococci or staphylococci. The bacteria enter the udder through the teat orifice. Mastitis results in a sharp reduction in milk yield.
- **Mastitis, if untreated, can result in the loss of the infected quarter or even death.**

- **Signs:**
- There are a number of symptoms of mastitis.
    - Thick or clotted milk.
    - Reduced milk yield.
    - Swollen or inflamed udder or quarter.
    - Painful udder when touched.
    - The cow loses appetite.
    - With severe infection the cow's hindquarter may be stiff.
- **Causes:**
- Mastitis is caused mainly by infection with bacteria. The infection is usually caused by poor management practices such as:
- Incomplete milking of the udder.
- Unwashed and dirty udders and teats.
- Dirty milking area.
- Milkier with dirty hands.
- Untreated cracks and sores on teats.
- **Prevention**
- Mastitis problems can be reduced by observing **a** few simple rules on milking practices and hygiene measures.
    - Wash hands before milking
    - Wash the cow's udder thoroughly.
    - Always use clean milking utensils.
    - Keep the milking area clean.
    - Squeeze the teat when had milking; do not pull.
    - Milk the first draw of milk into a strip cup, this will ensure early detection of mastitis.
    - Milk out the udder completely.
    - Treat cuts and sores on teats and udder with a suitable antiseptic.
    - **PARASITES**
- **Internal:**

- Most animals have a certain amount of internal parasites. Severe worm infestation, however, causes a severe drop in milk production and growth. Adult animals develop some resistance to worms but calves suffer badly from worm infestation.

- **Symptoms**
- There are many symptoms of worms in livestock including:
  - failure to thrive weakness
  - loss of appetite
  - diarrhea
  - Coughing and increased breathing rate.
  - Hair standing or dry staring coat.
- **Causes:**
- Roundworms and liver fluke are the main internal parasites of importance. The animals become infected with the parasites from infected pastures. The worm eggs can remain in the pasture from year to year.
- High stocking rates will usually lead to higher parasite levels.
- Wet and waterlogged areas lead to parasite problems, particularly fluke.
- **Treatment:**
- Use of antehelmintics is the only effective worm treatment. Service cooperatives stock suitable worm treatments and the manufacturers dosing rates should be observed. Refer to Section 7 for details on drenching and administration of bolus.
- Treatment for internal parasites, however, often occurs after the animal has suffered severe setbacks in growth. Parasite control is much more effective. Control:
- **There are three elements in a parasite control programme:**
  - proper rotational grazing
  - Good calf-shed hygiene.
  - Routine treatment.

- On small peasant holdings it may be difficult to operate a good rotational grazing system. However, where possible the following rules should be observed for parasite control:
    - Allow calves and young stock to graze pastures first.
    - Calves or young stock should not be grazed on the same pasture two years in a row.
    - Calves should graze pasture grazed by sheep in the previous year or on an area which was used for forage conservation in the previous year.
    - Calves and young dairy stock should be kept away from wet and waterlogged pastures.
    - The calf shed should be cleaned and disinfected once per month to prevent the build up of parasites.
    - All animals should be treated at 2-3 months of age and again at 6-9 months to fit in with the regular treatment programme on the farm.
    - Routine treatment should be carried out at the begining of the rains and again at the end of the rains.
- **External parasites**
- External or ectoparasites are a major problem in Ethiopia. Ticks, flies, fleas and lice intact dairy cattle with dangerous and often fatal diseases.
- Regular spraying or dipping are the only reliable methods of external parasite control. Dip baths, however, are expensive to construct and manage, and are scarce in Ethiopia. Dipping is not practical in most areas, so spraying for ectoparasites is more appropriate, because it can be done *regularly and at a low cost.*
- ***Spraying:***
- For treating small numbers of animals for ticks and lice, hand spraying is appropriate. Any standard knapsack sprayer can be use for spraying cattle. The pressure setting on the sprayer should be high to ensure good penetration,
- **3.2. Health control measures.**
- These include;

- Vaccination against various viral and bacterial diseases.
- Animals testing programme.
- De worming programme.

- **<u>Vaccination</u>**
- To-days it is well established that vaccination is one of the most effective ways of preventing specific diseases by inducing immunity in animals. Unfortunately not all type of vaccination are capable of imparting life long immunity, thus it is essential to know;
    - The period of effectiveness of a particular vaccine.
    - The dosage and rote of vaccination.
    - The storage condition for stocking vaccines
- **The following aspects may be helpful for making the vaccination programme successful.**
- Perform vaccination only in health stock.
- Cows in advanced pregnancies should never be vaccinated
- Calves between 4-6 months should be vaccinated
- During any out break of disease vaccination programme should never be carried out.
- Keep all vaccine under refrigeration until ready for use
- Follow strictly the manufacturers direction
- Destroy all un used vaccines which could not be used within validity period
- Clean up and disinfect all equipments' and clothing after the vaccination performed by trained personnel's.
- Keep the record of the brand, kind and batch number of vaccine used for animals
- **<u>Animals testing programme</u>**
- Animals should be tested for;
- Tuberculosis

- Brucellosis
- Johns diseases

Once every six months in the initial stage and later on, depends upon the health status of the herds.

- The test can be carried out annually
- Positive reactors should be eliminated
- Beside these strict hygienic measure should be adopted
- The breeding bulls should be completely free from infections

i. <u>De worming programme</u>

De-worming against the infestation of internal parasites (indo parasites) should be under taken bi-annually I.e. at the onset of monsoon and again after the end of monsoon

Self-check 3	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are the common disease ?(5pts)
2. Write the sing of mastitis ? (5pts)

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

1.

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2.

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Operation Sheet 1	Milking procedures

Techniques to Milking procedures

14. Prepare all the necessary equipments and materials. Make sure that all the equipments are clean and sanitized.
15. Put on clean clothes/apron/ and cover hair
16. Move the animal into the milking area /parlor/
17. Do not shout/disturb the animal during milking
18. Prepare warm water
19. Strip the first drop of milk from each quarter into a strip cup or onto a floor. Check for color of a drop of milk.
20. Wash the udder and tips of the teats thoroughly with warm water and sanitizer solution /110^0 F/
21. The udder should be thoroughly massaged and dried with and individual towel for each cow
22. Put the machine/or bucket under the cow
23. No eating, smoking and talking in the milking room during this process
24. Remove the machine or the bucket upon the completion of milking. In case of machine milking the vacuum should be turned off and the machine removed
25. Immediately after milking, the teats should be dipped in an effective teat dip solution.
26. All the milking equipments should be thoroughly cleaned, sanitized and properly stored

Operation sheet-2	Perform hand milking

Techniques to Perform hand milking

15. Identify all milking material, tools and equipment
16. Wear PPE
17. Create silent environment
18. Provide concentrate feed to the cow for good milk letdown
19. Restrain the cow in number 8 position
20. Clean milking utensils (equipment)
21. Washing hands
22. Clean teats with warm water
23. Dry teat by towel
24. Check for mastitis using strip cup
25. Milk using both hands; squeeze properly the teats with full hand.
26. Filter/sieve/ milk
27. Record the amount of milk from each cow
28. Cool the milk to store in time

Operation sheet-3	Organoleptic (sense) tests

Techniques to test Organoleptic test:

11. Open a can of milk.
12. Immediately smell the milk.
13. Observe the appearance of the milk.
14. If still unable to make a clear judgment, taste the milk, but do not swallow it. Spit the milk sample into a bucket provided for that purpose or into a drain basin, flush with water.
15. Look at the can lid and the milk can to check cleanliness.

Operation sheet-4	Clot –on – boiling test

Techniques to test Clot –on – boiling test

15) Use Apparatus
16) Boiling water bath (a 600 ml beaker on a gas or electric heater is adequate)
17) Test tubes
18) Timer (a watch or clock is adequate).
19) Place about 5 ml of milk in a test tube (the exact amount is not critical) and place the test tube in boiling water for 5 minutes.
20) Carefully remove the test tube and examine for precipitate.
21) The milk is rejected if any curd forms.

Operation sheet-5	Alcohol test

Techniques to test Alcohol test

1. Put equal volumes of milk and 75% alcohol in a test tube.
2. Invert the test tube several times with the thumb held tightly over the open end of the tube.
3. Examine the tube to determine whether the milk has coagulated. If it has, fine particles of curd will be visible.

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 hours.

Task 1. Milking procedures
Task 2 Perform hand milking
Task 3. Organoleptic (sense) tests
Task 4. Clot –on – boiling test
Task 5. Alcohol test

References

Marshall, R.T. (1992) Standard Methods for the determination of Dairy Products. 16th ed. Publ. American Public Health Association.

Richardson, G.H. (1985) Standard Methods for the examination Dairy Products 15th edition, American Public Health Association, Washington

Smith, P. W. 1981. “Milk Pasteurization” *Fact Sheet Number 57*, U.S. Department of Agriculture Research Service, Washington, D.C.

DAIRY PRODUCTION

Level II

Learning Guide -55-

Unit of Competence:- Perform milking operations

Module Title:- Performing milking operations

LG Code: AGR DRP2 M14 LO4-LG-55

TTLM Code: AGR DRP2 TTLM 0120v1

LO4: Coordinate and monitor milking operations

Instruction Sheet 1	Learning Guide 55

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

- Monitoring milking procedures
- Monitoring and maintaining Milk quality
- Monitoring costs to ensure operations
- Cleaning Work areas and equipment
- Documenting relevant data for analysis

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 –

- Monitor milking procedures
- Monitor and maintain Milk quality
- Monitor costs to ensure operations
- Clean Work areas and equipment
- Document relevant data for analysis

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 1 to 7.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check **1,2,3,4&5” in page -.6,12,15,20&23** respectively
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Monitoring milking procedures

1.1 Machine checks and milking-time

This level of testing is not intended to replace regular machine testing and service by qualified technicians. A field study in France indicated that the most common problems of milking machines were improper vacuum level, pulsator defects and poor condition of cluster components all of which require the attention of a service technician. Rather these simple checks are intended to help identify possible machine or milking management causes of slow or incomplete milking, teat condition problems or sanitation problems that may indicate the need for more frequent service or adjustments to the machine by a service technician.

1.1. 1 Test equipment

The equipment required for this entry level testing includes a stopwatch, a spirit level and a vacuum gauge of known accuracy. Because of the potential health and safety risks associated with mercury, a mercury column is not recommended for on-farm measurements.

Observations with machine not running

1.1.2. Teat cups and Liners

Record the condition of the liners and short milk tubes, noting the fraction that have visible cracking or are distorted (mouthpiece opening not round, liner barrel not round, mouth- piece lip not flat, etc.). Teat cup liners should be in good condition with no cracks in the short milk tube connecting to the claw, and no surface crazing evident on the mouthpiece lip or inner barrel.

1.2. Milking-time Observations

Milking management can have a far greater influence on the success of the milking process than milking machine factors. A systematic review of milking procedures is perhaps the most important part of determining the source of milking related problems.

1.2.1. Cow Cleanliness

Note the condition of cows before milking. Cow cleanliness is a major determinant of both milking efficiency and the rate of intra-mammary infection. It is estimated that cow preparation time is doubled for cows that enter the milking parlor with dirty udders, resulting in reduced parlor throughput. Management practices that reduce teat end exposure to environmental organisms will reduce the risk of developing mastitis.

1.2.2. Cow Handling and Behavior

Cow handling techniques should be examined if cows are hesitant to enter the milking area or are defecating frequently during milking. It is clear from research that human/cow interactions can have a large influence on the milking process If cows are handled well, very few should react aggressively to pre-milking preparation. Cow handling is an important determinant of milking efficiency.

1.2.3. Cow Grouping

Observe whether cows are grouped according to mastitis infection status. Uninfected cows should be grouped and milked in an order to minimizing exposure to cows known to be infected with sub-clinical mastitis. Also note the methods used for detection, handling and recording of clinical cases of mastitis.

1.2.4. Pre-Milking Cow Preparation

Observe pre-milking cow preparation procedures and measure the total amount of time spent in contact with each cow. Pre-milking preparation is performed to clean teats before unit attachment, to check for clinical mastitis and abnormal milk and, to stimulate milk letdown. If milk quality issues are of concern, note the completeness of pre-milking teat sanitation.

1.2.5. Unit Attachment

If vacuum stability in the milk line, milking unit slips and falls, or uneven milk-out are of concern record the method of unit attachment. Effective support should be provided for the long milk tube and units should be adjusted so that cluster weight is evenly distributed on the 4 teats. Even weight distribution of the cluster and adequate support for the long milk tube will result in fewer liner slips and unit fall-offs, and more even milk-out between quarters.

1.2.6. Unit Removal

If milking speed or completeness of milking are of concern, observe methods for unit removal and assess the amount of stripping yield. Early unit removal may result in reduced milk yield and promote the development of sub-clinical mastitis to the clinical stage. Over-milking is the time of highest risk for damaging teat tissues.

1.2.7. Post-Milking Management

Evaluate the adequacy of post-milking teat spraying or dipping by wrapping a paper towel around the teat. Post-milking teat antisepsis was initially developed to reduce the transmission of contagious mastitis pathogens and has been widely accepted. Spray applicators are preferred by some operators because of convenience and to keep teat dip from becoming tainted with contaminated milk.

1.2.8. Milking Routines

The objectives of a milking routine are to provide teat sanitation, abnormal milk and clinical mastitis detection and pre-milking stimulation in manner that is friendly to the cow and efficient for the workers. There are many ways to incorporate these performance goals into a work routine in a tie-stall barn or milking parlor. If labor efficiency is of concern document the time taken to perform the various aspects of the milking routine.

Evaluation of a milking parlor work routine should include measurements of:

- Time to moving cows into and out of a milking parlor
- Time spent for pre-milking cow preparation and unit attachment

- The time that the milking unit is on the cow
- Time to remove milking units (if ACRs are not used)
- Time for post milking sanitation.

1.2.9. Milking Time and Average Milk Flow Rate

The average rate of milk harvest is a good indicator of the efficiency of milking (effectiveness of pre-milking cow stimulation, proper milking unit attachment timing, and point of detachment). The average harvest rate is calculated as the total milk yield divided by the total machine-on time. In milking parlors equipped with milk meters and automated data collection systems the average harvest rate for the entire milking herd can be easily obtained .

1.2.10. Completeness of Milking

The completeness of milking can be assessed by hand stripping each quarter immediately after the milking machine is removed . If milking units are being removed at the proper time the majority of quarters will have little or no milk present after unit removal. It is common for the slowest milking quarter to have some milk left in the lower parts of the udder after unit removal.

1.2.11. Teat Condition

Teat ends that are roughened because of excessive hyperkeratosis are more difficult to clean and appear to have a slightly higher risk for mastitis infections than teats with moderate roughness.

1.2.12. Frequency of slipping or falling teat cups

Note the number of times the units must be adjusted by operators because of slipping or fall-off. A practical goal is less than 5% of cow milking requiring correction by the operator.

Self-check 1	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are the importance of monitor milk procedure ? (5pts)

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

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Information Sheet-2	Monitor and maintain Milk quality

Milk testing

2.1. Introduction

The milk tests described in this chapter are for raw milk only, and the results of the tests described can be used for screening or can be included in payment systems. Other tests available for raw milk are not included, as they are not related to milk payment systems described in this book. Milk testing has to be carried out with as little delay as possible after milk collection.

The testing methods are divided into the following groups:

- Quantity
- Organoleptic characteristics
- Compositional characteristics
- Physical and chemical characteristics
- Hygienic characteristics
- Adulteration
- Drug residues

Each test is described below; the purpose of each test is mentioned first, then the type of test as follows:

- **Tests for screening**: the test results are used to determine whether to accept the milk, e.g. at collection centre level, sometimes referred to as platform level.
- **Tests for payment system:** directly included in payment system.
- **Tests for grading:** included in a grading system.

2.2. Organoleptic characteristics

2.2.1. Introduction

Testing milk for organoleptic characteristics is also called sensory testing and uses the normal senses of sight, smell and taste in order to determine the overall quality. The result of this test is obtained immediately and is of minimum cost. This type of testing can be very reliable if carried out by an experienced person.

Testing for organoleptic characteristics is used as a screening test to determine whether to accept the milk or test the milk further.

2.2.2. Appearance

- The color of **cow** milk should be slightly yellowish white; a different colour may indicate milk, which is unsuitable for processing.
- In order to judge the appearance of the milk, remove the lid of the milk container and note the appearance of the surface of the milk **and** the lid, note any abnormal colour of the milk, visible dirt and particles, changes in viscosity etc.
- After emptying the container, inspect the inside of the lid and the container for visible dirt and impurities.
- Take note of the following appearances:
- **Visible dirt and impurities** can indicate that the milk is produced under unhygienic conditions. define
- **Yellow** milk can indicate pus or colostrums.
- **Reddish** milk could indicate that there is blood in the milk.
- A **"blue thin"** colour and a thin and watery appearance can indicate that the milk contains added water or skimming (fat removal).
- **Large clots** can indicate sour milk or mastitis milk.
- **Small white clots** or grains can indicate either Mastitis milk or milk adulterated with flour and / or skim milk powder.

2.2.3. Taste and smell

A bad smell or taste of the milk may be caused by bacteria, chemical reactions or by other flavors absorbed by the milk. Judging the quality of milk by its taste and smell requires considerable skill, which can only be acquired by practice.

The taste of milk is more permanent and easy to define than smell. ***Taste raw milk only after making sure that it is from healthy animals***. Any abnormal smell is noticed by inhalation of air standing above the milk in the upper part of the milk can. Samples for tasting must be spread around in the mouth in order to identify the taste. In addition to these basic tastes, the mouth also allows us to distinguish characteristics such as coolness, warmth, sweetness, etc.

The different abnormal flavors are described as follows:

1) Acid flavors are easily detected by smell and taste. The flavor is caused by the growth of acid-producing bacteria that reduce lactose to lactic acid.

2) Rancid and bitter flavors: a pure bitter flavor can be detected by taste only. The rancid flavor can be detected by both the senses of smell and taste and is caused by lipolysis (deterioration) of fat.

3) Feed flavors like garlic, onion, beets, poorly made silage, certain plants and pastures can cause off-flavors to milk.

4) Flat flavors are quite easy to detect. A very slight oxidized flavor suggests flat flavor as well as low solids and/or low-fat milk.

5) Malty Flavors are very suggestive of malt. The flavor is caused by the growth of the bacteria Streptococcus lactis var. maltigenes.

6) Oxidized flavors are sometimes described in such terms as “oily”, “stale”, “tallowy”, “cardboard” or “sunshine”. The oxidized flavor is characterized by a quick taste reaction.

7) Salty flavors are easy to detect; and often associated with milk from cows in an advanced stage of lactation or mastitis milk. It is caused by an increase in chlorine and decrease in lactose content.

8) Unclean flavours suggest mustiness, staleness and foul stable air.

9) Other flavors’ such as drugs, disinfectants and detergents can also be causes bad smell and flavor.

2.3. Physical and chemical characteristics

2.3.1. Lactometer test for water addition

Use:

- ✓ test for payment or screening;
- ✓ determine added water,
- ✓ Level of solids or removal of fat.

Advantages: quick, cheap.

Disadvantages: can be inaccurate, influenced by temperature and fat.

Alternatives: freezing point test

- **Principle**

With a lactometer (also called hydrometer :), the specific density (also called gravity) of milk is measured. The specific gravity of the milk varies according to the proportions of fat, SNF and water. At 15 °C, the normal density of the milk ranges from 1.028 to 1.034 g/ml, whereas water has a density of 1.0 g/ml.

- **Interpretation**
  - ➢ Readings between 1.028 and 1.033 are considered normal and are sometimes recorded as degrees using the last two figures, i.e. 28 and 33.
  - ➢ It is best to combine the lactometer reading with a fat test if the results of the fat test are low and the density is high (e.g. 1.035), then the milk might have been skimmed.
  - ➢ If the results of the fat test are low and the density is low (e.g. 1.027), then water might have been added to the milk.
  - ➢ You can use the lactometer reading together with the fat content to estimate the SNF content of the milk Make sure you adjust readings according to the temperature as indicated below.
  - ➢ Please take note that at high altitude milk boils at a lower temperature

Table. Temperature adjustments for lactometer readings

Temp (°C)	17	18	19	20	21	22	23	24
Correction:	-0.007	-0.005	-0.003	0.000	+0.003	+0.005	+0.008	+0.011

At other temperatures the correction is approximately + 0.0024 for each degree Celsius above 24oC.

2.3.2. Temperature test

Use: test for screening or grading system.

Advantages: simple, cheap.

- **Principle**

Most bacteria prefer to grow in the temperature region of 20 ºC to 45 ºC. It is therefore important to cool the milk as quickly as possible after milking.

Usually refrigerated milk is kept at a temperature of 4 ºC. Bulk raw milk, when received from a chilling station in the factory should have a temperature below 7 - 8 ºC.

The temperature of milk can be determined with a dairy thermometer; it is important to mix the milk well.

Self-check 2	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are different abnormal flavors are described ? (5pts)

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

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Information Sheet-3	Monitor costs to ensure operations

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.

3.1 Cost of auxiliary centers

A number of “cost centers”, corresponding to real and natural divisions, are grouped under the name auxiliary centers. These are the dairy services which, though not essential to dairy plant operations, do nonetheless constitute different production activities.

In a dairy plant these services may be:

- Steam production.
- Cold production (for cooling specific areas or producing chilled water).
- Power transformer station.
- Maintenance shop.
- Waste water treatment.
- Site development.
- Staff areas (dressing rooms, WC, sinks, linens, medical unit, cafeteria, etc.).

3.2 Structural cost centers

Structural costs can be broken down into two categories:

a. Specific structural costs for a specific department or function of the plant.

Examples:

- Planning department.
- Technical supervision plus secretarial and bookkeeping staff.

- Analytical laboratory.
- Division handling relations with milk producers.
- Invoicing (attached to the marketing service).

General plant-wide structural costs: general administration

Self-check 3	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are the importance of cost monitoring ? (5pts)

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

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Information Sheet-4	Clean Work areas and equipment

4.1 Water for dairy use

- Unless an approved piped supply is available it must be assumed that water is contaminated and therefore hypochlorite must be added at the rate of 50 ppm to the cleaning water.
- Hard water (ie. high levels of dissolved calcium and other salts) will cause surface deposits on equipment and reduce cleaning effectiveness. In such cases, it is necessary to use de-scaling acids such as sulphamic or phosphoric, periodically.
- WATER FOR DAIRY USE must be either an approved, piped supply or chlorinated (50 ppm) before use.
- In hard water areas, milking and ancillary equipment must be de-scaled periodically.
- MILKING EQUIPMENT must have smooth milk contact surfaces with minimal joints and crevices. Renew rubber components at regular intervals.
- Milking shall be done in an approved milking barn, stable, or parlor under relatively dust free conditions.)

4.2. Milking area

An approved milking area shall be provided to permit normal sanitary milking operations.

I. The milking area shall be well ventilated to minimize odors and prevent excessive condensation.
II. No swine or fowl shall be permitted in the milking area.
III. Bedding shall be permitted in the milking area if kept clean and manure is removed daily. Bedding shall be relatively dust free.
IV. The milk area ceiling shall be dust tight to prevent the entry of dust from feed stored overhead.
V. Walls and ceilings shall be kept clean and in good repair. It is recommended that the milking area be completely enclosed. If clean, orderly, dust free milking

operations can be conducted; the requirements of the walls may be waived.

VI. Feed shall be stored in a manner not to increase the dust content of the air or attract flies in the milking area.

VII. The milking area floor shall be kept clean and the manure removed daily.

VIII. Outside surfaces of pipeline systems located in the milking area shall be kept clean.

4.3. Cow yard and cattle housing area*. :-*Relatively free of organic waste.

a) The cow yard shall be graded to drain as well as local conditions will permit.
b) Cow yards which are muddy due to recent rains shall not be considered in violation of this section.
c) The cattle housing area shall be free of excessive manure, soiled bedding, and waste material to prevent the soiling of cows' udders.

All manure removed from the milking area shall be stored to prevent access of cows to the accumulation. Manure shall be stored to minimize fly breeding.

4.4. Milk house or milk room.

There shall be a conveniently located milk house or milk room in which the cooling, handling, and storing of milk; and the washing, sanitizing, and storing of equipment and utensils shall be done.

a) Ventilation shall be sufficient to prevent odors and condensation.
b) The milk house shall be kept clean and free from unnecessary articles and used only for purposes permitted by the cabinet. Only insecticides and rodent cedes approved for use in the milk house shall be stored in the milk house. Insecticides and rodenticides shall be stored to prevent contamination of milk, milking equipment, sinks, or cleaning supplies.
c) All outer openings shall be screened or protected against the entrance of insects and rodents. Outer doors shall open outward and be self-closing, except doors between the milk room and milking area may open either way or both ways and shall be self-closing. If during the winter months a screen door is taken down, the milk house door may open inward if it is self-closing. Bulk tank installations shall have an approved

hose port properly constructed through the outer wall for milk pickup operations.

d) Running water under pressure shall be provided. Water heating facilities conveniently available to supply hot water to the milk house shall be provided for all bulk tank installations. A supply of water shall be available to the milk room for all can shippers.
e) A two (2) compartment wash and rinse vat shall be provided; if milking equipment is cleaned in place, a single compartment wash vat will be acceptable.
f) A concrete slab at least four (4) feet by four (4) feet shall be located outside the milk house under the hose port.
g) The milk house shall be supplied with approved brushes, cleaners, and sanitizers to properly clean and sanitize equipment and utensils.
h) If approval is given by the cabinet, the can cooler may be stored in a suitable place away from the milk house in order to be easily accessible to the can hauler.

4.5. 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;
- be easy to clean and have a pest control system Ensure milk storage equipment is cleaned before each use,
- preferably immediately after milk collection.
- The storage equipment should be capable of holding milk at required temperature until collection time, and be constructed in 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 the equipment is working properly.

- Provide unobstructed access to the milk storage area to enable the safe collection of milk. Access to the milk collection areas should be free of animal pathways.

4.6. Utensils and equipment

- Utensils, milk cans, milking machines (including pipeline systems), and other equipment used in the handling of milk shall be maintained in good condition.
- Milk equipment shall be free from rust, open seams, milk stone, or any unsanitary condition.
- Milk equipment shall be washed, rinsed, and drained after each milking,
- Stored in suitable facilities, and sanitized immediately before use.

Self-check 4	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are the approved area clean of dairy cow ? (5pts)

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

1. -

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Information Sheet-5	Document relevant data for analysis

Source of Production Information

Agriculture, Food and Rural Development's specialists have access to many resources that can help you . Even if your enterprise is nontraditional or unusual, specialists can use their extensive networks to obtain information from colleagues in other regions. They may also recommend useful resources and refer you to producers with similar enterprises. Production budgets Production or enterprise budgets describe the production requirements and costs of producing crops or livestock. Production budgets may include a list of assumed production practices, average production rates (yields), yield ranges, input costs and capital investment costs. Choose production budgets from cropping areas with a climate similar to your own. Information included with the budgets usually describes the length of growing season and other climatological factors. Check to see which variety or breed was in the production budget and make sure the yields apply to your region. The greater the variation from your situation, the less useful the production information. Remember, production budgets are estimates constructed from either producer averages or experimental results.

Trade organizations and producers

Trade organizations and producers who offer the product or service you are considering can be good sources of information.

Try to arrange a farm visit with a current producer during the growing season. Producers who can show you their operation and talk in detail about production techniques and costs are invaluable. Ask the producer about production, average yields, necessary equipment and facilities. Be wary of producers who are too eager to sell you supplies, equipment or breeding stock.

Publications

Books and magazines are comprehensive sources of information, but they can be difficult to find and the information can be out of date. An exhaustive list of books and magazine

references can be generated through a computer database search. Ask members of trade organizations or successful producers to recommend the best titles.

Government offices

Federal, provincial and local agencies can provide information about regulations that apply to your new enterprise. Contact your natural resource and environmental agencies, economic development offices, municipal development offices and other relevant agencies. These offices may produce reports on an agricultural or service industry that is similar to yours. Provincial and local tourism and recreation agencies can help sort out regulations and liability issues affecting farm-based bed and breakfasts, tours and festivals.

Self-check 5	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are the relevant date recorded in milk operation ? (7pts)

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

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Operation Sheet 1	Milking procedures

Techniques to Milking procedures

27. Prepare all the necessary equipments and materials. Make sure that all the equipments are clean and sanitized.
28. Put on clean clothes/apron/ and cover hair
29. Move the animal into the milking area /parlor/
30. Do not shout/disturb the animal during milking
31. Prepare warm water
32. Strip the first drop of milk from each quarter into a strip cup or onto a floor. Check for color of a drop of milk.
33. Wash the udder and tips of the teats thoroughly with warm water and sanitizer solution /110^0 F/
34. The udder should be thoroughly massaged and dried with and individual towel for each cow
35. Put the machine/or bucket under the cow
36. No eating, smoking and talking in the milking room during this process
37. Remove the machine or the bucket upon the completion of milking. In case of machine milking the vacuum should be turned off and the machine removed
38. Immediately after milking, the teats should be dipped in an effective teat dip solution.
39. All the milking equipments should be thoroughly cleaned, sanitized and properly stored

Operation sheet-2	Perform hand milking

Techniques to Perform hand milking

29. Identify all milking material, tools and equipment
30. Wear PPE
31. Create silent environment
32. Provide concentrate feed to the cow for good milk letdown
33. Restrain the cow in number 8 position
34. Clean milking utensils (equipment)
35. Washing hands
36. Clean teats with warm water
37. Dry teat by towel
38. Check for mastitis using strip cup
39. Milk using both hands; squeeze properly the teats with full hand.
40. Filter/sieve/ milk
41. Record the amount of milk from each cow
42. Cool the milk to store in time

Operation sheet-3	Organoleptic (sense) tests

Techniques to test Clot –on – boiling test:

16. Open a can of milk.
17. Immediately smell the milk.
18. Observe the appearance of the milk.
19. If still unable to make a clear judgment, taste the milk, but do not swallow it. Spit the milk sample into a bucket provided for that purpose or into a drain basin, flush with water.
20. Look at the can lid and the milk can to check cleanliness.

Operation sheet-4	Clot –on – boiling test

Techniques to test Clot –on – boiling test

22) Use Apparatus
23) Boiling water bath (a 600 ml beaker on a gas or electric heater is adequate)
24) Test tubes
25) Timer (a watch or clock is adequate).
26) Place about 5 ml of milk in a test tube (the exact amount is not critical) and place the test tube in boiling water for 5 minutes.
27) Carefully remove the test tube and examine for precipitate.
28) The milk is rejected if any curd forms.

Operation sheet-5	Alcohol test

Techniques to test Alcohol test

1. Put equal volumes of milk and 75% alcohol in a test tube.
2. Invert the test tube several times with the thumb held tightly over the open end of the tube.
3. Examine the tube to determine whether the milk has coagulated. If it has, fine particles of curd will be visible.

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 hours.

Task 1. Milking procedures
Task 2 Perform hand milking
Task 3. Organoleptic (sense) tests
Task 4. Clot –on – boiling test
Task 5. Alcohol test

References

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