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Ministry of Labor and Skills

Animal Health

Level-IV

Based on March 2022, Version 4 Occupational standard



Module Title: - Carrying out Animal Husbandry practice and Farm Management

LG Code: AGR ANH4 M09LO (1-5) LG (32-36)

TTLM Code: AGR ANH4 TTLM 0923v1

September 2023

Addis Ababa, Ethiopia

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Introduction to the Module

This module covers the knowledge, skills and attitude required to carry out animal husbandry practice and farm management in order to enhance production and productivity of livestock industry. This module focus on farm site selection, housing, breeding, feeding, health, production management and marketing for dairy farm, Beef farm, small ruminant, pig, fishery and honey bee. It also covers good management practices, record and reporting after completion work.

LG #32	LO #1- Apply dairy farm Husbandry practice and management

Instruction sheet 1

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

- Introduction to dairy business
- Considerations in establishing dairy farm
- Types of dairy houses
- Forage production and management
- Breeding techniques and breed selection
- Young stock management in dairy business
- Assessment on production performance of dairy business
- Fertility and other health problems in dairy cattle
- Herd screening tests in management of major dairy cattle
- Measures to prevent transmission of zoonoses and reproductive diseases
- Hygienic milk production and marketing management

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify dairy farm business based on resource availability and cost benefit analysis
- Determine dairy farm site selection and the type of houses based relevant factors.
- Identify and apply forage production and management for the dairy animal based on forage selection criteria's
- Identify appropriate feed and feeding practice based on required feed type and animal status
- Understand and performe selection of the proper dairy cattle breed with reproduction health based on breed selection criteria's.

- Identify and implement the proper young stock management for dairy cattle as per the production objective.
- Carry-out assessment of the production performance of dairy using signs of fertility problem and information gathered from record book of the dairy.
- Diagnose fertility problems of dairy cattle based on veterinary clinical examination methods
- Identify and minimize health abnormalities on dairy cattle due to environmental, metabolic disorders, nutritional and animal handling stresses according to the organizational guide lines.
- Conduct screening and testing of the herd for major dairy health risks and suspected diseases according to the enterprise guideline.
- Take appropriate measures to prevent the occurrence and transmission of reproductive diseases among dairy cows, and zoonosis diseases according to the national diseases' prevention and control guideline and enterprise guide lines.
- Undertake prevention and control activities for reproductive and fertility problems of dairy cows.
- Identify and recommendations/advice on health abnormalities of non-productive animals given for nutritionist, animal care takers.
- Identify analyze and apply the proper hygienic milk production and marketing management well to improve the benefit from the dairy sector.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below and try to understand what are being discussed.
3. Ask your teacher for assistance if you have hard time understanding them.
4. Read the information written in the information Sheets
5. Accomplish the Self-checks
6. Perform Operation Sheets
7. Do the "LAP test"

Information Sheet 1

1.1. Introduction to dairy business

The dairy business is the process of producing, processing, and marketing dairy products. Dairy products include milk, cheese, butter, yogurt, ice cream and others. The dairy business is a global industry, with production taking place in both developed and developing countries. The dairy industry is a major contributor to the global economy, providing jobs and income for millions of people.

Here are the key aspects of the dairy business:

- **Dairy Farming**: Dairy farming is the primary source of milk production. It involves raising and breeding dairy cows or other milk-producing animals, such as goats or sheep. Successful dairy farming requires adequate facilities, proper nutrition, veterinary care, and effective breeding programs to ensure consistent milk production.
- **Milk Processing:** After milk is obtained from dairy farms, it undergoes various processing steps to transform it into different dairy products. Processing involves pasteurization, homogenization, separation of cream, and fortification with vitamins and minerals. The processed milk is then used to produce products such as cheese, butter, yogurt, ice cream, and other dairy-based beverages.
- **Product Manufacturing**: Dairy product manufacturing includes the production of a wide range of dairy-based food items. This involves specialized equipment and processes specific to each product. For example, cheese production involves curdling milk, draining whey, pressing, and aging, while ice cream production involves blending milk, cream, sweeteners, flavors, and freezing.
- **Quality Control and Regulations**: Dairy businesses must adhere to stringent quality control measures to ensure the safety and consistency of their products. This includes regular testing for milk quality, maintaining proper hygiene during processing, and complying with food safety regulations set by local and international authorities.
- **Packaging and Distribution**: Once dairy products are manufactured, they are packaged into various forms such as bottles, cartons, tubs, or bulk containers. Proper packaging

ensures product freshness, extends shelf life, and facilitates distribution. Dairy products are distributed through various channels, including wholesale to retailers, direct sales to consumers, and export to international markets.

- **Marketing and Sales**: Effective marketing strategies are crucial for promoting dairy products and building a strong customer base. Dairy businesses engage in advertising, branding, product positioning, and market research to understand consumer preferences and trends. They may also establish partnerships with retailers, participate in trade shows, and utilize digital marketing platforms to reach a wider audience.
- **Sustainability and Animal Welfare**: In recent years, sustainability and animal welfare have gained significant importance in the dairy industry. Consumers are increasingly concerned about the environmental impact of dairy farming, as well as the welfare and ethical treatment of animals. Dairy businesses are adopting sustainable practices, investing in renewable energy sources, improving waste management, and implementing animal welfare initiatives to address these concerns.

Starting and operating a successful dairy business requires careful planning, knowledge of the industry, and adequate resources. It is essential to consider factors such as market demand, competition, financial feasibility, and regulatory requirements.

1.2.Considerations in establishing dairy farm

Dairy farms take a lot of money and capital to start up, way more than a meat operation does. Know what you're getting into and how you want to get into it before you decide to start a dairy farm. Even if you grew up on a farm, managing your own means sitting down for long, careful planning sessions. There are a number of factors to consider when establishing a dairy farm. These include:

- **Topography: -** It is a crucial criterion to consider when establishing a dairy farm, as it can significantly impact the functionality, efficiency, and sustainability of the farm.
- **Nearby market**- Proximity to the market provides better access to consumers and potential customers. Dairy farms located close to urban areas or population centers can tap into the demand for fresh, locally produced dairy products.

- **Climatic conditions: -** Like Temperature and Humidity, Wind and Ventilation are a critical criterion to consider when establishing a dairy farm, as they directly impact the health and productivity of dairy cows, as well as the overall sustainability of the operation.
- **The type of dairy farm**. There are two main types of dairy farms: cow-calf operations and dairy operations. Cow-calf operations raise cows for the purpose of selling calves to other farmers or ranchers. Dairy operations raise cows for the purpose of producing milk.
- **Landscaping**: - It can be an important consideration when establishing a dairy farm, as it can impact the functionality, aesthetics, and environmental aspects of the farm.
- **The size of the dairy farm**. The size of your dairy farm will depend on a number of factors, including the amount of land you have available, the amount of capital you have to invest, and the number of cows you want to raise.
- **The location of the dairy farm**. The location of your dairy farm will be important in terms of access to markets, feed, and water. It is also important to consider the climate and the soil conditions in the area where you plan to locate your dairy farm.
- **The type of housing.** The type of housing you will need for your cows will depend on the climate in the area where you plan to locate your dairy farm. In cold climates, cows will need to be housed in a barn that is well-insulated and heated. In warm climates, cows will need to be housed in a barn that is well-ventilated.
- **The type of feed**. The type of feed you will need for your cows will depend on the climate in the area where you plan to locate your dairy farm. In cold climates, cows will need to be fed a diet that is high in energy. In warm climates, cows will need to be fed a diet that is high in fiber.
- **The type of milking equipment.** The type of milking equipment you will need will depend on the size of your dairy farm and the number of cows you plan to milk.
- **Create a breeding plan.** Dairy bulls have a reputation for dangerous behavior, and in any case raising one year round gets expensive. The safer options are paying for a bull's service at breeding time, or practicing artificial insemination (AI).

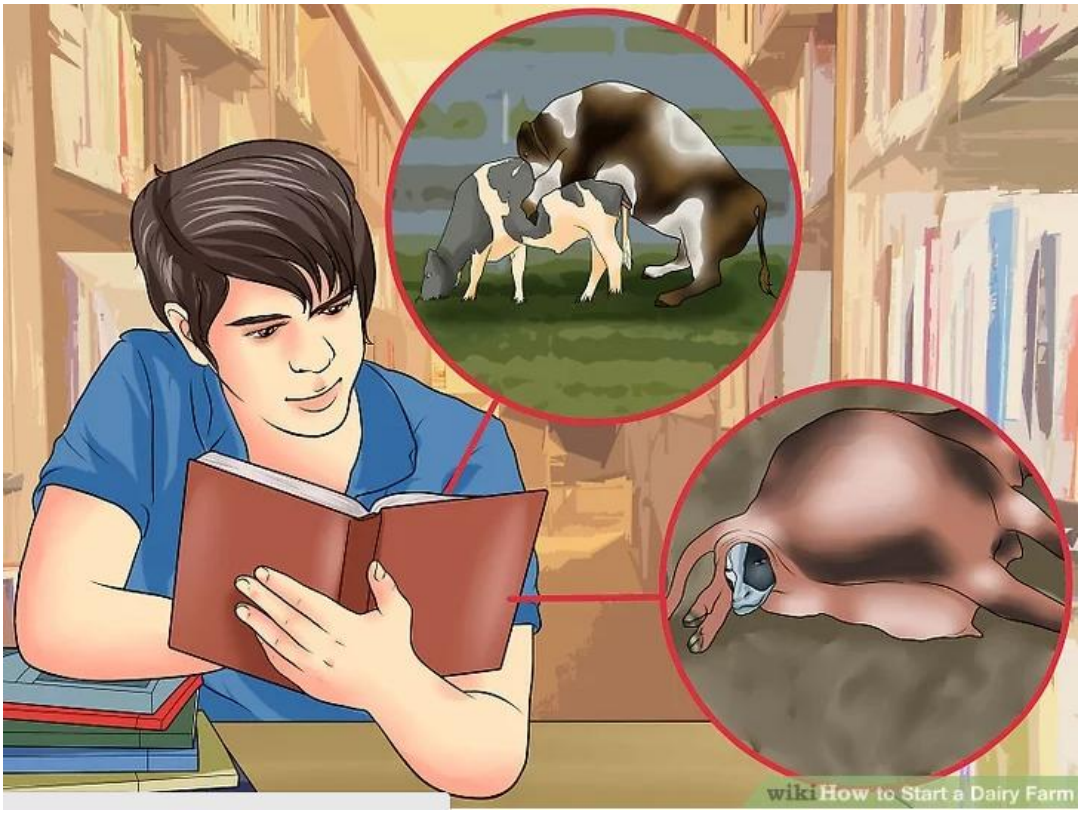


Figure 1.1: planning the breeding plan of the dairy farm

- **Research the type of marketing you will do for your milk and local milk market.** The type of marketing you will do for your milk will depend on the size of your dairy farm and the amount of milk you produce. You may choose to sell your milk directly to consumers, to a milk cooperative, or to a dairy processor.



Figure 1.2: Searching and communicating with local customers

In addition to these factors, there are a number of other considerations that you should make when establishing a dairy farm. These include:

- ✓ The cost of starting a dairy farm. The cost of starting a dairy farm can vary significantly, depending on the size of the farm and the type of housing and equipment you need.
- ✓ The time commitment required to operate a dairy farm. Operating a dairy farm is a full-time job. You will need to be prepared to work long hours, seven days a week.
- ✓ The risks associated with operating a dairy farm. There are a number of risks associated with operating a dairy farm, including the risk of disease, the risk of injury, and the risk of financial loss. If you are considering starting a dairy farm, it is important to do your research and to make sure that you are aware of all of the factors involved. By doing your research, you can increase your chances of success. **Available a**t: - Starting a Small Dairy Farm: Considerations and thoughts! - YouTube **Accessed on** 22/09/2023

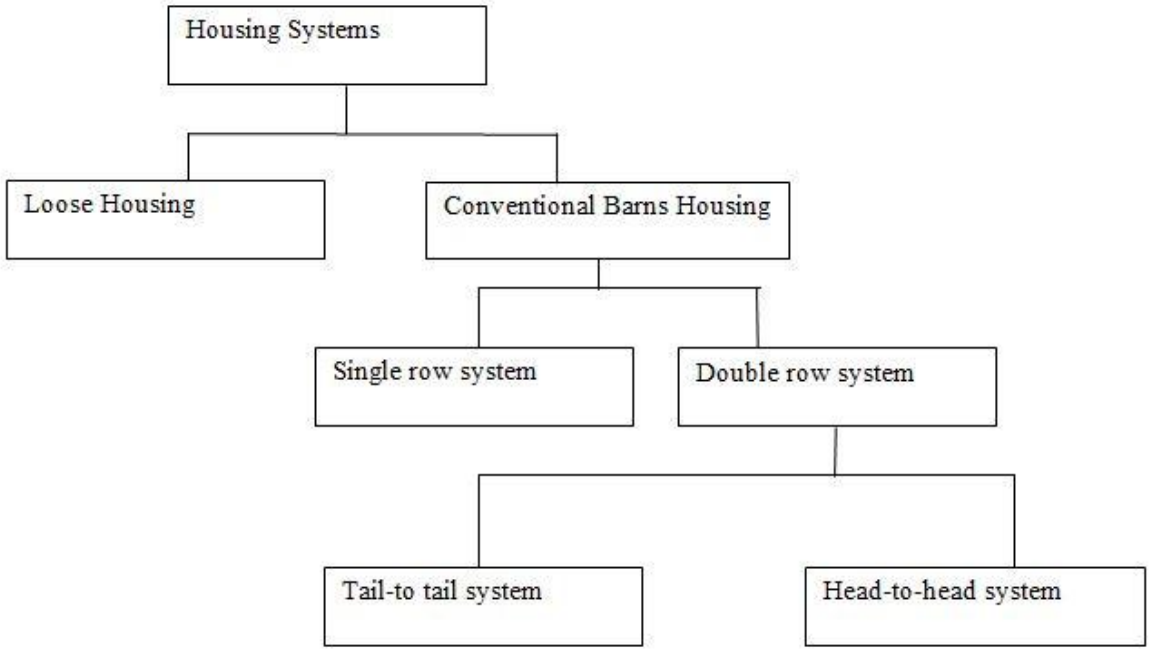


Figure 1.3: Factors in establishing dairy farm/business

1.3.Types of dairy houses

Dairy housing systems are designed to provide cows with a comfortable and safe environment in which to live and produce milk. The type of housing system that is used will depend on a number of factors, including the size of the farm, the climate, and the preferences of the farmer.

Available at: - Conventional Housing System For Cattle - YouTube Accessed on 23/09/2023



1.3.1. Housing for large animals

Conventional barns and loose houses are two different types of cattle housing systems. Conventional barns are typically used for dairy cows, while loose houses are more commonly used for beef cattle.

a. Conventional barns

Conventional barns are typically long, narrow structures with a central aisle. The cows are housed in individual stalls that are lined up along the sides of the aisle. The stalls are typically made of wood or concrete, and they are equipped with a feeding trough and a water trough. The cows are fed and watered from the outside of the stalls, and they are milked in a separate milking parlor.

Conventional barns have a number of advantages, including:

- They are relatively easy to build and maintain.
- They provide a comfortable and secure environment for the cows.
- They allow for easy access to the cows for feeding, milking, and other management activities.

However, conventional barns also have a number of disadvantages, including:

- They can be expensive to build and maintain.
- They can be difficult to clean and disinfect.
- They can be a source of heat stress for the cows.

The orientation of this conventional housing type is can be:

✓ **Single row system**

- In single row system, 12-16 numbers of animals can be kept.

✓ **Double row system**

- If it is greater than 16, then double row system is preferable.
- In double row system up to 50 animals can be maintained in a single shed.
- The distance between two sheds should be greater than 30 feet or it should be twice the height of the building.

In double row system two methods available. They are

- **Tail to tail or face–out method**

Advantages

- ❖ Cleaning and milking of animals easy.
- ❖ Supervision of milking also easy.
- ❖ Less chance for transmission of diseases from animal to animal.
- ❖ Animals can get more fresh air from outside.

- **Head to head or face–in method**

Advantages

- ❖ Getting animals into the shed is easy.
- ❖ Feeding of animals also easy.
- ❖ Disinfection of gutter will be more due to the direct fall of sunrays over the gutter.
- ❖ Animals are better exhibited to visitors

Disadvantages

- ❖ Milking supervision is difficult.
- ❖ Possibilities of transmission of disease are more.



Figure 1.4: Conventional housing type (head to head and tail to tail orientation of dairy cows)

b. Loose houses

Loose houses are typically large, open structures with a dirt floor. The cows are free to roam around the house, and they typically have access to a variety of different types of bedding, such as straw, sawdust, or shavings. The cows are fed and watered from troughs that are located throughout the house.

Loose houses have a number of advantages, including:

- They are relatively inexpensive to build and maintain.
- They provide a comfortable and natural environment for the cows.
- They allow for easy access to the cows for feeding, watering, and other management activities.

However, loose houses also have a number of disadvantages, including:

- They can be difficult to clean and disinfect.
- They can be a source of heat stress for the cows.
- They can be difficult to control the spread of disease.

The best type of cattle housing system for a particular operation will depend on a number of factors, including the size of the operation, the climate, and the farmer's budget. Ultimately,

the best type of cattle housing system for a particular operation will depend on the specific needs of the farmer.



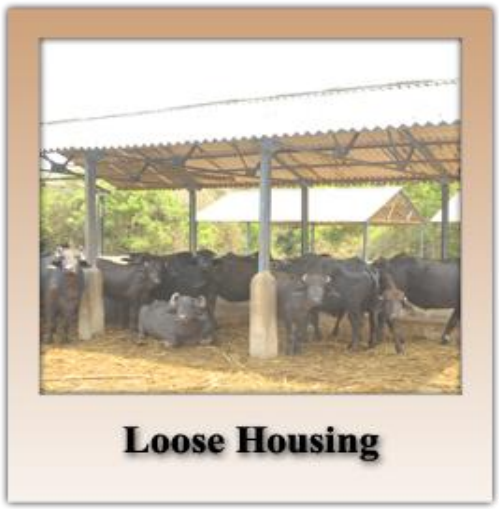


Figure 1.5: loose type of housing in dairy cows

1.3.2. Calf shed and pen

Cattle houses and calf sheds are essential for the proper care and management of dairy cows and calves. They provide a safe and comfortable environment for the animals to live in, and they help to protect them from the elements. There are a variety of different types of cattle houses and calf sheds available, each with its own unique set of features and benefits. The type of cattle house or calf shed that is best for a particular operation will depend on a number of factors, including the size of the operation, the climate, and the farmer's budget. Calf sheds are used to house calves from birth to weaning. Calf sheds should be well-ventilated and provide calves with a comfortable and safe environment to live in.



Figure 1.6: images of calf shed and pen with facilities

1.3.3. Purpose oriented cattle houses

Purpose-oriented cattle houses are designed to meet the specific needs of dairy cows or calves. For example, a purpose-oriented cattle house for dairy cows may include a milking parlor, a manure storage area, and a feed storage area. A purpose-oriented cattle house for calves may include a nursery area, a feeding area, and a bedding area.

Purpose-oriented cattle houses can be more efficient than conventional barns or loose houses because they are designed to meet the specific needs of the animals. For example, a purpose-oriented cattle house for dairy cows may be able to milk more cows per hour than a conventional barn or loose house. A purpose-oriented cattle house for calves may be able to provide more comfortable conditions for the calves than a conventional barn or loose house. However, purpose-oriented cattle houses can also be more expensive than conventional barns or loose houses. The cost of a purpose-oriented cattle house will depend on the size of the house, the materials used to build the house, and the features included in the house.

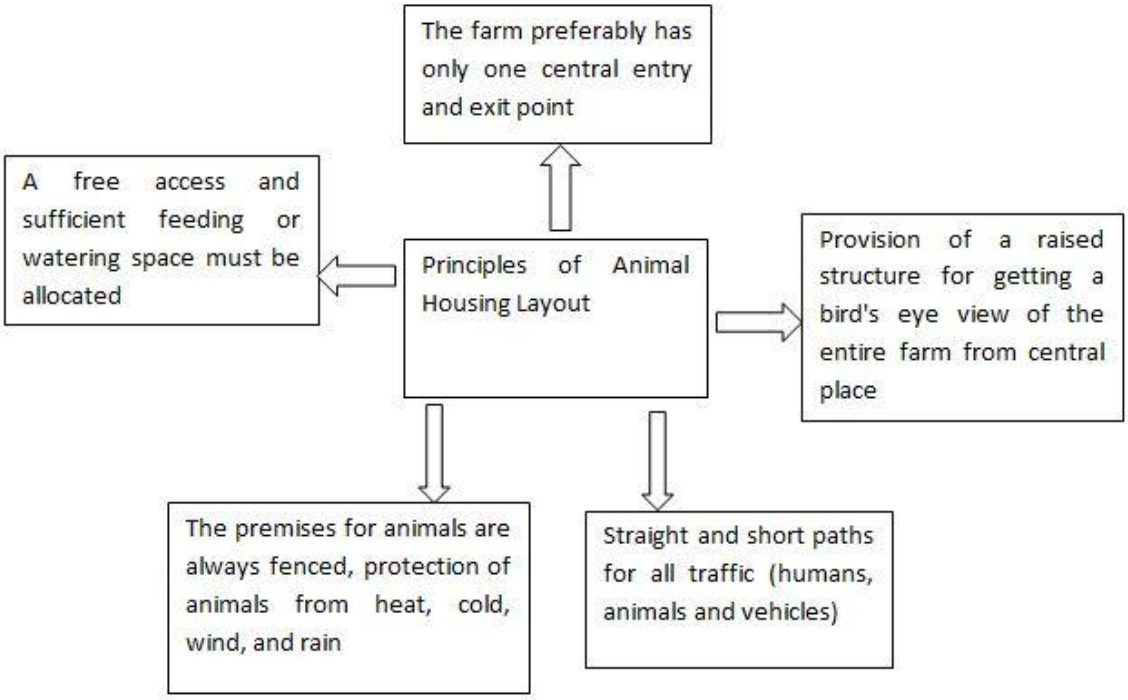


Figure 1.7: principle of dairy cattle housing layout

1.4.Forage production and management

Forage is the most important feed for dairy cows, providing the majority of their energy and protein requirements. It is also a major source of vitamins and minerals. Forage production and management is therefore critical to the profitability and sustainability of dairy farming.

1.4.1. Forage production

Forage production is the process of growing and harvesting plants that are used as feed for livestock. Forage crops are typically grown on land that is not suitable for growing crops for human consumption, such as marginal land or land that is not irrigated. Forage crops can be grown in a variety of climates and soil conditions, and they can be harvested throughout the year.

- **The required feed type and animal status**

Animal feed is a type of food that is given to animals to provide them with the nutrients they need to grow, develop, and stay healthy. Animal feed can be made from a variety of sources, including plants, animals, and minerals. The type of feed that is given to an animal will depend on its species, age, and stage of production.

✓ **Types of animal feed**

- **Roughage**: - is a type of feed that is high in fiber and low in energy. Roughage is important for animals because it helps to maintain a healthy digestive system and prevent constipation. Examples of roughage include hay, straw, and grass. There are a wide variety of forage crops that can be grown for dairy cows. The most common types include:
  - **Grasses**: Grasses are the most important forage crop for dairy cows, and they can be grown in a variety of climates and soil conditions. The most common grass species for dairy cows include alfalfa, brome grass, orchard grass, and tall fescue.
  - **Legumes**: Legumes are another important forage crop for dairy cows, and they provide a good source of protein and energy. The most common legume species for dairy cows include clover, alfalfa, and soybeans.
  - **Other crops**: Other crops that can be grown for dairy cows include corn silage, wheat straw, and barley straw. These crops are not as nutritious as grasses and legumes, but they can be used to supplement the diet of dairy cows.
- **Concentrate:** - is a type of feed that is high in energy and low in fiber. Concentrate is important for animals because it provides them with the nutrients they need to grow, develop, and stay healthy. Examples of concentrate include grain, corn, and soybeans.

In addition to roughage and concentrate, animals may also be given **supplements** to provide them with additional nutrients. Supplements can be made from a variety of sources, including vitamins, minerals, and amino acids. The type of feed that is given to an animal will vary

depending on its species, age, and stage of production. For example, dairy cows require a diet that is high in energy and protein, while beef cattle require a diet that is high in roughage.

The ideal concentrate to roughage ratio for dairy cows varies depending on the cow's stage of production, milk production level, and body condition score. In general, cows in early lactation require a higher proportion of concentrates in their diet than cows in late lactation. This is because cows in early lactation need to produce more milk and therefore require more energy. The ideal concentrate to roughage ratio for cows in early lactation is typically between 60:40 and 70:30. As cows progress through lactation, their milk production levels decrease and their body condition score increases. This means that they require less energy and can therefore eat more roughage. The ideal concentrate to roughage ratio for cows in late lactation is typically between 40:60 and 50:50.



Figure 1.8: Different types of animal feeds used for dairy cattle

- ✓ **Animal status**: - The animal status refers to the stage of production that the dairy cow is in. The different stages of production are as follows:
  - **Dry cow**: - A dry cow is a cow that is not lactating. Dry cows need a diet that is high in fiber and low in energy.
  - **Lactating cow: -** A lactating cow is a cow that is producing milk. Lactating cows need a diet that is high in energy and protein.
  - **Producing heifer:** - A producing heifer is a young cow that is producing milk. Producing heifers need a diet that is high in energy and protein.

Available at: - Types of dairy feed-Forages, concentrates and supplements - YouTube

- **Forage selection criteria for dairy cattle:**

The selection of appropriate forage species for dairy cattle is an important factor in ensuring the health and productivity of the herd. Dairy farmers can make informed decisions about selecting forage species that align with agro ecology principles, promote sustainable land use, and meet the nutritional needs of their dairy cattle. Forages should be selected based on their nutritional value, palatability, and resistance to pests and diseases. Some of the criteria's that will ensure includes:

i. **Dry matter intake (DMI)**: The DMI of forage is a measure of its nutritional value. Forages with a high DMI are more likely to be consumed by dairy cows and will provide more nutrients.
ii. **Fiber conten**t: - The fiber content of forage is a measure of its digestibility. Forages with a high fiber content are more difficult to digest and will provide less nutrients.
iii. **Protein content**: - The protein content of forage is a measure of its ability to meet the protein requirements of dairy cows. Forages with high protein content are more likely to meet the protein requirements of dairy cows.
iv. **Mineral content**: - The mineral content of forage is a measure of its ability to meet the mineral requirements of dairy cows. Forages with a high mineral content are more likely to meet the mineral requirements of dairy cows.
v. **Anti-nutritional factors**: - Anti-nutritional factors are compounds in forages that can inhibit the digestion and absorption of nutrients. Forages with a high level of anti-nutritional factors are less likely to be consumed by dairy cows and will provide fewer nutrients.
vi. **Availability and Consistency**
vii. **Cost and Economic Viability**: Forage selection for dairy cattle should also consider the cost-effectiveness and economic viability of different options. Balancing the nutritional quality of forage with its cost and availability is necessary for efficient dairy farm management.

viii. **Digestibility**: Highly digestible forage allows cows to extract nutrients efficiently from their feed. For dairy cattle, selecting forage with high digestibility helps maximize feed intake and milk production.

1.4.2. Forage management

The key to successful forage management is to grow a high-quality crop that meets the nutritional needs of dairy cows. This involves:

- Choosing the right forage crop for your climate and soil conditions.
- Planting the crop at the right time of year.
- Applying the right amount of fertilizer and water.
- Controlling weeds and pests.
- Harvesting the crop at the right time.

- **Harvesting and feeding the forage**

Forage should be harvested at the correct stage of maturity to ensure maximum nutritive value. Forage that is harvested too early will be low in nutrients, while forage that is harvested too late will be high in fiber and low in energy. The ideal stage of maturity for harvesting forage will vary depending on the type of forage, the climate, and the intended use of the forage.

For example, alfalfa should be harvested when the leaves are green and the stems are still flexible. If alfalfa is harvested too early, the leaves will be low in nutrients. If alfalfa is harvested too late, the stems will be tough and difficult to digest. Corn silage should be harvested when the kernels are milky and the leaves are still green. If corn silage is harvested too early, the kernels will be immature and low in nutrients. If corn silage is harvested too late, the kernels will be hard and difficult to digest. Grass hay should be harvested when the stems are still green and the leaves are still attached. If grass hay is harvested too early, the leaves will be low in nutrients. If grass hay is harvested too late, the stems will be tough and difficult to digest.

- **Forage storage**

Forage crops that are not harvested immediately can be stored for later use. Dairy cows require a constant supply of fresh forage to maintain their milk production. In most regions, it is not

possible to grow enough forage to meet the needs of dairy cows year-round. Therefore, dairy farmers must either store forage for use during the winter months or purchase forage from other sources. Forage can be stored in a variety of ways, including baling, ensiling, and drying. Baled forage is stored in large bales that can be stacked in a barn or other storage facility. Ensiled forage is stored in a silo, where it is fermented to produce a high-quality feed. Dried forage is stored in bags or bins.

Dairy farmers who do not have enough land to grow their own forage may purchase forage from other farmers or from commercial forage suppliers. Forage can be purchased in a variety of forms, including baled hay, silage, and dried hay.

The most common methods of forage storage are:

- ✓ Haylage: Haylage is made by wilting grass or legume hay to a moisture content of 50-60% and then packing it into a silo.
- ✓ Silage: Silage is made by ensiling grass or legume hay at a moisture content of 60-70%.
- ✓ Hay: Hay is made by drying grass or legume hay to a moisture content of 10-12%.

- **Forage feeding**

Dairy cows are typically fed a diet that consists of a mixture of forage and concentrate. The amount of forage and concentrate in the diet depends on the milk production of the cows, the availability of forage, and the cost of feed. Forage is an important part of the diet of dairy cows, and it provides the majority of their energy and protein requirements. Forage production and management is therefore critical to the profitability and sustainability of dairy farming.

1.4.3. Ration formulation

The ration formulation for dairy cows is a complex process that takes into account the cow's age, stage of lactation, milk production level, and body condition score. The goal of ration formulation is to provide the cow with the nutrients she needs to maintain good health and produce milk at a high level.

The following steps are involved in ration formulation for dairy cows:

a. **Gather information about the cow**. This includes the cow's age, stage of lactation, milk production level, and body condition score.

b. **Determine the cow's nutrient requirements**. This includes the amount of energy, protein, vitamins, and minerals the cow needs to maintain good health and produce milk at a high level.

c. **Select the feedstuffs that will meet the cow's nutrient requirements**. This includes considering the availability, cost, and quality of the feedstuffs in a particular region.

d. **Formulate the ration.** This involves calculating the amount of each feedstuff that needs to be included in the ration to meet the cow's nutrient requirements. It can be used the formula for calculating the feed formulations by:

Ration = [(DM intake) * (NEm requirement)] / [(NEm value) * (DM

Where:

- Ration is the amount of feedstuffs to be fed to the cow in kilograms per day (kg/d).
- DM intake is the amount of dry matter (DM) that the cow is expected to consume in kilograms per day (kg/d).
- NEm requirement is the net energy for maintenance (NEm) requirement of the cow in megajoules per day (MJ/d).
- NEm value is the net energy for maintenance (NEm) value of the feedstuff in megajoules per kilogram of dry matter (MJ/kg DM).

DM content is the dry matter content of the feedstuff in kilograms of dry matter per kilogram of feed (kg DM/kg feed).

To use this formula, you need to know the following information:

- ✓ The DM intake of the cow.
- ✓ The NEm requirement of the cow.
- ✓ The NEm value of the feedstuffs that you are planning to feed to the cow.
- ✓ The DM content of the feedstuffs that you are planning to feed to the cow.

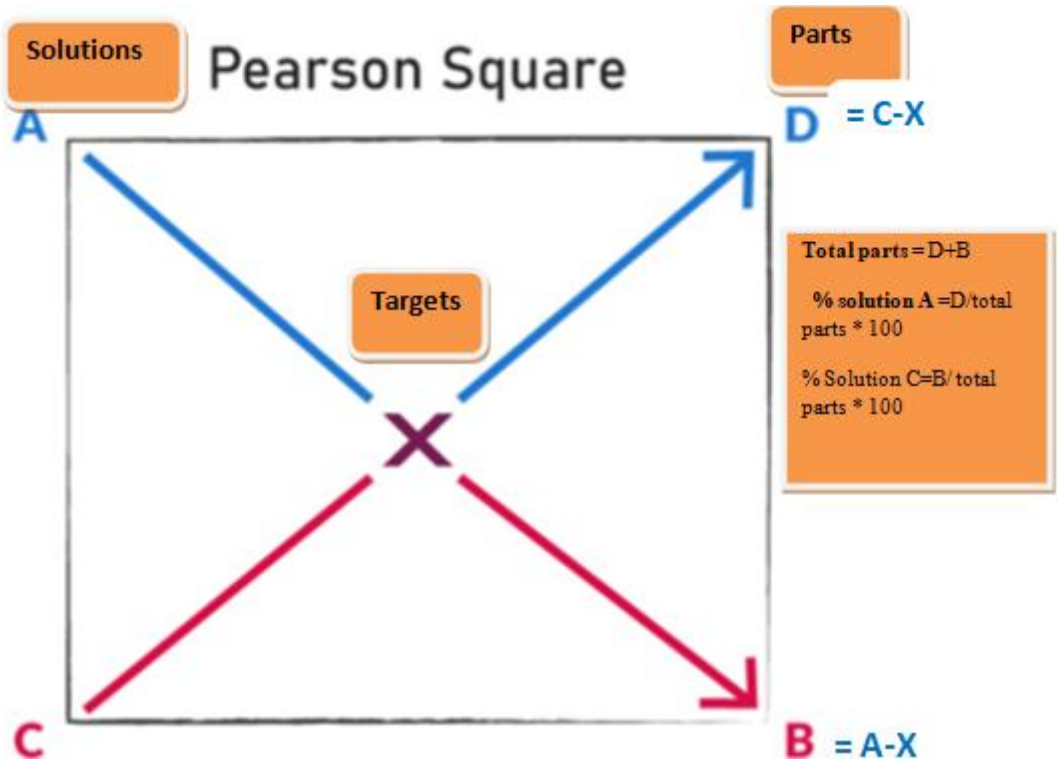
e. **Monitor the cow's response to the ration**. This includes checking the cow's milk production, body condition score, and health status.

Daily feed intake of different dairy cows

- **DMI= Maintenance feed which is (3% *body weight) + production i.e (10% milk yield)**
- **Concentrate =1/3*DMI and Roughage = 2/3*DMI**

Pearson square method

The Pearson square method is a simple and practical technique used in feed formulation to determine proportions of two needed to achieve a desired nutrient composition. It is especially useful when formulating small batches of feed on the farm. This could be the desired protein, energy, or mineral content of feed. **Available at:** - Pearson's square - YouTube **Accessed on** 24/09/2023



1.5.Breeding techniques and breed selection

The choice of breeding technique will depend on the specific goals of the farmer. For example, if a farmer is looking to improve the milk production of their herd, they may choose to use AI or In Vitro Fertilization to select the best bulls for their cows. If a farmer is looking to produce offspring from a specific cow, they may choose to use embryo transfer. And if a farmer is looking to improve the genetic quality of their herd for a variety of traits, they may choose to use genetic selection.

1.5.1. Breeding techniques

There are a number of different breeding techniques that can be used to improve the genetic quality of dairy animals. These techniques include:

- **Artificial insemination** (AI):This is the most common breeding technique used in dairy cattle. It involves collecting semen from a bull and artificially inseminating a cow. This allows farmers to select the best bulls for their herds and to improve the genetic quality of their cows.
- **In vitro fertilization (IVF**): This technique involves fertilizing an egg outside of the body. The fertilized egg is then implanted into a surrogate mother. IVF can be used to produce offspring from cows that are not able to conceive naturally.
- **Embryo transfer (ET):** This technique involves transferring an embryo from one cow to another. This can be used to produce offspring from cows that are not able to carry a pregnancy to term.
- **Genetic selection**: - This technique involves selecting cows for breeding based on their genetic traits. This can be done using a variety of methods, such as DNA testing and pedigree analysis. Genetic selection can be used to improve the genetic quality of dairy animals for a variety of traits, such as milk production, fertility, and disease resistance.

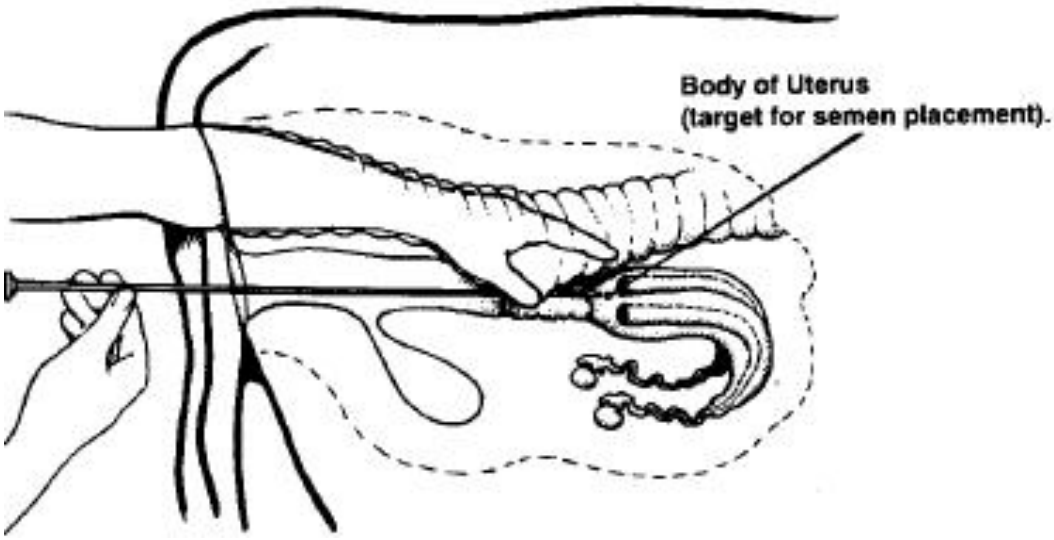


Figure 1.9: Artificial techniques for dairy cattle

1.5.2. Breed selection criteria's

When selecting dairy cattle breeds, it is important to consider various criteria to ensure productive and healthy cows. Here are some common breed selection criteria:

- The objectives of breeding dairy cattle are to:
  - ✓ Milk production
  - ✓ Heifer raising and sell to other farms
  - ✓ Improve milk quality
  - ✓ Improve fertility
  - ✓ Improve health
  - ✓ Improve longevity
  - ✓ Improve resistance to disease
  - ✓ Improve adaptability

- Capacity of fertility

Fertility is the ability of an animal to reproduce. It is a measure of the number of offspring that an animal can produce over its lifetime. Fertility is influenced by a number of factors, including genetics, nutrition, management, and environment. Fertility is an important criteria for breed selection in dairy cattle. Dairy cattle that are highly fertile will produce more calves, which will lead to increased milk production and profitability.

There are a number of ways to measure fertility in dairy cattle. The most common method is to calculate the calving interval, which is the number of days between calving and the next conception. A short calving interval indicates that the cow is fertile and is able to conceive quickly after calving. Other methods of measuring fertility include the number of services per conception, the number of days open, and the pregnancy rate. Fertility is a complex trait that is influenced by a number of factors. However, by selecting for cows that are highly fertile, dairy farmers can improve the productivity of their herds and increase their profitability.

- Heat detection

Heat detection in dairy cows is the process of identifying when a cow is in heat. This is important for dairy farmers because it allows them to breed their cows at the optimal time to maximize milk production.

There are a number of different methods for heat detection in dairy cows. The most common method is to observe the cow's behavior. Another method for heat detection in dairy cows is to use a heat detection device. These devices are placed in the cow's vagina and measure changes in temperature and pH. When a cow is in heat, the temperature and pH of her vagina will increase.

- Nutrition requirement for reproduction

The nutritional requirements of dairy cows are an important consideration in breed selection, as different breeds have different nutritional requirements. By understanding the nutritional requirements of dairy cows, dairy farmers can select breeds that are best suited for their operation and provide their cows with a diet that meets their nutritional needs. For example, Holstein cows require more energy and protein than Jersey cows during the reproductive period. This is because Holstein cows are larger and produce more milk than Jersey cows. Therefore, it is important to consider the breed of the cow when developing a feeding program for dairy cows during the reproductive period.

- Maintain Reproduction Record

The reproduction record is an important tool for managing the reproductive health of dairy cows. It provides information on the cow's reproductive history, including dates of calving, estrus, and insemination, as well as the results of pregnancy tests. This information can be used to identify cows that are not cycling regularly, cows that are not getting pregnant, and cows that are having problems with their reproductive tract. The reproduction record can also be used to track the calving interval, which is the time between one calving and the next. A long calving interval can indicate a problem with the cow's reproductive tract, such as a uterine infection or a hormonal imbalance.

The reproduction record should be kept on a computer or in a notebook. It should include the following information:

- ✓ Cow's name
- ✓ Date of birth
- ✓ Date of calving
- ✓ Date of estrus
- ✓ Date of insemination
- ✓ Result of pregnancy test
- ✓ Calving interval

The reproduction record should be updated regularly, and it should be reviewed by the veterinarian at each annual checkup. The veterinarian can use the information in the reproduction record to help diagnose and treat reproductive problems.

- Record herd reproduction status

Breeding Records provides important information about the reproductive performance of the herd. This includes progeny records, calving interval (the time between successive calving), age at first calving, lactation period, and weaning period. These records help evaluate the fertility, reproductive efficiency, and genetic potential of the animals in the herd.

There are a number of factors that can affect the reproduction status of a dairy herd, including:

- ✓ **Genetics**: - The genetics of a breed can have a significant impact on its reproduction status. Some breeds are more likely to produce cows that calve regularly and produce high-quality milk than others.
- ✓ **Management**: - The management of a dairy herd can also have a significant impact on its reproduction status. Cows that are well-managed and fed a nutritious diet are more likely to calve regularly and produce high-quality milk.
- ✓ **Environment**: - The environment in which a dairy herd is housed can also have a significant impact on its reproduction status. Cows that are housed in a comfortable environment and have access to fresh air and sunlight are more likely to calve regularly and produce high-quality milk.

When selecting a breed for a dairy herd, it is important to consider the reproduction status of the breed. A breed with a good reproduction record is more likely to produce cows that will calve regularly and produce high-quality milk.

- **Nutritional Records**: Nutritional records provide information about the feeding practices and the balance of diets provided to different groups of cattle. It includes the daily concentrate to roughage ratio supplied to calves, lactating cows, heifers, and dry cows. Evaluating these records helps assess the adequacy and quality of the diets provided, ensuring proper nutrition for optimal growth, reproduction, and milk production.
- **Health Records**: Reviewing the health records of the herd helps assess the overall health status and disease management practices. It includes records of diagnoses, treatments, control measures, and preventive measures taken for common diseases and health issues.

1.6.Young stock management in dairy business

Young stock management is a critical part of dairy farming, as it ensures that calves are healthy and well-developed before they enter the milking herd. Young stock management includes a variety of tasks, such as:

- Providing adequate nutrition and care
- Vaccinating and deworming calves
- Handling and training calves
- Preventing and treating diseases

By following good young stock management practices, dairy farmers can help to ensure that their calves grow up to be healthy and productive cows.

- **Colostrum feeding**

Colostrum provides passive immunity to calves, which helps protect them from diseases. It also contains nutrients that help calves to digest their first feed and to grow and develop. Calves should be fed colostrum as soon as possible after birth. The ideal time to feed colostrum is within the first two hours of life. This is because calves absorb antibodies from colostrum most efficiently during this time. If calves do not receive colostrum within the first two hours of life, they are at increased risk of developing diseases.

Calves should be fed colostrum from their own mother if possible. If a calf's mother is not available, colostrum can be collected from another cow and fed to the calf. Colostrum can also be purchased from a dairy supply store. Calves should be fed colostrum for at least two days. After two days, calves can be gradually transitioned to milk replacer.

Here are some tips for feeding colostrum to calves:

- ✓ Use a clean container to feed colostrum.
- ✓ Warm the colostrum to body temperature before feeding.
- ✓ Feed colostrum slowly and allow the calf to suckle.
- ✓ Feed colostrum until the calf is full.
- ✓ Discard any unused colostrum.

Colostrum is an important part of calf management. By feeding colostrum to calves, you can help to protect them from diseases and promote their health and development.

- **Care for new born**

The care of newborn calves is an important part of young stock management. Calves are born with little immunity and are therefore susceptible to disease. Good calf care practices (feeding, housing, good handling, etc) can help to protect calves from disease and ensure that they grow and develop properly.

- **Separate space**

Young stock, such as calves and heifers, require a separate space from adult cows for several reasons.

- ✓ To prevent the spread of disease: - Young stocks are more susceptible to diseases than adult cows, and they can easily spread diseases to the rest of the herd. By keeping young stock separate, you can help to prevent the spread of disease.
- ✓ To provide a clean environment: - Young stocks are more likely to get dirty and contaminated than adult cows. By keeping them in a separate space, you can help to keep them clean and healthy.
- ✓ To provide a comfortable environment: - Young stock needs a comfortable environment to thrive. They need a warm, dry place to sleep and plenty of room to move around. By providing a separate space for young stock, you can help to create a comfortable environment for them.
- ✓ Preventing and treating diseases

- **Weaned heifers feed requirement**

Weaned heifers are young female cattle that have been separated from their mothers and are now eating solid food. They are typically between 6 and 12 months old and weigh between 300 and 500 pounds. Weaned heifers require a diet that is high in energy and protein to support their growth and development. The ideal diet for a weaned heifer will vary depending on her age, weight, and stage of production.

1.7.Assessment on production performance of dairy business

The production performance of dairy cows is a complex and multifaceted issue that is influenced by a variety of factors, including genetics, nutrition, management, and environment. However, some general trends can be observed with regard to the production performance of dairy cows. The production performance of a dairy business can be assessed by evaluating a number of factors, including:

- **Reproductive performance**

The reproductive performance of a dairy herd is important for maintaining a steady supply of milk. The overall production performance of dairy cows is a complex and multifaceted issue that is influenced by a variety of factors. However, some general trends can be observed with regard to the production performance of dairy cows. Dairy cows that are genetically superior, well-fed, well-managed, and housed in comfortable and stress-free environments will produce more milk, have higher milk quality, and have better reproductive performance than cows that are not.

- ✓ **conception rate**

Conception rate is a measure of the number of cows that become pregnant during a given period of time. It is an important indicator of a dairy cow's reproductive performance and can be used to assess the overall health and fertility of the herd. Conception rate is typically expressed as a percentage, with a higher percentage indicating better reproductive performance. Conception rate is an important indicator of a dairy cow's reproductive performance and can be used to assess the overall health and fertility of the herd. By understanding the factors that affect conception rate, dairy farmers can take steps to improve their herd's reproductive performance and increase their profitability

- ✓ **calving interval**

Calving interval is the average number of days between the birth of one calf and the birth of the next calf. It is an important indicator of a dairy cow's reproductive performance and can be used

to assess the overall health and fertility of the herd. Calving interval is typically expressed as a number of days, with a shorter calving interval indicating better reproductive performance.

Cows that are bred to a bull that is not compatible with their breed or that are bred too frequently are more likely to have a longer calving interval. Environmental factors such as temperature, humidity, and disease can also affect calving interval. Cows that are exposed to extreme temperatures or that are infected with a disease are more likely to have a longer calving interval. Calving interval is an important indicator of a dairy cow's reproductive performance and can be used to assess the overall health and fertility of the herd. By understanding the factors that affect calving interval, dairy farmers can take steps to improve their herd's reproductive performance and increase their profitability.

- ✓ **age at first calving**

Age at first calving is the average age at which a dairy cow gives birth to her first calf. It is an important indicator of a dairy cow's reproductive performance and can be used to assess the overall health and fertility of the herd. Age at first calving is typically expressed as a number of months, with a younger age at first calving indicating better reproductive performance. There are a number of factors that can affect age at first calving, including genetics, nutrition, management, and environment.

- ✓ **days to first service**

Days to first service are a measure of the average number of days between calving and first service. It is an important indicator of production performance, as it reflects the ability of cows to return to estrus and conceive after calving. Days to first service is influenced by a number of factors, including genetics, nutrition, management, and environment.

- ✓ **pregnancy rate**

Pregnancy rate is a measure of the proportion of cows that become pregnant during a given period of time. It is an important indicator of reproductive performance, as it reflects the ability of cows to conceive and carry a calf to term. Pregnancy rate is influenced by a number of factors, including genetics, nutrition, management, and environment.

- **Milk yield**

This is the most important indicator of production performance, as it directly affects the profitability of the business. Milk production per cow can be influenced by a number of factors, including genetics, nutrition, management, and health.

- **Lactation period**

Lactation period is a measure of the length of time that a cow produces milk after calving. It is an important indicator of production performance, as it reflects the ability of cows to maintain their milk production over time. Lactation period is influenced by a number of factors, including genetics, nutrition, management, and environment.

1.8.Fertility and other health problems in dairy cattle

The dairy industry is facing a decline in cow fertility, which results in reduced milk yields, increased labour and veterinary costs, increased culling of cows, and a loss of income to dairy farmers. Cows with mastitis, retained placenta, metritis, respiratory, or digestive diseases have reduced fertility.

1.8.1. Fertility problems of dairy cattle

- **Anoestrous**

Anoestrous is the absence of estrus (heat) in a female animal. It is a normal condition in some species, such as camels and elephants, but it is considered a reproductive disorder in dairy cattle. Anoestrous is diagnosed by the absence of estrus for more than 60 days. The veterinarian will perform a physical examination of the cow and take a blood sample to test for hormones that regulate estrus.

The treatment of anoestrous depends on the underlying cause. If the cause is genetic, there is no treatment available. If the cause is nutritional, the cow will need to be provided with adequate nutrition. If the cause is management-related, the cow will need to be moved to a more

comfortable environment. If the cause is disease-related, the cow will need to be treated for the disease. If the cause is metabolic, the cow will need to be treated for the metabolic disorder. The best way to prevent anoestrous in dairy cattle is to provide them with adequate nutrition, good management, and a healthy environment. It is also important to vaccinate cows against diseases that can cause anoestrous.

- **Silent Heat**: Silent heat occurs when a cow undergoes estrus without showing clear signs of heat behavior, making it difficult for farmers to detect. This can result in missed opportunities for artificial insemination (AI) or natural breeding.
- **Retained Placenta**: Retained placenta refers to the failure of the placenta to be expelled within 24 hours after calving. It can lead to uterine infections, endometritis, and subsequent fertility problems if not promptly addressed.
- **Poor Semen Quality**: The quality of semen used for artificial insemination is crucial for successful conception. Factors such as improper semen handling, storage, or poor semen quality can reduce fertility rates.
- **Genetic Factors**: Some genetic traits can influence fertility in dairy cattle. Breeding for improved fertility traits, such as shorter calving intervals and better conception rates, can help address fertility issues over time

- **Repeat breeding or prolonged calving interval**

Repeat breeding or prolonged calving interval Repeat breeding or prolonged calving interval is a common problem in dairy cows. It can lead to a number of health problems for the cow, including mastitis, metritis, and endometritis. It can also reduce milk production and profitability. If a cow has repeat breeding or prolonged calving interval, there are a number of things that can be done to treat the condition. These include:

- ✓ Treating any underlying health problems: If the cow has a health problem that is causing the repeat breeding or prolonged calving interval, this problem should be treated.
- ✓ Adjusting the cow's diet: The cow's diet should be adjusted to ensure that she is getting the proper nutrients. This may include increasing the amount of protein in her diet or adding supplements to her feed.

- ✓ Improving the cow's management: The cow's management should be improved to reduce stress and provide her with the proper environment. This may include providing her with more exercise, a cleaner environment, and more space.

- **Abortion**

Abortion in dairy cattle Abortion in dairy cattle is a common problem that can lead to significant economic losses. It is estimated that abortion rates in dairy cattle range from 5% to 20%, with the average being around 10%. Abortion can be caused by a variety of factors, including:

- ✓ Infectious diseases: Infectious diseases such as brucellosis, leptospirosis, and vibriosis can all cause abortion in dairy cattle.
- ✓ Nutritional deficiencies: A lack of essential nutrients, such as protein, vitamins, or minerals, can also lead to abortion.
- ✓ Metabolic disorders: Metabolic disorders such as ketosis and hypocalcemia can also cause abortion.
- ✓ Environmental stressors: Environmental stressors such as heat stress, cold stress, and poor ventilation can also lead to abortion.
- ✓ Genetics: Some breeds of dairy cattle are more prone to abortion than others.

- **Still birth**

Stillbirth in dairy cattle is a serious problem that can have a significant impact on the dairy industry. The most common cause of stillbirth in dairy cattle is genetic defects. These defects can be inherited from either the sire or the dam, and can affect the development of the fetus. Some of the most common genetic defects that can lead to stillbirth include:

- ✓ Congenital heart defects: These defects can cause the fetus to die in utero due to a lack of oxygen.
- ✓ Congenital skeletal defects: These defects can prevent the fetus from developing properly, and can also lead to death in utero.
- ✓ Congenital neurological defects: These defects can cause the fetus to be born with a neurological disorder, which can lead to death shortly after birth. In addition to genetic defects, stillbirth can also be caused by infections. These infections can be transmitted

to the fetus from the dam during pregnancy, or they can be acquired by the fetus in utero.

- **Abnormal vaginal discharge**: Abnormal vaginal discharge in dairy cattle can be caused by a variety of factors, including:
  - ✓ Bacterial infections: Bacterial infections of the reproductive tract are a common cause of abnormal vaginal discharge in dairy cattle. These infections can be caused by a variety of bacteria, including Escherichia coli, Klebsiella pneumoniae, and Streptococcus agalactiae.
  - ✓ Fungal infections: Fungal infections of the reproductive tract can also cause abnormal vaginal discharge in dairy cattle. These infections are most commonly caused by Candida albicans.
  - ✓ Parasitic infections: Parasitic infections of the reproductive tract can also cause abnormal vaginal discharge in dairy cattle. These infections are most commonly caused by Trichomonas vaginalis.
  - ✓ Neoplasia: Neoplasia, or cancer, of the reproductive tract can also cause abnormal vaginal discharge in dairy cattle.
  - ✓ Other causes: Other causes of abnormal vaginal discharge in dairy cattle include trauma, foreign bodies, and hormonal imbalances.

- **Alteration of the size of reproductive organs**

Alteration of the size of reproductive organs can be a fertility problem. For example, a woman with a small uterus may have difficulty conceiving or carrying a pregnancy to term.

- **Ovarian cyst and in active ovary**

Ovarian cysts are fluid-filled sacs that develop on the ovaries. They can be caused by a number of factors, including hormonal imbalances, infections, and tumors. Ovarian cysts can interfere with ovulation, which is the release of an egg from the ovary. This can lead to infertility. Inactive ovaries are ovaries that do not produce eggs. This can be caused by a number of factors, including genetic defects, hormonal imbalances, and infections. Inactive ovaries can also lead to infertility.

- **Hyperplasia and hypoplasia of ovary**

Hyperplasia and hypoplasia of ovary are two conditions that can affect the fertility of dairy cattle. Hyperplasia is the abnormal growth of cells in an organ or tissue, while hypoplasia is the abnormal underdevelopment of an organ or tissue. In the case of the ovary, hyperplasia can lead to an increase in the number of follicles, while hypoplasia can lead to a decrease in the number of follicles. Both of these conditions can interfere with the normal function of the ovary and lead to reduced fertility. Hyperplasia of the ovary is more common than hypoplasia, and it is often associated with other reproductive disorders, such as cystic ovaries and ovarian tumors. The exact cause of hyperplasia is unknown, but it is thought to be caused by a combination of genetic and environmental factors. Environmental factors that have been linked to hyperplasia include exposure to endocrine-disrupting chemicals, such as pesticides and herbicides, and stress.

- **Metritis**

Metritis is a bacterial infection of the uterus that occurs after calving. It is one of the most common causes of infertility in dairy cows. The bacteria that cause metritis enter the uterus through the cervix during calving. Once inside the uterus, the bacteria multiply and produce toxins that damage the uterine tissue. This damage can lead to inflammation, pain, and discharge from the uterus. Metritis can be a serious condition that can lead to infertility, loss of milk production, and even death. It is important to treat metritis promptly to prevent these complications.

- **Persistence of corpus luetum and other diseases**

Persistence of corpus luteum (PCL) is a condition in which the corpus luteum, a temporary endocrine gland that develops in the ovary after ovulation, does not regress normally. This can lead to a number of problems, including infertility. In dairy cattle, PCL is a common cause of infertility. The condition is characterized by a prolonged luteal phase, which is the period of time

after ovulation when the corpus luteum is active. The luteal phase normally lasts for about 14 days, but in cows with PCL, it can last for up to 30 days.

1.8.2. Other health abnormalities of dairy cattle

- **Heat stress, respiratory infection due to poor ventilation**

Heat stress and respiratory infections are two common health problems in dairy cattle. Heat stress can occur when the ambient temperature and humidity are high, and it can lead to decreased milk production, reduced fertility, and increased mortality. Respiratory infections can occur when dairy cattle are exposed to bacteria or viruses, and they can lead to coughing, sneezing, and difficulty breathing. Respiratory infections are another common health problem in dairy cattle. These infections can be caused by a variety of bacteria and viruses, and they can lead to coughing, sneezing, and difficulty breathing. Respiratory infections can be spread through contact with infected animals or contaminated surfaces.

- **Injury due to slippery floor**

Slippery floors in dairy cattle housing can cause a number of health problems, including lameness, injuries, and mastitis. Lameness is a common problem in dairy cattle, and it can be caused by a variety of factors, including slippery floors. Slippery floors can make it difficult for cows to walk and stand, which can lead to injuries such as sprains, strains, and fractures. In addition, slippery floors can make it difficult for cows to reach their feed and water, which can lead to dehydration and malnutrition. Mastitis is a bacterial infection of the udder, and it is one of the most common health problems in dairy cattle. Slippery floors can make it difficult for cows to clean their udders, which can increase the risk of mastitis.

- **Food and water born infection**

Food and water born infections are a common problem in dairy cattle. These infections can be caused by a variety of bacteria, viruses, and parasites. Food and water born infections can be a

serious problem for dairy cattle, as they can lead to decreased milk production, weight loss, and even death. It is important to take steps to prevent these infections, such as providing clean feed and water, and vaccinating animals against common diseases.

Here are some tips for preventing food and water born infections in dairy cattle:

- ✓ Provide clean feed and water. Make sure that the feed and water that you provide to your dairy cattle is clean and free of contamination. This means that you should regularly clean the feed and water troughs, and you should also make sure that the water source is clean and free of bacteria.
- ✓ Vaccinate your animals. Vaccination is an important way to protect your dairy cattle from common diseases. Talk to your veterinarian about which vaccines are recommended for your herd.
- ✓ Isolate sick animals. If you have a dairy cow that is sick, it is important to isolate her from the rest of the herd. This will help to prevent the spread of the disease to other animals.
- ✓ Practice good hygiene. It is important to practice good hygiene when working with dairy cattle. This means washing your hands before and after handling animals, and it also means cleaning and disinfecting equipment regularly.

- **Hoof overgrowth, abnormal growth or broken horn**

Abnormal growth or broken horn in dairy cattle can also be a problem, as it can lead to pain and infection. There are a number of things that can be done to manage this condition, including:

- ✓ Hoof trimming: This is the most important step in managing abnormal growth or broken horn. Hoof trimming should be done every 6-8 weeks, or more often if necessary.
- ✓ Proper nutrition: A diet that is high in calcium and phosphorus can help to promote healthy hoof growth.
- ✓ Foot baths: Foot baths can help to soften the hoof and make it easier to trim.
- ✓ Hoof sealants: Hoof sealants can help to protect the hoof from infection and moisture.

If abnormal growth or broken horn is severe, it may be necessary to surgically remove the affected tissue. This should only be done by a veterinarian.

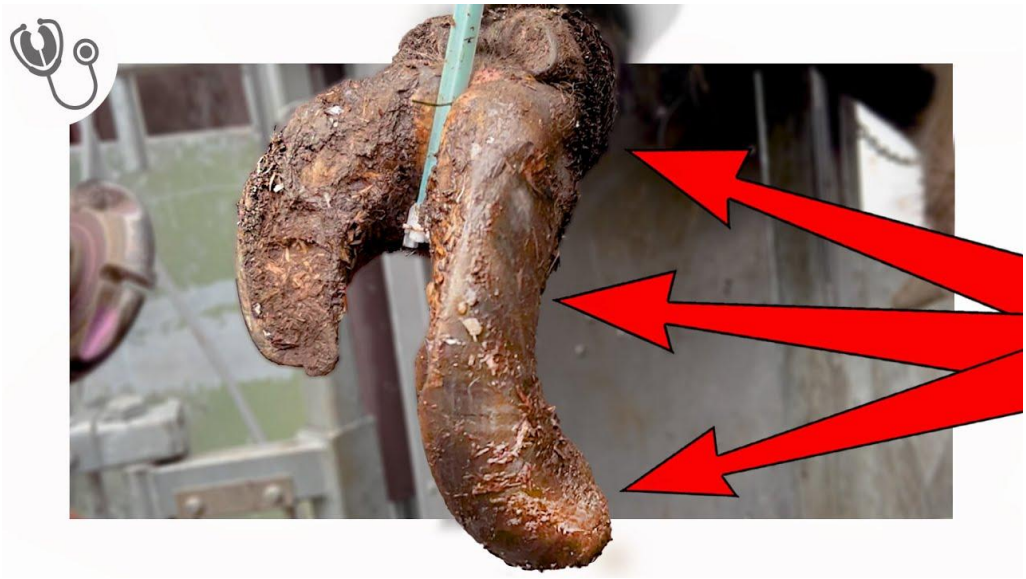


Figure 1.10: Hoof overgrowth in dairy cow

- **Deficiency diseases or metabolic diseases**

✓ Hypocalcemia (Ketosis)

Hypocalcemia, also known as ketosis, is a metabolic disorder that occurs when the body's calcium levels become too low. This can be caused by a number of factors, including:

- Low calcium intake: Dairy cows need a diet that is high in calcium in order to maintain healthy levels of calcium in their blood. If a cow's diet is not providing enough calcium, she may develop hypocalcemia.
- High milk production: Cows that produce a lot of milk can lose a lot of calcium through their milk. This can lead to hypocalcemia if the cow's diet is not providing enough calcium to replace what is lost.
- Stress: Stress can also lead to hypocalcemia. This is because stress can cause the body to release hormones that can lead to a decrease in calcium levels.

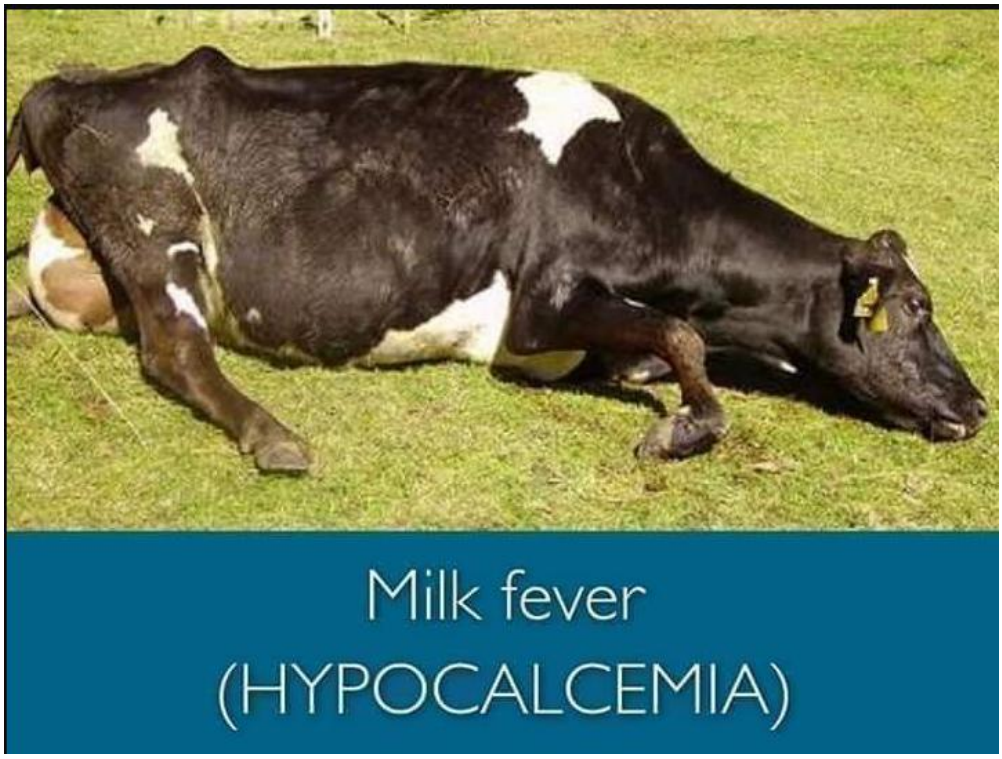


Figure 1.11: images of dairy cow with hypocalcemia

- ✓ Ketosis (Hypoglycemia)

Ketosis, also known as hypoglycemia, is a metabolic disorder that occurs when the body's blood sugar levels become too low. This can be caused by a number of factors, including:

- Low energy intake: Dairy cows need a diet that is high in energy in order to maintain healthy blood sugar levels. If a cow's diet is not providing enough energy, she may develop ketosis.
- High milk production: Cows that produce a lot of milk can lose a lot of energy through their milk. This can lead to ketosis if the cow's diet is not providing enough energy to replace what is lost.
- Stress: Stress can also lead to ketosis. This is because stress can cause the body to release hormones that can lead to a decrease in blood sugar levels.

- ✓ Acute Ruminal Acidosis

Acute ruminal acidosis (ARA) is a metabolic disorder that occurs when the pH of the rumen drops too low.

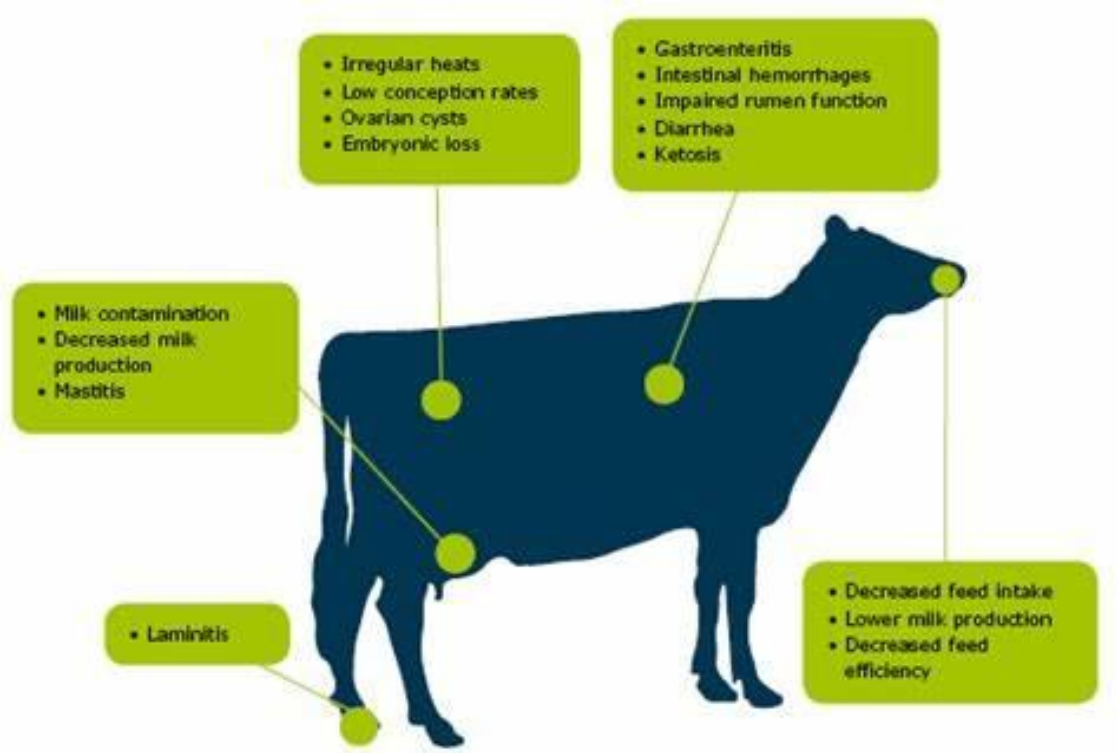


Figure 1.12: Fertility and other health problems in dairy cow

Available at: - What Are Common Health Problems In Dairy Cows ✓ Biggest Bulls - YouTube Accessed on 23/09/2023

1.9.Herd screening tests in management of major dairy cattle

To screen and test a dairy herd for major health risks and suspected diseases, a health management program is typically developed cooperatively by the herd veterinarian and the dairy producer. The program is designed to ensure optimal care and well-being of dairy cattle while reducing productivity losses caused by disease and management errors.

- **Brucellosis**

Screening and testing of the dairy herd for brucellosis is an important part of preventing the spread of the disease. Testing can help to identify infected animals so that they can be treated and isolated from the rest of the herd. It can also help to identify herds that are at risk of infection so

that they can be vaccinated. There are a number of different tests that can be used to screen for brucellosis in cattle.

- ✓ The most common test is the **Rose Bengal test**, which is a blood test that detects antibodies to the bacteria. Other tests that can be used include the agglutination test, the complement fixation test, and the ELISA test. The frequency of testing for brucellosis will vary depending on the risk of infection in the herd. Herds that are at high risk of infection should be tested more frequently than herds that are at low risk.
- ✓ **Serum Agglutination Test (SAT):** The serum agglutination test is one of the most widely used tests for brucellosis screening. It detects the presence of antibodies produced by the cow's immune system in response to the Brucella abortus bacteria. A positive result indicates exposure to the bacteria. However, further confirmatory testing is required to confirm active infection.
- ✓ **Milk Ring Test (MRT):** The milk ring test is a simple and cost-effective screening test for brucellosis. It involves mixing a small amount of milk from the cow with a specific reagent or dye. If the milk sample contains antibodies against Brucella abortus, it will cause a visible color change or clumping reaction, indicating a positive result.

- **Tuberculosis**

Screening and testing a dairy herd for tuberculosis involves a **TB testing regime** that includes the following diagnostic methods:

a. **Clinical examination of animals**: A visual examination of the animals.
b. **TB skin test**: The Single Intradermal Comparative Cervical Tuberculin (SICCT) test is used to test herds and animals (except for direct export). The TB skin test is the most common method used for TB testing in cattle. It involves injecting two types of tuberculin under the skin of the neck and measuring the skin reactions to determine infection status.
c. **Interferon Gamma testing**: A blood test used as a supplementary test to the SICCT when considered epidemiologically necessary.

- **Mastitis**

Mastitis screening and testing are essential for maintaining the health of dairy herds. A good screening program can help identify problems before they escalate into disasters. There are several types of screening tests that can be combined to protect your farm. Some of the common screening tests include:

- ✓ **Bulk tank somatic cell count (BTSCC)**: This test measures the number of somatic cells in a bulk milk sample.
- ✓ **CMT test**: - CMT stands for California Mastitis Test, which is a commonly used test in dairy farming to detect subclinical mastitis in cows. Mastitis is an inflammation of the udder, usually caused by bacterial infection, and it can negatively impact milk production and the cow's overall health.
- ✓ **Bulk tank culture**: It involves culturing a bulk milk sample to identify the presence of bacteria.
- ✓ **Individual cow culture**: This test involves culturing milk samples from individual cows to identify the presence of bacteria.
- ✓ **PCR (Polymerase chain reaction)**: PCR is a rapid screening test that can detect contagious pathogens responsible for mastitis.

- **CBPP, LSD and FMD**

Screening and testing methods: Specific screening and testing methods for CBPP, LSD and FMD may include serological tests such as competitive enzyme-linked immunosorbent assay (c-ELISA), PCR and virus isolation.

1.10. Measures to prevent transmission of zoonoses and reproductive diseases

Preventing the transmission of zoonotic diseases and reproductive diseases in a dairy farm is crucial for maintaining the health and productivity of both the animals and the workers. Here are some measures that can be implemented to minimize the risk of transmission:

- **Biosecurity Practices:**
  - ✓ **Restricted Access**: Control access to the farm to authorized personnel only and limit visitor entry to essential visits.

- ✓ **Quarantine and Testing**: Isolate newly introduced animals and conduct appropriate health screenings and testing before integrating them into the herd.
- ✓ **Disease Monitoring**: Implement regular monitoring programs to detect and respond to any signs of diseases promptly.
- ✓ **Cleaning and Disinfection**: Maintain strict cleaning and disinfection protocols for barns, equipment, and shared spaces to prevent the spread of pathogens.
- ✓ **Pest Control**: Implement measures to control pests, such as rodents and insects, which can carry diseases.

- **Vaccination Programs: -** Follow a comprehensive vaccination program recommended by veterinarians to protect cattle against common infectious diseases. Vaccination can significantly reduce the risk of transmission.
- **Proper Hygiene Practices:**
  - ✓ **Hand Hygiene**: Promote regular handwashing with soap and water or use of hand sanitizers for all personnel before and after handling animals or engaging in farm activities.
  - ✓ **Protective Clothing**: Provide and enforce the use of appropriate protective clothing, including gloves, boots, and coveralls, to prevent the transfer of pathogens between animals and humans.
- **Sanitary Milking Practices:** Follow strict milking hygiene protocols, including proper udder cleaning, sanitization of milking equipment, and separation of milk from cows with mastitis or other infectious udder conditions.
- **Training and Education:** Provide training to farm personnel regarding disease prevention, proper animal handling techniques, and the importance of biosecurity practices.

1.11. Hygienic milk production and marketing management

1.11.1. Hygienic milk production

It refers to the practices and measures implemented to ensure that milk is produced and processed under clean and sanitary conditions, minimizing the risk of contamination and maintaining the quality and safety of the milk. It involves following specific guidelines and protocols to prevent or reduce the presence of harmful microorganisms, chemicals, and foreign substances in milk.

- **Milk contamination related to animal disease**: - Milk contamination related to animal disease can occur when bacteria or other pathogens are introduced into the milk supply. This can happen through contact with infected animals, contaminated equipment, or environmental sources.

Milk adulteration: - Milk adulteration is the practice of adding substances to milk to increase its volume or improve its appearance, taste, or other qualities. Adulteration can occur at any stage of the milk production process, from the farm to the retail store. There are many different types of milk adulteration, but some of the most common include:

- ✓ Water dilution: This is the most common form of milk adulteration. Water is added to milk to increase its volume and make it appear more profitable.
- ✓ Fat skimming: This involves removing the cream from milk to increase its shelf life and make it more profitable.
- ✓ Sugar or glucose addition: This is done to improve the taste of milk and make it more appealing to consumers.
- ✓ Melamine addition: This is a dangerous form of milk adulteration that can cause kidney failure. Melamine is a toxic chemical that is used to make plastics and fertilizers. It is sometimes added to milk to make it appear to have higher protein levels.

- **Milk quality testing and preventive measure**

Milk quality testing is an important part of ensuring the safety and quality of milk for human consumption. Milk quality testing can help to identify potential contaminants, such as bacteria, viruses, and parasites, and can also help to ensure that milk meets the nutritional requirements of consumers. There are a number of different milk quality tests that can be performed, including:

- ✓ Microbial testing: This test can help to identify the presence of bacteria in milk
- ✓ Nutritional testing: This test can help to ensure that milk meets the nutritional requirements of consumers, such as the protein, fat, and calcium content.

In addition to milk quality testing, there are a number of preventive measures that can be taken to ensure the safety and quality of milk. These measures include:

- ✓ Good animal husbandry practices: This includes keeping animals clean and healthy, and providing them with adequate nutrition and care.
- ✓ Proper milking practices: This includes washing hands and equipment before and after milking, and cooling milk quickly to prevent the growth of bacteria.
- ✓ Regular testing of milk: This can help to identify potential contaminants and ensure that milk meets the nutritional requirements of consumers.

1.11.2. Marketing management

- **Cost benefit analysis:** The cost-benefit analysis of marketing dairy milk is a complex and challenging process. However, it is important to consider the costs and benefits of marketing in order to make informed decisions about how to market dairy milk. Benefits of Marketing Dairy Milk: - Increased demand for dairy milk, higher prices for dairy milk, Protection from competition from plant-based milks. Costs of Marketing Dairy Milk: - High cost of production, High cost of marketing

- **Market place and pricing** - The price of milk is determined by a number of factors, including the supply and demand of milk, the cost of production, and the policies of governments and retailers. The price of milk can vary significantly from one region to another, and it can also vary from one time of year to another. High demand and numbers of populations for milk and milk products is an opportunity for marketing purpose.

- **Milk quality-based pricing: -** Milk quality-based pricing Milk quality-based pricing (MQBP) is a pricing system that rewards farmers for producing high-quality milk. It is based on the assumption that farmers have an incentive to produce high-quality milk if they are paid more for it. MQBP can be implemented in a variety of ways. One common

approach is to use a milk quality scorecard. This scorecard lists the different factors that are considered when determining the quality of milk, such as the milk's fat content, protein content, and somatic cell count. Farmers are then paid a higher price for milk that meets or exceeds the standards set for each factor. Another approach to MQBP is to use a milk quality premium. This premium is a fixed amount of money that is added to the price of milk that meets or exceeds certain quality standards.

- **Milk quality testing, collection, transportation, processing and selling**.

Milk quality testing is an important part of the dairy industry, as it helps to ensure that milk is safe for human consumption. Milk quality is affected by a number of factors, including the health of the cows, the environment in which they are raised, and the way in which the milk is processed. Milk collection is the process of transporting milk from the farm to the processing plant. Milk is typically collected in bulk tanks, which are then transported to the processing plant by truck or rail.

Milk transportation is an important part of the dairy industry, as it helps to ensure that milk is delivered to the processing plant in a safe and timely manner. Milk transportation is also important for the environment, as it helps to reduce the amount of fuel used to transport milk.

Milk processing is the process of converting raw milk into a variety of dairy products, such as milk, cream, butter, cheese, and yogurt. Milk processing can be done at a number of different scales, from small-scale operations on the farm to large-scale operations in processing plants. Milk processing is an important part of the dairy industry, as it helps to create a variety of products that can be enjoyed by consumers around the world. Milk processing also helps to preserve milk, so that it can be consumed long after it has been produced.

Milk selling is the process of marketing and distributing milk and dairy products to consumers. Milk can be sold directly to consumers at farmers markets or grocery stores, or it can be sold to foodservice businesses, such as restaurants and cafes.

Self-check 1	

Name_____ ID_____signature_____ date_____

Directions: Answer all the questions below accordingly.

Part I: write true for correct statement and false for incorrect one (1pt each)

1) Regular testing and analysis of milk samples is necessary to ensure the absence of contaminants and maintain high hygiene standards.
2) Hygienic milk production and marketing management are not significant factors in ensuring the quality and safety of dairy products.
3) Providing a consistent supply of high-quality forage is essential for maintaining the health and productivity of dairy cows.
4) Rotational grazing allows for better utilization of pasture and promotes more balanced nutrition for dairy cows.
5) The selection of forage species and varieties should consider factors such as climate, soil conditions, and the nutritional needs of dairy cows.

Part II. Choose the best answers (1pt each)

1) Which of the following is a common breeding technique used in dairy cattle?
   a) Artificial insemination (AI) b) Embryo transfer (ET) c) Crossbreeding
   d) All of the above
2) Which of the following is a key consideration when selecting dairy cattle breeds?
   a) Milk production potential b) Adaptability to local climate c) Disease resistance
   d) All of the above
3) Which of the following factors affects the reproductive efficiency of dairy cows?
   a) Nutrition b) Health status c) Breeding management d) All of the above
4) Which breed of dairy cattle is known for its high milk production potential?
   a) Holstein b) Jersey c) Guernsey d) All of the above
5) Which breeding technique involves the transfer of embryos from a superior donor cow to multiple recipient cows? a) Artificial insemination b) Embryo transfer (ET) c) Crossbreeding d) Inbreeding
6) Which of the following factors should be considered when designing dairy farm facilities?
   a) Proper ventilation b) Sufficient space for cow movement c) Adequate lighting

d) All of the above

part III: Short Answer Questions (2pts each)

1) What are some key performance indicators used to assess the production performance of a dairy business?
2) What are common factors that can affect the fertility of dairy cattle?
3) What are some common health problems or diseases that can impact dairy cattle?
4) How can a dairy farmer monitor and manage the reproductive health of their herd?
5) What are some preventive measures that can be taken to minimize the occurrence of health problems in dairy cattle?

Note: Satisfactory rating – 21 points **Unsatisfactory - below 21 points**

Operation Sheet -1	

1.1.Procedures to formulate feed using Pearson square method

1.2.

Suppose we want formulate a feed for dry cow with 40% cp using soya bean meal having 45% CP and 10% corn both weighting 120kg.

a. Materials required

Weighting balance, note book, pen/pencil, 45% CP soya bean and 10 % CP corn

b. Steps

i. Draw a square and insert the desired nutrient requirement in the middle of the square.
ii. Calculate the percentage of each ingredient by subtracting the nutrient value from the nutritional requirement on the diagonal and arrive at a numerical value entitled "parts".
iii. Sum those parts and divide by the total to determine the percent of the ration that each ingredient should represent in order to provide a 40% CP feed content.
iv. Weighting with weighting scale for its parts and mix them for providing to the cow.

LAP TEST-1	

Name_____ ID_____ Signature_____-Date_____

Time started: 2:30 Time finished: 3:30 local time

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **1 hour**. The project is expected from each student to do it.

Task-1:- Formulate a feed for dry cow with 40% CP using soya bean meal having 45% CP and 10% corn both weighting 120 kg using Pearson square method

LG #33	LO #2- Apply beef Farm/feedlot Husbandry practice and management

Instruction sheet 2

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

- Considerations to establish beef farm
- Types of houses in feedlot
- Forage development for feed lot animals
- Breeds of beef cattle and selection criteria
- Nutrition and feeding plan of beef animals
- Management of health problems in feedlots

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Practice livestock farming systems based on production system and source of feeds and grazing system.
- Identify beef farm/ feedlot business based on resource availability and cost benefit analysis
- Determine beef/ feedlot farm site selection and the type house based on relevant factors.
- Performe selection of the proper beef cattle breed based on animal body conformation.
- Determine economic basis to supplementary feeding system according to enterprise requirements.
- Confirm and prepare feed and feed supplements in line with feeding plans.
- Identify and report existing and potential hazards in relation to feeding and watering to the supervisor.
- Perform beef animal feeding based on the required body gain.
- Identify and prevent beef animal disease measures applied as organization rule and regulation.
- Identify body weight gaining, transportation, transportation related risk and marketing.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets

Information Sheet 2

2.1.Considerations to establish beef farm

There are a variety of production systems of beef animals, each with its own advantages and disadvantages. The most common production systems include:

- **Commercial or more intensive production systems**: These systems are characterized by the use of specialized facilities and equipment, as well as the application of management practices that are designed to maximize production efficiency. These systems are typically found on large-scale farms, where the animals are housed in confinement and fed a diet that is formulated to meet their nutritional requirements. Commercial beef production systems are often used to produce high-quality beef products for the export market.
- **Peri-urban production systems**: These systems are found in areas that are located near urban centers. The animals are typically raised on small-scale farms or ranches, and they are often grazed on pastureland. Peri-urban production systems are often used to produce beef for local markets.
- **Traditional production systems**: These systems are found in rural areas, and they are characterized by the use of traditional methods of raising beef animals. The animals are typically raised on small-scale farms or ranches, and they are often grazed on pastureland. Traditional production systems are often used to produce beef for local markets.

2.1.1. Relevant factors to establish beef farm

Establishing a beef farm requires careful planning and consideration of various factors. And it is a complex and challenging business, but it can also be a very rewarding one. If you are considering starting a beef farm, there are a number of factors you will need to consider.

- Climatic conditions
- Landscaping
- Size of farm
- Nearby market
- Water supply
- Topography
- Drainage
- Size and slope of area
- Sun exposure and wind protection
- Zero-grazing housing and feeding system

2.1.2. Source of feeds for beef farm

Beef animals are ruminants and their digestive system is designed to ferment forages.

- **Forages** are the main source of energy and nutrients for beef animals. Forages can be divided into two main categories:
  - ✓ **Grasses**: Grasses are the most common forage for beef animals. They are available in a variety of species and varieties, and they can be grown in a variety of climates. Grasses are a good source of energy, protein, and fiber.
  - ✓ **Legumes**: Legumes are important forage for beef animals. They are a good source of protein and energy, and they can help to improve soil fertility. Legumes include alfalfa, clover, and soybeans.
- **Agricultural and Industrial by products**: Agricultural by-products are a valuable source of feed for beef animals. They are often low-cost and can provide a number of nutrients that are essential for beef production. Some of the most common agricultural by-products used as feed for beef animals include:
  - ✓ Wheat bran
  - ✓ Corn gluten meal
  - ✓ Soybean meal
  - ✓ Distillers dried grains
  - ✓ Molasses
  - ✓ Bakery waste
  - ✓ Cannery waste
  - ✓ Animal manure

These by-products can be used as a complete feed or as a supplement to other feeds. They can be fed to beef animals in a variety of ways, including as a dry feed, a wet feed, or silage. Industrial by-products are a valuable source of feed for beef animals. They are typically low in cost and can provide a number of nutrients that are essential for animal growth and development. However, it is important to note that not all industrial by-products are suitable for use as feed. Some by-products may contain harmful substances that can negatively impact animal health. It is therefore important to carefully evaluate the potential risks and benefits of using industrial by-products as feed before making a decision.

- **Minerals and vitamins**: - Minerals and vitamins are essential nutrients for beef animals. They are required for a variety of bodily functions, including growth, reproduction, and immunity. Minerals and vitamins can be obtained from a variety of sources, including forages, grains, and supplements.

2.2.Types of houses in feedlot

There are several types of housing and handling facilities that are suitable for beef operations. The type of facility must be designed according to the weather, topography, and the availability of feed and pasture. Here are some examples of structures that can be used:

a. **Open-sided, single slope roof shed**: This is the least expensive of new structures and very easy to build. Open sheds should face the south for winter sun and block the prevailing winds.



Figure 2.1: Open-sided, single slope roof shed of feedlot house

b. **Open-sided, clear span pole shed**: The clear span provides more space for equipment to remove manure and thus any side of the building can be open to the environment. This type of housing is more practical for smaller sized herds (under 20 head of cattle).



Figure 2.2: Open-sided, clear span pole shed of feedlot house

c. **Closed houses**: Such type of beef cattle house is usually high expensive than building a new structure. Lighting and ventilation are usually adequate in former dairy facilities for use by beef cattle. The type of house that is best for a particular feedlot will depend on a number of factors, including the climate, the size of the feedlot, and the type of cattle that are being raised.



Figure 2.3: Closed houses of feedlot

There are a number of factors to consider when selecting a site for a beef farm. These include:

- **Climate**: The climate in the area should be suitable for raising cattle. The ideal climate is one that is not too hot or cold, and has adequate rainfall.
- **Water**: A reliable source of water is essential for a beef farm. The water should be clean and free of contaminants.
- **Land**: The land should be suitable for grazing cattle. The soil should be fertile and well-drained.
- **Transportation**: The farm should be located near transportation routes to facilitate the delivery of feed and the marketing of cattle.
- **Labor**: The farm should be located in an area where there is a reliable source of labor.
- **Regulations**: The farm should be located in an area that is in compliance with all applicable regulations.

2.3.Forage development for feed lot animals

Forage development plays a crucial role in supporting the nutritional needs of feedlot animals. While a significant portion of the diet in a feedlot typically comes from concentrate feeds, incorporating forages can provide added fibre, enhance rumen health, and contribute to overall animal well-being. Here are some considerations for forage development in a feedlot setting:

- **Forage Selection**: Choose forage species and varieties that are suitable for your region's climate, soil conditions, and available resources. Common forage options for feedlots include annual crops like corn silage, sorghum, and small grains (e.g., barley, wheat) or perennial forages like alfalfa or grasses.
- **Yield and Quality**: Select forages with good yield potential and nutritional quality.
- **Crop Management**: Implement proper crop management practices to maximize forage production and quality. This includes timely planting, appropriate fertilization, irrigation (if applicable), weed and pest control, and proper harvesting techniques.
- **Harvest and Storage**: Determine the optimum stage of maturity for harvest to achieve the desired balance between yield and quality.

  Available at: - Pasture and Forage Management - YouTube Accessed on 20/09/2023



Figure 2.4: Forage storage mechanism as bailing

- Feeding Strategies: Develop feeding strategies that incorporate forages effectively into the overall diet of feedlot animals.
- **Forage Processing**: Depending on the forage type and animal requirements, consider processing forages to enhance digestibility and intake. Common processing methods include chopping, grinding, or pelleting forages to improve particle size and palatability.
- **Quality Control**: Implement quality control measures to ensure consistency and safety of the forage supply. This includes periodic forage testing, monitoring forage storage conditions, and addressing any issues promptly to prevent spoilage or contamination.

The amount of forage that is produced per acre depends on a number of factors, including the type of forage crop, the climate, the soil conditions, and the management practices that are used. In general, alfalfa produces more forage per acre than corn silage or wheat pasture.

2.4.Breeds of beef cattle and selection criteria

2.4.1. Breeds of beef cattle in Ethiopia

Ethiopia is home to several indigenous cattle breeds, but in recent years, efforts have been made to introduce and develop exotic beef cattle breeds in the country. These exotic breeds are bred for their improved meat production and growth characteristics. Here are some examples of exotic beef cattle breeds found in Ethiopia:

- **Boran**: The Boran breed originated in Kenya but has been imported and successfully established in Ethiopia. Boran cattle are known for their adaptability to harsh environments, good meat quality, and resistance to diseases.
- **Simmental**: Simmental cattle are originally from Switzerland but have been introduced to various countries worldwide, including Ethiopia. They are large, dual-purpose cattle known for their excellent meat quality and high growth rates.
- **Charolais**: Charolais cattle, originating from France, are known for their muscular build and fast growth. They have been imported to Ethiopia to improve meat production.
- **Limousin**: Limousin cattle, also from France, are highly regarded for their meat quality and feed conversion efficiency. They have been introduced to Ethiopia to enhance beef production.
- **Aberdeen Angus**: The Aberdeen Angus breed, originating from Scotland, is known for its marbled meat and adaptability to different climates. These cattle have been introduced to Ethiopia to improve beef quality and productivity.

There is no specific indigenous cattle breed that is exclusively selected and used for beef production in Ethiopia. The indigenous cattle breeds are used for multi-purpose traits, particularly for milk, meat, draft, and manure production. Some of the indigenous breeds of Ethiopia like Borana, Horro, and Barka are promising in their beef production performances. But the rest cattle breeds like ogaden, shoko mejenger, fogera, zebu (bos taures, indicus), arsi-bale are more for milk production or multipurpose.

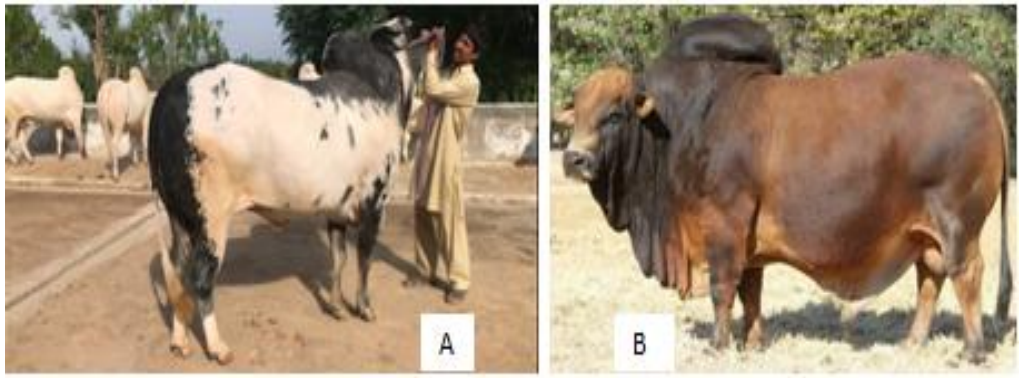


Figure 2.5: Barka breed (A) and Boran breed (B) found in Ethiopia used for feedlot

2.4.2. Breed selection criteria for feedlot

The selection criteria for beef cattle in a feedlot can vary depending on several factors. Here are some general considerations:

a. **Growth Potential**: Look for cattle breeds or individuals with good growth potential, as feedlot operations aim to achieve rapid weight gain. Traits such as average daily gain (ADG) and feed conversion (F/G) are important indicators of growth potential.
b. **Feed Efficiency**: Efficient feed conversion is crucial for profitability in a feedlot. Cattle that can convert feed into weight gain more efficiently are desirable. Feed efficiency can be measured by the amount of feed required to produce a unit of weight gain.
c. **Carcass Traits**: Carcass traits such as dressing percentage, marbling, ribeye area, and fat thickness are important for beef quality and market value. Selecting cattle with desirable carcass traits can help maximize profitability.
d. **Health and Adaptability**: Choose cattle breeds or individuals that are known for their adaptability to the local environment and resistance to common diseases. Healthy animals have better feed utilization and growth rates.
e. **Structural Soundness**: Cattle with good structural soundness, including strong legs and feet, are better equipped to handle the stress of a feedlot environment. Structural soundness contributes to overall animal well-being and longevity.
f. **Disposition**: Animals with calm and docile temperaments are easier to handle in a feedlot setting, reducing stress for both the animals and workers.

It is important to note that specific selection criteria may vary depending on the goals and objectives of the feedlot operation, as well as regional preferences and market demands. Consulting with local experts or agricultural extension programs can provide more tailored guidance based on your specific needs.

2.5.Nutrition and feeding plan of beef animals

The nutrition and feeding plan of beef animals is an important part of beef production. The goal of the nutrition and feeding plan is to provide the animals with the nutrients they need to grow and develop properly, while also keeping costs down. The nutrition and feeding plan for beef

animals will vary depending on the type of animal, the stage of production, and the environmental conditions.

2.5.1. Feeding system in feedlot

The type of feeding system used in a feedlot can have a significant impact on the efficiency and profitability of the operation.

- Indoor feeding systems: - offer protection from the elements, controlled environments, and reduced labor costs. However, they also have higher construction and operating costs and increased disease risk.
- Outdoor feeding systems: - have lower costs, reduced disease risk, but expose cattle to the elements and require more labor. The choice of feeding system depends on a number of factors, including:
  - ✓ Climate: Indoor feeding systems are more common in cold climates, while outdoor feeding systems are more common in warm climates.
  - ✓ Land availability: Indoor feeding systems require less land than outdoor feeding systems.
  - ✓ Operator preferences: Some operators prefer the control and predictability of indoor feeding systems, while others prefer the lower costs and reduced disease risk of outdoor feeding systems.

2.5.2. Feed and feed supplements for feedlot

The quantity and quality of feed and feed supplements in a feedlot can vary depending on factors such as the type of cattle, their age, weight, and nutritional requirements. Here are some general considerations:

a. **Protein**: Feedlot rations typically include protein sources such as soybean meal, cottonseed meal, distillers grains, or other protein-rich ingredients.
b. **Energy**: Energy-dense feeds like corn, barley, or sorghum are commonly used to meet the energy needs of feedlot cattle.
c. **Roughage**: While roughage is not the primary component of feedlot diets, it can be included in small amounts to promote rumen health. Common roughage sources include hay or silage.

d. **Minerals**: Feedlot diets should be balanced with essential minerals like calcium, phosphorus, magnesium, potassium, and trace minerals.
e. **Vitamins**: Vitamin supplements may be added to ensure adequate nutrition. These can include vitamins A, D, E, and B-complex vitamins.

The quantity and specific formulation of these feeds and supplements will depend on the specific nutritional requirements of the cattle being raised in the feedlot. It is important to work with a nutritionist or veterinarian to develop a balanced ration that meets the needs of the animals while optimizing their growth and health.

2.5.3. Feeding plans in feedlot

Like other, all nutrients are required for feeding of beef cattle. The feeds also include roughage and concentrates. The nutrients are used for maintenance, growth, meat or beef production (finishing or fattening), and reproduction. Feeding plan provide an outline of the feed type and quantity required to be feed to specific animals. If the animal may be very choosy when it comes to feeding due to stress, sudden change in diet and environment Therefore, nutrient requirement may vary considerably from one individual to next. The feeding plan should consider and achieved the following targets in feedlot.

- Target weights
- Amount and type of feed and feed supplements
- How to introduce animals to dietary changes
- Feeding frequency and rates
- Feeding methods and procedures
- Weed and pest control strategy
- Reporting and recording requirements

2.5.4. Existing and potential hazards while handling feedlot

Handling cattle in a feedlot can present significant risks to workers, including injuries and fatalities. Some of the hazards that can arise from direct interaction with cattle include being crushed, gored, trampled, kicked, or bitten. To manage these risks, it is important to follow safe

work practices and implement appropriate control measures. Here are some general considerations:

a. **Physical Hazards**: These can include objects such as stones, glass, metal, wood, plastic, or any other physical object that could enter the feed and cause harm.
b. **Chemical Hazards**: These may arise from the use of certain medications or chemicals in the feedlot environment. It is important to handle and store these substances properly to minimize the risk of exposure.
c. **Biological Hazards**: These can include zoonotic diseases that can be transmitted from animals to humans. Proper hygiene practices and personal protective equipment (PPE) can help reduce the risk of exposure.
d. **Environmental Hazards**: Extreme weather conditions, such as heat stress or cold stress, can pose risks to both workers and animals. Adequate shelter and appropriate clothing should be provided to mitigate these hazards.
e. **Equipment Hazards**: Machinery and equipment used in a feedlot can present risks if not operated or maintained properly. Regular inspections, maintenance, and training on equipment use are essential.
f. **Slips, Trips, and fall**: Wet or uneven surfaces can increase the risk of slips, trips, and falls. Good housekeeping practices and appropriate footwear can help prevent these accidents.

2.6.Management of health problems in feedlots

Skin diseases, tick and other exo-parasites infestation are common problems in beef cattle production systems. These diseases can cause significant economic losses due to reduced productivity, increased veterinary costs, and decreased carcass quality. Therefore, it is important to have a good understanding of the different types of skin diseases and exo-parasites that can affect beef cattle, as well as the appropriate management strategies for preventing and treating these diseases.

- **Skin Diseases**

Skin diseases can be caused by a variety of factors, including bacteria, viruses, fungi, parasites, and allergies. The most common skin diseases in beef cattle include:

- **Tick and Other Exo-Parasites**

Ticks and other exo-parasites can also cause significant problems for beef cattle. The most common ticks that infest beef cattle include the cattle tick (Boophilus microplus), the brown dog tick (Rhipicephalus sanguineus), and the lone star tick (Amblyomma americanum). These ticks can transmit a variety of diseases to cattle, including anaplasmosis, babesiosis, and heartwater. Other exo-parasites that can infest beef cattle include lice, mites, and flies. These parasites can cause irritation and discomfort for cattle, and they can also transmit diseases.

The best way to manage skin diseases and tick and other exo-parasites infestation in beef cattle is to prevent them from occurring in the first place. This can be done by following good management practices, such as:

- ✓ Providing adequate shelter and ventilation to keep cattle cool and dry.
- ✓ Maintaining good sanitation to reduce the spread of bacteria and parasites.
- ✓ Treating cattle with vaccines and other medications to prevent and treat diseases.

Using tick and other exo-parasites control products to keep these pests off of cattle.

The management of health problems in feedlots is an important part of ensuring the health and welfare of cattle. Feedlots are often crowded and stressful environments, which can increase the risk of disease transmission. Additionally, feedlots often house cattle from a variety of sources, which can increase the risk of introducing new diseases into the herd. Body weight gaining, transportation, transportation related risk and marketing are identified as management of health problems in feedlot.

There are a number of things that can be done to manage health problems in feedlots, including:

- **Vaccination**: Vaccination is an important way to prevent diseases in feedlots. Cattle should be vaccinated against common diseases such as brucellosis, leptospirosis, and erysipelas and others.
- **Deworming**: Deworming is also an important way to prevent diseases in feedlots. Cattle should be dewormed regularly to prevent the spread of internal parasites.

- **Good sanitation**: Good sanitation is essential for preventing the spread of disease in feedlots. Feedlots should be cleaned and disinfected regularly to remove manure and other organic matter that can harbor bacteria and other pathogens.
- **Proper nutrition**: Proper nutrition is important for maintaining the health of cattle in feedlots. Cattle should be fed a diet that is balanced in nutrients to ensure that they are getting the nutrients they need to stay healthy.
- **Good management practices**: Good management practices can also help to prevent diseases in feedlots. Cattle should be handled carefully to avoid injuries. They should also be provided with adequate space, ventilation, and water to ensure their comfort and well-being.
- **Biosecurity**: Implementing a biosecurity plan is crucial to prevent the spread of infectious agents. This includes avoiding the introduction of disease agents by keeping a closed herd/flock and minimizing contact with wildlife or other domesticated species.

Self-Check – 2	

Name_____ ID_____signature_____ date_____

Directions: Answer all the questions up on the instruction

Part I. Choose the best answers (1pt each)

1) Open feedlots provide a roofed structure for housing cattle and offer protection from weather conditions.
2) Bedded pack feedlots utilize a deep bedding material to provide comfort and reduce stress in feedlot cattle.
3) Proper drainage and waste management are important considerations in the management of health problems in feedlots.
4) Vaccination programs are commonly implemented in feedlots to prevent and control the spread of diseases.
5) Adequate ventilation is crucial in feedlot houses to minimize respiratory issues and maintain air quality

Part II. Choose the best answers (1pt each)

1) Which of the following factors should be considered when selecting a location for a beef farm?
   a) Availability of grazing land b) Proximity to markets c) Access to water resources d) All of the above
2) Which of the following is a common source of feed for beef cattle?
   a) Pasture and forage b) Grain and concentrates c) Silage and hay d) All of the above
3) Which of the following is a consideration when designing beef farm facilities?
   a) Adequate fencing and containment b) Proper handling facilities c) Shelter and protection from extreme weather conditions d) All of the above
4) What is the primary purpose of backgrounding or stocker operations in beef farming?

a) Raising calves to weaning age b) Growing weaned calves before finishing

c) Producing breeding stock d) All of the above

5) Which of the following is a common feedlot practice for finishing beef cattle?

a) Feeding high-energy diets b) Providing constant access to fresh water

c) Monitoring and managing animal health d) All of the above

Part III Short Answer Questions (2pts each)

1) What is some common safety hazards associated with the handling of feedlot cattle?
2) What are the potential health risks for workers exposed to manure and dust in a feedlot environment?
3) How can the risk of accidents and injuries be minimized when handling equipment and machinery in a feedlot?
4) What are some biosecurity measures that should be implemented to prevent the introduction and spread of diseases in a feedlot?
5) What are the potential environmental hazards associated with improper management of feedlot waste and runoff?

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

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

LG #34 LO3 # Perform small ruminate Farm/pig farm Husbandry practice and management

Instruction sheet 3

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

- Considerations in the establishment of shoat farm
- Breeding and nature of sheep and goat breeds
- Housing accommodation sheep and goat farm
- Nutrition and feeding plan for sheep and goat
- Management of common health problems

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Practice livestock farming systems based on production system and source of feeds and grazing system.
- Identify the farm b*u*siness based on resource availability and cost benefit analysis
- Determine the farm site selection and the type of house based relevant factors.
- Perform selections of the proper breed based on animal body conformation and the objective of the farm.
- Determine economic basis to supplementary feeding system according to enterprise requirements.
- Confirm and prepare feed and feed supplements in line with feeding plans.
- Identify and report existing and potential hazards in relation to feeding and watering to the supervisor.
- Perform animal feeding based on the required farm objective.
- Identify and apply preventive measures on specific small ruminant pig disease as organization rule and regulation.
- Perform product quality, transportation, marketing and cost benefit analysis based on

farm management practices
Learning Instructions:
1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below. 3. Read the information written in the information Sheets 4. Accomplish the Self-checks

Information Sheet 3

3.1.Considerations in the establishment of shoat farm

Sheep and goat farming is a profitable agricultural enterprise that can provide a steady source of income for farmers. However, before starting a sheep and goat farm, it is important to consider the following factors:

- **Site selection**: The site for the farm should be well-drained and have access to water and feed. It should also be located in an area with a mild climate and low risk of pests and diseases.
- **Sheep and goat breeds**: The breeds of sheep and goats that are chosen should be suited to the climate and conditions of the farm. They should also be resistant to diseases and parasites.
- **Housing:** The housing for sheep and goats should be well-ventilated and provide protection from the elements. It should also be large enough to allow the animals to move around freely.
- **Feeding**: Sheep and goats should be fed a diet that is high in quality and nutrients. The diet should be based on forage, but it may also include grain and supplements.
- **Water**: Sheep and goats need access to clean water at all times. The water should be fresh and free of contaminants.
- **Health care**: Sheep and goats should be vaccinated and dewormed regularly to prevent diseases. They should also be treated for any health problems that they may develop.
- **Marketing**: The products from the sheep and goat farm should be marketed to a target audience. The products can be sold directly to consumers or through a distributor.

3.2.Breeding and nature of sheep and goat breeds

Sheep and goats are two of the most important livestock species in the world. They provide meat, milk, wool, and hides, and they are also used for draft power and transportation. There are many different breeds of sheep and goats, each with its own unique characteristics.

- **Sheep breeds**

Sheep breeds are classified into two main groups: wool breeds and meat breeds. Wool breeds are raised for their wool, which is used to make clothing, blankets, and other textiles. Meat breeds are raised for their meat, which is a popular source of protein. Some of the most popular wool breeds of sheep include the Merino, the Suffolk, and the Cheviot. These breeds produce high-quality wool that is used to make fine fabrics. Meat breeds of sheep include the Hampshire, the Dorset, and the Southdown. These breeds produce high-quality meat that is lean and flavorful.

- **Goat breeds**

Goat breeds are also classified into two main groups: dairy breeds and meat breeds. Dairy breeds are raised for their milk, which is used to make cheese, yogurt, and other dairy products. Meat breeds are raised for their meat, which is a popular source of protein. Some of the most popular dairy breeds of goats include the Saanen, the Alpine, and the Toggenburg. These breeds produce high-quality milk that is rich in nutrients. Meat breeds of goats include the Boer, the Kiko, and the Nigerian Dwarf. These breeds produce high-quality meat that is lean and flavorful.

3.2.1. Popular breeds of Sheep and goats in Ethiopia

Ethiopia is known for its rich diversity of sheep and goat breeds, with many adapted to the country's diverse agro-ecological zones. Here are some popular sheep and goat breeds in Ethiopia:

- **Sheep**:
  - ✓ **Menz sheep**: Indigenous to the Menz region of Ethiopia, this breed is well-adapted to harsh environments and is known for its resistance to diseases and parasites. It is a medium-sized breed with a white or black coat.

- ✓ **Afar sheep**: Found in the Afar region, these sheep are well-suited to arid and hot climates. They have a long-legged and slender body, often with a white or light-colored coat.
- ✓ **Horro sheep**: Indigenous to the Horro region, these sheep are known for their high fertility and adaptability to various environments. They have a medium-sized body and can have different coat colors, including white, brown, or black.
- ✓ **Washera sheep**: Found in the central highlands of Ethiopia, the Washera breed is known for its good meat and wool production. They have a medium-sized body and a white or black coat.

- **Goats:**
  - ✓ **Arsi-Bale goat**: Indigenous to the Arsi and Bale highlands, this breed is well-adapted to cold and mountainous regions. It has a medium-sized body and is known for its meat and milk production.
  - ✓ **Somali goat**: Commonly found in the Somali region, this breed is adapted to arid and semi-arid environments. It has a small to medium-sized body and is known for its resilience and ability to browse on various vegetation types.
  - ✓ **Bati goat**: Indigenous to the Bati area of Ethiopia, these goats are well-adapted to the dry and hot lowland areas. They have a medium-sized body and are known for their meat production.
  - ✓ **Central Highland goat**: Found in the central highland areas of Ethiopia, this breed is adaptable to various agroecological zones. It has a medium to large-sized body and is raised for meat, milk, and skin production.

3.2.2. Breeding Techniques of sheep and goats

The breeding technique that is used will depend on the specific goals of the breeder. For example, if the goal is to produce a large number of offspring, natural breeding may be the best option. However, if the goal is to produce offspring with specific traits, such as high milk production or resistance to disease, artificial insemination or in vitro fertilization may be a better option.

When selecting animals for breeding, it is important to look for specific traits. For example, female goats and sheep should have a long, preferably low-set body, a roomy hind quarter, a well-formed pliable udder, an active foraging habit, and good mothering instincts. Wide roomy hind quarters with good space between the inner aspects of two thighs indicate future udder development. Male animals should be in good body condition, have strong legs free from defects, and show good libido. They should also have both testicles intact in the scrotum. The breeding age for indigenous breeds of sheep and goats should be between 18 and 24 months, depending on their body condition. Breeding ewes that are too young can result in more weaklings and higher lamb loss. As a guideline, females should be mated only when they reach 70% of the average adult body weight.

There are a number of breeding techniques that can be used to improve the quality and productivity of sheep and goats. These techniques include:

- **Natural breeding**: This is the most common breeding technique used for sheep and goats. It involves the natural mating of two animals.
- **Artificial insemination**: This technique involves the artificial introduction of semen from a male animal into the reproductive tract of a female animal.
- **In vitro fertilization**: This technique involves the fertilization of an egg outside of the body. The fertilized egg is then transferred to the uterus of a female animal.
- **Embryo transfer**: This technique involves the transfer of an embryo from one female animal to another.

3.3.Housing accommodation sheep and goat farm

The accommodations of a house for sheep and goats should be designed to provide the animals with a comfortable and safe environment. The house should be well-ventilated and have plenty of space for the animals to move around. The floor should be covered with a soft material, such as straw or wood shavings, to protect the animals' feet. The house should also be equipped with a water trough and a feeding trough.

There are a number of different types of houses that can be used for sheep and goat farming. The type of house that is best suited for a particular farm will depend on a number of factors, including the climate, the size of the flock, and the budget.

Some of the most common types of houses for sheep and goats include:

- **Open-air houses**: These houses are typically made of wood or metal and have a roof to protect the animals from the elements. They are often used in areas with mild climates.



Figure 3.1: open air house for sheep and goats

- **Barns**: These houses are typically made of wood or concrete and have walls and a roof to protect the animals from the elements. They are often used in areas with cold climates.




Figure 3.2: modern and traditional barns for small ruminates

- **Sheds**: These houses are typically made of wood or metal and have a roof to protect the animals from the elements. They are often used in areas with hot climates.
- **Tunnel houses**: These houses are typically made of plastic or metal and have a roof to protect the animals from the elements. They are often used in areas with cold climates.



Figure 3.3:- Tunnel houses for shoats

3.4.Nutrition and feeding plan for sheep and goat

Sheep and goats are ruminants, which mean that they have a four-chambered stomach that allows them to digest plant material that is difficult for other animals to digest. This makes them well-suited for grazing on roughage, such as hay and straw. However, they also need a diet that is balanced in nutrients, including protein, carbohydrates, fats, vitamins, and minerals. The specific nutritional requirements of sheep and goats vary depending on their age, breed, and production status. For example, lactating ewes and does have higher nutritional requirements than non-lactating animals. Similarly, growing lambs and kids need more protein and energy than adult animals.

The feeding plan for sheep and goats should be based on their nutritional requirements and the availability of feed resources. For example, if you are grazing your animals on pasture, you will need to supplement their diet with hay or other feedstuffs during the winter months. Like other, all nutrients are required for feeding of sheep and goat. The feeds also include roughage and concentrates. The nutrients are used for maintenance, growth, production (meat, milk and wool), and reproduction. The amount of those nutrients for different classes of sheep and goat is found in nutrient requirement table (NRC) tables.

The feeding of sheep classified as:

- Feed of breeding ewes according to their production states i.e. during pregnancy, at lambing and during lactation.
- Feeding growing, finishing lambs from birth to weaning
- Scales for body condition scoring of sheep.

It is important to note that sheep and goats are susceptible to a number of nutritional disorders, such as copper deficiency, vitamin A deficiency, and salt poisoning. It is important to consult with a veterinarian to ensure that your animals are getting the nutrients they need to stay healthy.

The nutrition and feeding plan for sheep and goats depends on several factors. Here are some general guidelines: Sheep and goats require five essential nutrients: water, energy (carbohydrates and fat), protein, vitamins, and minerals. A deficiency in any of these can cause illness, poor growth or performance, and even death[1]. Signs of a good diet include rapid growth and high

productivity. The feeding system of shoat farming can be indoor or outdoor but for energy conservation and good turn over indoor feeding system is better than outdoor feeding system.

Nutrient Requirements of Lambs (*from NRC, Nutrient Req. of Sheep, 1985*)

Body Weight (lb)	Daily Gain (lb)	DAILY DRY MATTER: Per Animal (lb)	DAILY DRY MATTER: % Live Weight	TDN (%)	Crude Protein (%)	Calcium (%)	Phosphorus (%)
Growing - Lambs finishing - 4 to 7 months old							
66	0.65	2.9	4.4	72.4	14.5	0.50	0.24
88	0.60	3.5	4.0	77.1	11.7	0.42	0.21
110	0.45	3.5	3.2	77.1	10.0	0.35	0.19
Early weaned lambs - Moderate growth potential							
22	0.44	1.1	5.0	81.8	25.5	0.80	0.38
44	0.55	2.2	5.0	81.8	16.8	0.54	0.25
66	0.66	2.9	4.4	75.9	14.5	0.51	0.24
88	0.76	3.3	3.8	78.8	13.3	0.51	0.26
110	0.66	3.3	3.0	78.8	12.1	0.47	0.25
Early weaned lambs - Rapid growth potential							
22	0.55	1.3	5.9	84.6	26.9	0.83	0.37
44	0.66	2.6	5.9	76.9	17.3	0.55	0.25
66	0.72	3.1	4.7	77.4	15.5	0.51	0.24
88	0.88	3.3	3.8	75.8	15.5	0.57	0.29
110	0.94	3.7	3.4	75.7	14.3	0.56	0.29
132	0.77	3.7	2.8	75.7	14.3	0.49	0.27

Figure 3.4: Nutrient requirement chart for lamb

3.5.Management of common health problems

- **Hoof overgrowth**

Hoof overgrowth in sheep and goats can be a serious problem, as it can lead to lameness and other health problems. There are a number of things that can be done to manage this condition, including:

- ✓ Hoof trimming: This is the most important step in managing abnormal growth or broken horn. Hoof trimming should be done every 6-8 weeks, or more often if necessary.
- ✓ Proper nutrition: A diet that is high in calcium and phosphorus can help to promote healthy hoof growth.

- ✓ Foot baths: Foot baths can help to soften the hoof and make it easier to trim.
- ✓ Hoof sealants: Hoof sealants can help to protect the hoof from infection and moisture.

If abnormal growth or broken horn is severe, it may be necessary to surgically remove the affected tissue. This should only be done by a veterinarian.



Figure 3.5: overgrowth of hoof in small ruminates

- **Abnormal growth or broken horn**

Abnormal growth or broken horn of sheep and goats is a common problem in farming. It can be caused by a variety of factors, including genetics, nutrition, and environment. Abnormal growth or broken horn can lead to pain, discomfort, and infection. It can also make it difficult for sheep and goats to eat and drink.

There are a number of management practices that can be used to prevent and treat abnormal growth or broken horn of sheep and goats. These include:

- ✓ Selecting healthy animals for breeding: - Animals with a history of abnormal growth or broken horn should not be used for breeding.
- ✓ Providing adequate nutrition: Sheep and goats need a diet that is rich in protein, vitamins, and minerals. A deficiency in any of these nutrients can lead to abnormal growth or broken horn.

- ✓ Maintaining a clean environment: Sheep and goats should be housed in a clean environment that is free of parasites and other potential sources of infection.
- ✓ Handling sheep and goats carefully: Rough handling can damage the horns and lead to abnormal growth or broken horn.

If abnormal growth or broken horn does occur, it can be treated with a variety of methods, including:

- Surgery: Surgery can be used to remove or repair abnormal growth or broken horn.
- Medication: Medication can be used to treat infection and pain.
- Home remedies: Home remedies, such as applying a warm compress or using a natural antibiotic, can also be used to treat abnormal growth or broken horn.

- **Skin diseases, tick and other exo-parasites infestation**

Skin diseases, tick and other exo-parasites infestation are common problems in sheep and goat farms. These diseases can cause significant economic losses due to reduced productivity, increased mortality, and treatment costs. Therefore, it is important to have a good understanding of the different types of skin diseases and exo-parasites that can affect sheep and goats, as well as the appropriate management strategies to control them. The management of skin diseases and exo-parasites infestation in sheep and goats involves a combination of preventive measures and treatment. Preventive measures include:

- ✓ Good sanitation: to reduce the risk of infection.
- ✓ Regular grooming: to remove ticks and other parasites.
- ✓ Vaccination: against common diseases.
- ✓ Treatment of sick animals with appropriate antibiotics, antifungals, or antiparasitic drugs.

The management of common health problems in sheep and goat farms is essential to ensure the health and productivity of the animals. The management of these health problems can involve a variety of measures, including:

- Vaccinations

- Biosecurity: Implementing a biosecurity plan is crucial to prevent the spread of infectious agents. This includes avoiding the introduction of disease agents by keeping a closed herd/flock and minimizing contact with wildlife or other domesticated species.
- Deworming
- Good sanitation
- Proper nutrition
- Early detection and treatment of illness

Here are some specific tips for managing common health problems in sheep and goat farms:

- Parasites

  ✓ Vaccinations can help protect sheep and goats from internal parasites.
  ✓ Deworming can help control internal and external parasites.
  ✓ Good sanitation can help reduce the spread of parasites.
  ✓ Proper nutrition can help sheep and goats resist parasites.
  ✓ Early detection and treatment of parasitic infections can help prevent serious health problems.

- Infectious diseases
  ✓ Vaccinations can help protect sheep and goats from a variety of infectious diseases.
  ✓ Good sanitation can help reduce the spread of infectious diseases.
  ✓ Proper nutrition can help sheep and goats resist infectious diseases.
  ✓ Early detection and treatment of infectious diseases can help prevent serious health problems.

- Nutritional deficiencies
  ✓ Adequate nutrition is essential for the health of sheep and goats.
  ✓ A balanced diet that provides all the essential nutrients is important for preventing nutritional deficiencies.
  ✓ Good sanitation can help reduce the risk of nutritional deficiencies.
  ✓ Early detection and treatment of nutritional deficiencies can help prevent serious health problems.

Self-Check – 3	Written test

Name_____ ID_____signature_____ date_____

Directions: Answer all the questions below according to the instruction

Test I: write true for correct statement and false for incorrect one (1pt each)

1) Adequate fencing and secure enclosures are important considerations in the establishment of a shoat farm.
2) Providing proper nutrition and access to clean water is crucial for the health and productivity of sheep and goats on a farm.
3) Regular vaccination programs are commonly implemented in sheep and goat farms to prevent and control the spread of diseases.
4) Proper hygiene practices, such as regular cleaning and disinfection of facilities, are important in the management of health problems in sheep and goat farms.
5) Maintaining a good record-keeping system for monitoring health, breeding, and performance is not necessary in a sheep and goat farm.

Part II. Multiple questions (1pt each)

1) Which of the following is an essential nutrient that should be included in the diet of sheep and goats?
   a) Carbohydrates b) Proteins c) Fats d) All of the above
2) Which of the following is a common forage source for sheep and goats?
   a) Pasture grasses b) Hay c) Silage d) All of the above
3) What should be considered when formulating a feeding plan for sheep and goats?
   a) Nutritional requirements based on age and stage of production b) Availability and quality of forage c) Supplementing with minerals and vitamins as needed
   d) All of the above
4) Which of the following housing accommodations are important for sheep and goat farms?

a) Adequate shelter from extreme weather conditions b) Sufficient space for comfortable movement c) Proper ventilation to maintain air quality d) All of the above

5) Which of the following is a common feeding system for sheep and goats in a farm setting?

a) Free-choice feeding b) Total mixed ration (TMR) c) Grazing on pasture

d) All of the above

Test III Short Answer Questions (2pts each)

1) What are some factors to consider when selecting sheep and goat breeds for breeding purposes?
2) What are some characteristics of prolific sheep and goat breeds?
3) What is the importance of nutrition in the breeding process of sheep and goats?
4) What are some key components of a balanced feeding plan for sheep and goats?
5) How can the nutritional needs of pregnant and lactating sheep and goats differ from those of non-breeding individuals?

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

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

LG #35 LO4 # Apply fish production and management

Instruction sheet 4

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

- Introduction to aquaculture
- Fish as a vital source of food
- Considerations in construction of ponds and lakes
- Character and location of Ethiopian native freshwater fishes
- Fish nutrition and feeding
- Fish health management and biosecurity measures in fish farms

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Identify the farm business based on resource availability and cost benefit analysis.
- Determine the production site selection based on the availability of resource.
- Identify and manage specific disease related to fish as per organization disease control and prevention procedure.
- Identify and manage fish anatomy and behavior to improve farm production and productivity.
- Record and report feeding and watering abnormalities and signs of stress in animals to the supervisor according to organizational guidelines and procedures
- Implement bio-security programs in the different farming activities production and enterprise objectives.
- Maintain and regulate product quality and marketing in regularly way to reduce risks related to marketing.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet 4

4.1.Introduction to aquaculture

Aquaculture is the farming of aquatic organisms such as fish, shellfish, and aquatic plants. It is a major global industry, with an estimated value of $260 billion in 2020. Aquaculture provides food for millions of people around the world, and it is also a source of jobs and economic growth.

Aquaculture can be practiced in a variety of settings, from small ponds to large-scale industrial farms. The type of aquaculture system used depends on the species being farmed, the climate, and the availability of resources. Aquaculture is a major global industry. It provides food for millions of people around the world, and it is also a source of jobs and economic growth. Aquaculture is still a relatively new industry, but it has the potential to play a major role in feeding the world's growing population. **Available** at: - Introduction to Aquaculture - YouTube **Accessed** on 19/09/2023

Aquaculture can be used to farm a variety of aquatic organisms, including:

- Fish, such as salmon, tilapia, and catfish
- Shellfish, such as oysters, clams, and mussels
- Aquatic plants, such as seaweed and kelp

Aquaculture can provide a number of benefits, including:

- Food security. Aquaculture can help to meet the growing demand for seafood by providing a sustainable source of food.
- Economic development. Aquaculture can create jobs and economic growth in rural areas.
- Environmental protection. Aquaculture can help to protect the environment by reducing the pressure on wild fish stocks.

However, aquaculture can also have some negative impacts, such as:

- Pollution: - Aquaculture can pollute the water with waste products from the farmed organisms.

- Disease: - Aquaculture can spread diseases to wild fish populations.
- Conservation: - Aquaculture can compete with wild fish for food and habitat.

There are two main types of aquaculture systems:

i. **Freshwater aquaculture**: is the farming of aquatic organisms in freshwater environments, such as ponds, lakes, and rivers. Freshwater aquaculture is the most common type of aquaculture, and it is practiced in all parts of the world. Marine aquaculture is more challenging, but it is becoming increasingly important as the demand for seafood grows. Freshwater aquaculture systems can be divided into two main types:
   - **Pond aquaculture**: is the farming of aquatic organisms in ponds. Ponds can be natural or man-made, and they can be used to farm a variety of species, including fish, shellfish, and aquatic plants.
   - **Raceway aquaculture**: is the farming of aquatic organisms in raceways. Raceways are long, narrow channels that are used to circulate water through the system. Raceways are typically used to farm fish, and they can be used to produce a variety of species, including salmon, tilapia, and catfish.

ii. **Marine aquaculture**: is the farming of aquatic organisms in marine environments, such as oceans, estuaries, and coastal lagoons.

Marine aquaculture systems can be divided into two main types:

a) **Offshore aquaculture**: is the farming of aquatic organisms in offshore waters. Offshore aquaculture systems are typically used to farm shellfish, such as oysters, clams, and mussels.

b) **Inshore aquaculture**: is the farming of aquatic organisms in inshore waters. Inshore aquaculture systems are typically used to farm fish, and they can be used to produce a fish

4.2.Fish as a vital source of food

Fish is considered one of the healthiest foods on the planet. It is packed with important nutrients such as high-quality protein, iodine, and various vitamins and minerals. Fatty fish species like salmon, trout, sardines, tuna, and mackerel are particularly beneficial due to their higher fat-based nutrient content. Fish is also a great source of omega-3 fatty acids, which are essential for growth and development, especially brain and eye development in pregnant and breastfeeding women. It is recommended that pregnant women consume low-mercury fish such as salmon, sardines, and trout in moderation. Eating fish regularly has been linked to a reduced risk of heart attacks, strokes, and death from heart disease. It plays an important role in fighting hunger and malnutrition. Fish is a source of many vital ingredients such as protein, carbohydrate, minerals and vitamins, peptides and lipid, and essential fatty acids.



Figure 4.1: Image of fish as source of food and income

4.3.Considerations in construction of ponds and lakes

Ponds and lakes are important features in many landscapes. They can provide a place for recreation, wildlife habitat, and water storage. However, before you can build a pond or lake, there are a few things you need to consider.

- **Site selection**: The first step in building a pond or lake is to choose a suitable site. The site should be large enough to accommodate the desired size of the pond or lake, and it should be

located in an area that is not prone to flooding. The site should also be relatively flat, with good drainage.

- **Soil type**: The soil type is another important consideration. The soil should be able to hold water without becoming saturated. Sandy soils are not ideal for ponds or lakes, as they drain too quickly. Clay soils are better suited for ponds and lakes, as they hold water more effectively.
- **Water source**: You will need to provide a water source for your pond or lake. The water source can be a natural spring, a well, or a municipal water supply. If you are using a natural spring or a well, you will need to make sure that the water is clean and free of contaminants.
- **Pond liner**: If you are building a pond, you will need to install a liner to prevent the water from seeping into the ground. The liner can be made of a variety of materials, including rubber, plastic, or fiberglass.
  - **Excavation**: Once you have chosen a site and installed a liner, you can begin excavating the pond or lake. The depth of the pond or lake will depend on the desired use. For example, a pond that will be used for swimming should be at least 4 feet deep.
  - **Planting**: Once the pond or lake is excavated, you can begin planting aquatic plants. Aquatic plants help to oxygenate the water and provide food and shelter for fish and other wildlife.
  - **Fishing**: - If you plan to fish in your pond or lake, you will need to stock it with fish. The type of fish you stock will depend on the size of the pond or lake and the climate.
  - **Maintenance**: Ponds and lakes require regular maintenance to keep them clean and healthy. You will need to remove debris from the water, control algae growth, and test the water quality regularly.



Figure 4.2: Typical pond used for fish farming

4.4.Character and location of Ethiopian native freshwater fishes

Ethiopia is home to a wide variety of freshwater fish species. These fish are found in a variety of habitats, including rivers, lakes, and wetlands. The Ethiopian native freshwater fishes are classified into two groups: the cyprinids and the characins. The cyprinids are a large family of fish that includes carp, minnows, and barbs. The characins are a family of fish that includes tetras, piranhas, and hatchet fish.

The cyprinids are the most common group of Ethiopian native freshwater fishes. They are found in a variety of habitats, including rivers, lakes, and wetlands. The most common cyprinids in Ethiopia are the Nile tilapia, the African catfish, and the African lungfish. The characins are a smaller group of Ethiopian native freshwater fishes. They are found in a variety of habitats, including rivers, lakes, and wetlands. The most common characins in Ethiopia are the tiger fish, the African tetra, and the African butterfly fish.

The Ethiopian native freshwater fishes are an important part of the country's ecosystem. They provide food for humans and other animals, and they help to regulate the water quality in rivers and lakes. The Ethiopian native freshwater fishes are also a popular tourist attraction.

4.5.Fish nutrition and feeding

Fish nutrition and feeding strategy play vital roles in the growth, health, and productivity of fish. Proper nutrition ensures that fish receive the necessary nutrients for their metabolic processes, growth, reproduction, and overall well-being. Here are some key points related to fish nutrition and feeding:

- **Nutrient requirement of fish**

  The nutrient requirements of fish vary depending on their species, life stage (larvae, fingerlings, and adults), activity level, and environmental conditions. Each species has specific dietary needs, and their feed must be tailored accordingly.

  - ✓ **Macronutrients**: Fish require macronutrients such as proteins, carbohydrates, and lipids (fats) in their diet. Proteins are essential for growth and tissue repair, carbohydrates provide energy, and lipids serve as a concentrated energy source.
  - ✓ **Micronutrients:** Fish also need micronutrients, including vitamins and minerals, in small quantities. These micronutrients are crucial for various metabolic functions, enzyme systems, and overall health.

- **Feeding habits**: Fish exhibit diverse feeding habits based on their species. Some are herbivorous, consuming plant matter, while others are carnivorous or omnivorous, feeding on other animals or a combination of plant and animal matter.
- **Formulated feeds**: Commercial fish feeds are widely used in aquaculture. These feeds are formulated to provide a balanced diet containing the necessary nutrients for optimal fish growth and health. They are available in various forms, such as pellets, flakes, or granules.
  - ✓ **Protein sources**: Fish feed formulations typically include protein sources such as fishmeal, soybean meal, and other plant or animal protein concentrates. The protein content and quality of the feed are crucial for promoting healthy growth.

- ✓ **Lipid sources**: Fats and oils from fish, vegetable, or animal sources are included in fish feeds as lipid sources. These lipids provide energy and essential fatty acids required for various physiological functions.

Feeding strategies: Feeding strategies in aquaculture can vary. In aquaculture, various feeding strategies are employed to ensure that fish receive adequate nutrition and optimize their growth and health. The choice of feeding strategy depends on the fish species, their feeding habits, farming system, and available resources. Here are some common feeding strategies used in fish aquaculture:

- ✓ **Hand-feeding:** This is a straightforward method where feed is manually provided to the fish at regular intervals. It is commonly used in small-scale or pond-based aquaculture systems. Hand-feeding allows for direct observation of fish behavior and feeding response, making it easier to monitor feed intake and adjust feeding rates accordingly.
- ✓ **Automatic feeders**: Automatic feeders are mechanical devices that dispense feed at predetermined times and rates. These devices are often used in larger-scale aquaculture operations, such as fish farms or recirculating aquaculture systems (RAS). Automatic feeders can be programmed to release feed at specific intervals, ensuring regular and consistent feeding.
- ✓ **Demand feeding**: Demand feeding systems rely on the fish's natural feeding behavior to regulate feed intake. Feed is continuously available, and fish can access it as per their appetite. These systems often use floating feeders or feed trays that are replenished as needed. Demand feeding can help reduce feed waste and optimize feed conversion efficiency.
- ✓ **Feeding belts or conveyors:** This feeding strategy is commonly used in cage culture systems for species like salmon or trout. A continuous belt or conveyor system is installed beneath the cages, and feed pellets are dispensed onto the belt. As the belt moves, fish swimming near the surface consume the feed.
- ✓ **Feeding by-products**: In some cases, fish in aquaculture systems are fed with agricultural by-products or waste materials. This strategy helps reduce feed costs and promotes sustainability by utilizing available resources. Examples include feeding fish with rice bran, soybean hulls, or agricultural residues.

- ✓ **Biofloc technology:** Biofloc systems promote the growth of microbial communities that convert organic matter into microbial protein. In these systems, the microbial biomass serves as a food source for the fish, reducing the reliance on external feed inputs. Fish in biofloc systems can feed on the suspended particles and biofloc aggregates present in the water.
- ✓ **Precision feeding**: Precision feeding involves adjusting the feed ration based on real-time monitoring of fish behavior, growth, and environmental conditions. It utilizes sensors, cameras, or automated systems to collect data on fish size, weight, and feeding activity. This information is then used to optimize feed delivery and minimize feed waste. Environmental impact: Sustainable aquaculture practices aim to minimize the environmental impact of fish feeding. This includes optimizing feed formulations, reducing feed waste, and managing nutrient discharge to maintain water quality. Feeding frequency and portion size should be optimized to prevent overfeeding or underfeeding.

4.6.Fish health management and biosecurity measures in fish farms

Fish health management and biosecurity measures are crucial in fish farms to prevent the introduction and spread of diseases, maintain fish health, and ensure the overall productivity and sustainability of the operation. Here are some key aspects of fish health management and biosecurity in fish farms:

a) **Disease prevention and monitoring**: Regular monitoring of fish health is essential to detect any signs of disease early. This includes visual observation of fish behavior, appetite, and external signs of illness, as well as periodic health checks conducted by trained professionals. Monitoring can help identify potential disease outbreaks and prompt immediate action.

b) **Quarantine and screening**: Introducing new fish to a farm can carry the risk of introducing pathogens. Quarantine procedures involve isolating newly arrived fish in separate facilities for a period of time to observe their health status and ensure they are free from diseases before introducing them into the main population. Screening tests,

such as PCR (polymerase chain reaction) or ELISA (enzyme-linked immunosorbent assay), may be conducted to detect specific pathogens.

c) **Pathogen control and treatment**: If diseases are detected, appropriate treatment or management strategies should be implemented. This may involve the use of veterinary-approved medications, vaccines, or biosecurity measures to control the spread of pathogens. It is important to follow local regulations and guidelines regarding the use of medications and treatments.

d) **Water quality management**: Maintaining good water quality is crucial for fish health. Regular monitoring of water parameters such as temperature, dissolved oxygen levels, pH, ammonia, and nitrite levels helps ensure optimal conditions for fish. Proper filtration, aeration, and regular water exchange are important for preventing stress and disease outbreaks.

e) **Biosecurity protocols**: Implementing biosecurity measures can help prevent the introduction and spread of pathogens within fish farms. These measures may include:

- **Restricted access**: Controlling access to fish farm facilities to minimize the risk of unauthorized individuals or vehicles entering the premises.

- **Disinfection:** Establishing proper disinfection procedures for equipment, vehicles, and personnel to prevent the transmission of pathogens. This may include foot and hand baths, disinfection of nets, equipment, and vehicles before entering or leaving the farm.
- **Sanitation**: Maintaining good farm hygiene by regularly cleaning and removing organic waste, dead fish, and uneaten feed to reduce the risk of disease.
- **Pest control**: Implementing measures to control pests, such as birds, rodents, and insects, that can introduce diseases to fish farms.
- **All-in, all-out production**: Practicing all-in, all-out production involves emptying and thoroughly cleaning and disinfecting production units between fish batches to minimize the risk of disease transmission.

f) **Education and training:** Providing education and training to farm staff on fish health management, disease recognition, and biosecurity protocols is crucial. Well-informed and

trained staff can actively contribute to disease prevention, early detection, and appropriate response measures.

g) **Regulatory compliance**: Adhering to local regulations, permits, and reporting requirements related to fish health management and biosecurity is essential. Compliance with regulations helps ensure the responsible and sustainable operation of fish farms.

Fish health management and biosecurity measures should be tailored to the specific fish species, farming systems, and local conditions. Consulting with fish health professionals, veterinarians, or fisheries authorities can provide valuable guidance in developing and implementing effective health management and biosecurity protocols

Self-Check – 4	Written test

Name_____ ID_____signature_____ date_____

Directions: Answer all the questions below according to the instruction

Test I: write true for correct statement and false for incorrect one (1pt each)

1) Ethiopian native freshwater fishes are predominantly found in marine habitats.
2) Ethiopian native freshwater fishes exhibit a wide range of colors, shapes, and sizes.
3) Ethiopian native freshwater fishes are primarily found in the rivers and lakes of the Ethiopian Highlands.
4) When constructing ponds and lakes, it is important to consider the topography and soil characteristics of the site.
5) Adequate water supply and proper drainage are important considerations in the construction of ponds and lakes.

Part II. Choose the best one (1pt each)

1) Which of the following practices are part of fish health management in fish farms?
   a) Monitoring water quality parameters b) Regular health inspections and disease screenings c) Implementing vaccination programs d) All of the above
2) What are some common biosecurity measures implemented in fish farms?
   a) Quarantine and testing of new fish arrivals
   b) Controlling and monitoring the movement of personnel and equipment
   c) Disinfection of water sources and equipment d) All of the above
3) What is an essential nutrient that plays a crucial role in fish nutrition?
   a) Proteins b) Carbohydrates c) Lipids (fats) d) All of the above
4) Which of the following factors should be considered when formulating a fish feeding plan?
   a) Species-specific nutritional requirements b) Feeding frequency and portion sizes
   c) Utilization of appropriate feed types (pellets, flakes, etc.) d) All of the above
5) What are some common feed ingredients used in fish nutrition?
   a) Fishmeal b) Soybean meal c) Corn gluten meal d) All of the above

Test III Short Answer Questions (2pts each)

1) What is aquaculture, and how does it contribute to global food production?
2) What are some advantages of fish farming in comparison to traditional fishing methods?
3) How does aquaculture help in meeting the increasing demand for seafood?
4) What are some sustainable practices in aquaculture that promote environmental conservation?
5) What are the nutritional benefits of including fish in a balanced diet?

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

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

LG #36 LO5 # Carryout honey Bee production and

management

Instruction sheet 5

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

- Introduction to Apiculture
- Importance of bee keeping
- Important species of Honey bee in Ethiopia
- Site selection and nest configuration
- The three best types of hives
- Feed preparation and honey bee feeding
- Health management and biosecurity programs
- Honey/wax collection and marketing

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Identify the farm business based on resource availability and cost benefit analysis.
- Determine the production site selection based on the availability of resource.
- Identify and manage specific disease related to honey bee as per organization disease control and prevention procedure.
- Identify and manage honey bee anatomy and behavior to improve farm production and productivity.
- Record and report feeding and watering abnormalities and signs of stress in animals to the supervisor according to organizational guidelines and procedures
- Implement bio-security programs in different farming activities production and enterprise objectives.
- Maintain and regulate product quality and marketing in regularly way to reduce risks related to marketing

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 5

5.1.Introduction to Apiculture

Apiculture, also known as beekeeping, is the practice of managing honeybee colonies for the production of honey, beeswax, pollen, royal jelly, propolis, and other hive products. It is an ancient agricultural activity that has been practiced for thousands of years and continues to be an important industry worldwide.

Apiculture offers numerous ecological, economic, and cultural benefits. It contributes to pollination, biodiversity conservation, and the production of valuable hive products. Beekeeping also provides income opportunities for beekeepers and supports agricultural ecosystems by enhancing crop pollination. However, beekeepers must prioritize honeybee health and practice responsible management techniques to ensure the sustainability of honeybee populations and the quality of hive products.

Apiculture faces a number of challenges. One challenge is the spread of pests and diseases that can kill bees. Another challenge is the loss of habitat for bees. Beekeepers also face competition from other producers of honey and other hive products.

5.2.Importance of bee keeping

Beekeeping, also known as apiculture, is of significant importance for various reasons. Here are some key reasons why beekeeping is important:

a) **Honey Production**: Honey is the most well-known and widely consumed product of beekeeping. It is a natural sweetener with numerous health benefits and culinary uses. Beekeeping provides a sustainable and reliable source of honey, supporting local and global honey markets.

Honey can come in various types based on the food sources of the bees and the color of the honey. Here are some common types of honey classified by their food sources and colors:

I. **Clover Honey**: Clover honey is one of the most popular and widely available types of honey. It is derived from the nectar of clover flowers and has a light, golden color.

II. **Wildflower Honey**: Wildflower honey is made from the nectar of various wildflowers and blossoms. The color and flavor can vary depending on the specific flowers in the region, but it typically has a medium to dark amber color.

III. **Orange Blossom Honey:** Orange blossom honey is produced from the nectar of orange tree blossoms. It has a light, citrusy flavor and a pale to medium amber color.

IV. **Alfalfa Honey:** Alfalfa honey is made from the nectar of alfalfa flowers. It has a mild, delicate flavor and a light color, often appearing as a pale amber or almost white.

V. **Acacia Honey**: Acacia honey comes from the nectar of acacia tree blossoms. It has a light, transparent appearance and a mild, floral flavor.

VI. **Eucalyptus Honey**: Eucalyptus honey is derived from the nectar of eucalyptus tree blossoms. It tends to have a strong, distinctive flavor and a dark amber to reddish color.

VII. **Manuka Honey**: Manuka honey is produced by bees that feed on the nectar of the Manuka tree, which is native to New Zealand. It is known for its rich, earthy flavor and dark amber color. Manuka honey is highly regarded for its potential medicinal properties.

VIII. **Buckwheat Honey**: Buckwheat honey is made from the nectar of buckwheat flowers. It has a strong, robust flavor and a dark, reddish-brown color.

IX. **Lavender Honey:** Lavender honey is derived from the nectar of lavender flowers. It has a delicate, floral taste and a light golden color.

X. **Sage Honey**: Sage honey comes from the nectar of sage plant blossoms. It has a mild, herbal flavor and a light amber color.

It's important to note that the color and flavor of honey can vary depending on factors such as the geographical region, climate, and beekeeping practices.

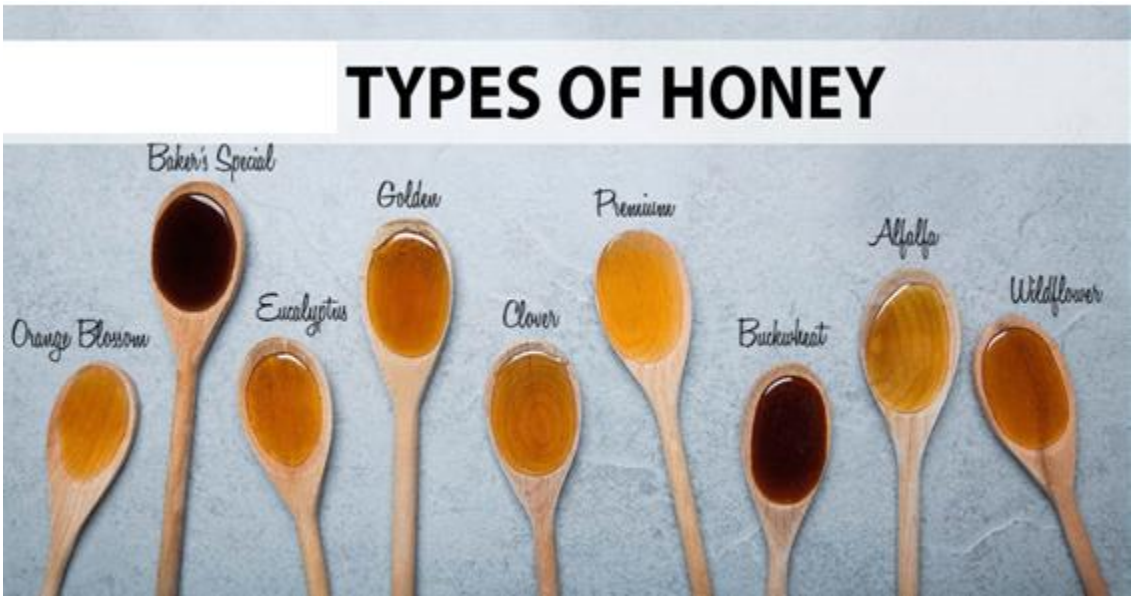


Figure 5.1 types of honey based on feed source and color

b) **Pollination:** Bees play a vital role in pollinating flowering plants, including many crops that are important for human food production. It is estimated that over 70% of the world's major crops depend on insect pollinators, with bees being the most effective and efficient pollinators. Beekeeping helps maintain healthy bee populations, ensuring the pollination of a wide range of plants and contributing to agricultural productivity and food security.

c) **Biodiversity:** Bees are crucial contributors to biodiversity and ecosystem health. Their pollination services help in the reproduction of wild plants, including trees, shrubs, and wildflowers. By supporting diverse plant populations, beekeeping indirectly promotes habitat preservation and conservation of ecosystems.

d) **Environmental Stewardship**: Beekeeping practices often align with sustainable and environmentally friendly principles. Beekeepers who use organic or natural methods of hive management help protect bees from exposure to synthetic chemicals and pesticides. This approach promotes ecological balance and contributes to the overall health of the environment.

e) **Economic Benefits**: Beekeeping can provide economic opportunities for individuals, communities, and regions. It can be a profitable venture through the sale of honey,

beeswax, pollen, royal jelly, and other bee-related products. Beekeepers can also offer pollination services to farmers, generating additional income.

f) **Educational and Recreational Value**: Beekeeping offers educational opportunities for individuals of all ages to learn about the fascinating world of bees, their behavior, and biology. It can serve as a valuable educational tool in schools and communities, raising awareness about the importance of pollinators, biodiversity, and environmental conservation. Moreover, beekeeping can be a fulfilling and enjoyable hobby, providing a connection with nature and a sense of accomplishment.

g) **Scientific Research:** Beekeeping contributes to scientific research and understanding of bees and their behavior. It provides opportunities for studying bee biology, genetics, disease management, and the impacts of environmental factors on bee health. Research outcomes from beekeeping can inform conservation efforts, sustainable agriculture practices, and the development of innovative solutions for bee-related challenges. **Available at**: Top 5 Reasons You Should Be Keeping Honey Bees - YouTube **Accessed** on 19/09/2023

5.3.Important species of Honey bee in Ethiopia

Ethiopia, known for its rich biodiversity, is home to several important species of honeybees. Here are some of the key honeybee species found in Ethiopia:

i. **Apis mellifera jemenitica**: Also known as the Ethiopian honeybee or the Yemeni honeybee, Apis mellifera jemenitica is a subspecies of the Western honeybee. It is well adapted to the arid and semi-arid regions of Ethiopia, particularly in the northern and eastern parts of the country. Ethiopian honeybees are known for their ability to withstand harsh environmental conditions, including hot and dry climates.

ii. **Apis mellifera scutellata**: The African honeybee, Apis mellifera scutellata, is another important honeybee subspecies found in Ethiopia. It is known for its high level of defensive behavior and adaptability to tropical and sub-tropical regions. African honeybees are highly productive and are known for their strong foraging capabilities.

iii. **Apis mellifera monticola**: Apis mellifera monticola, commonly referred to as the mountain honeybee, is found in the highland regions of Ethiopia. These honeybees have adapted to the cooler climates and higher altitudes, including the areas around the Ethiopian highlands. They are known for their ability to forage on various mountainous plant species.

iv. **Apis mellifera bandasii:** Apis mellifera bandasii is a subspecies of the Western honeybee found in Ethiopia. It is mainly distributed in the southwestern part of the country. These honeybees are adapted to the diverse vegetation and climatic conditions of the region.

v. **Apis mellifera adansonii**: Apis mellifera adansonii, also known as the West African honeybee, is found in the western part of Ethiopia. It is a subspecies of the Western honeybee and is known for its adaptability to the humid and forested areas.

These honeybee species in Ethiopia play a vital role in pollination, honey production, and the ecosystem as a whole. They have adapted to the diverse climatic and ecological conditions across the country, making beekeeping an important agricultural and economic activity in Ethiopia.

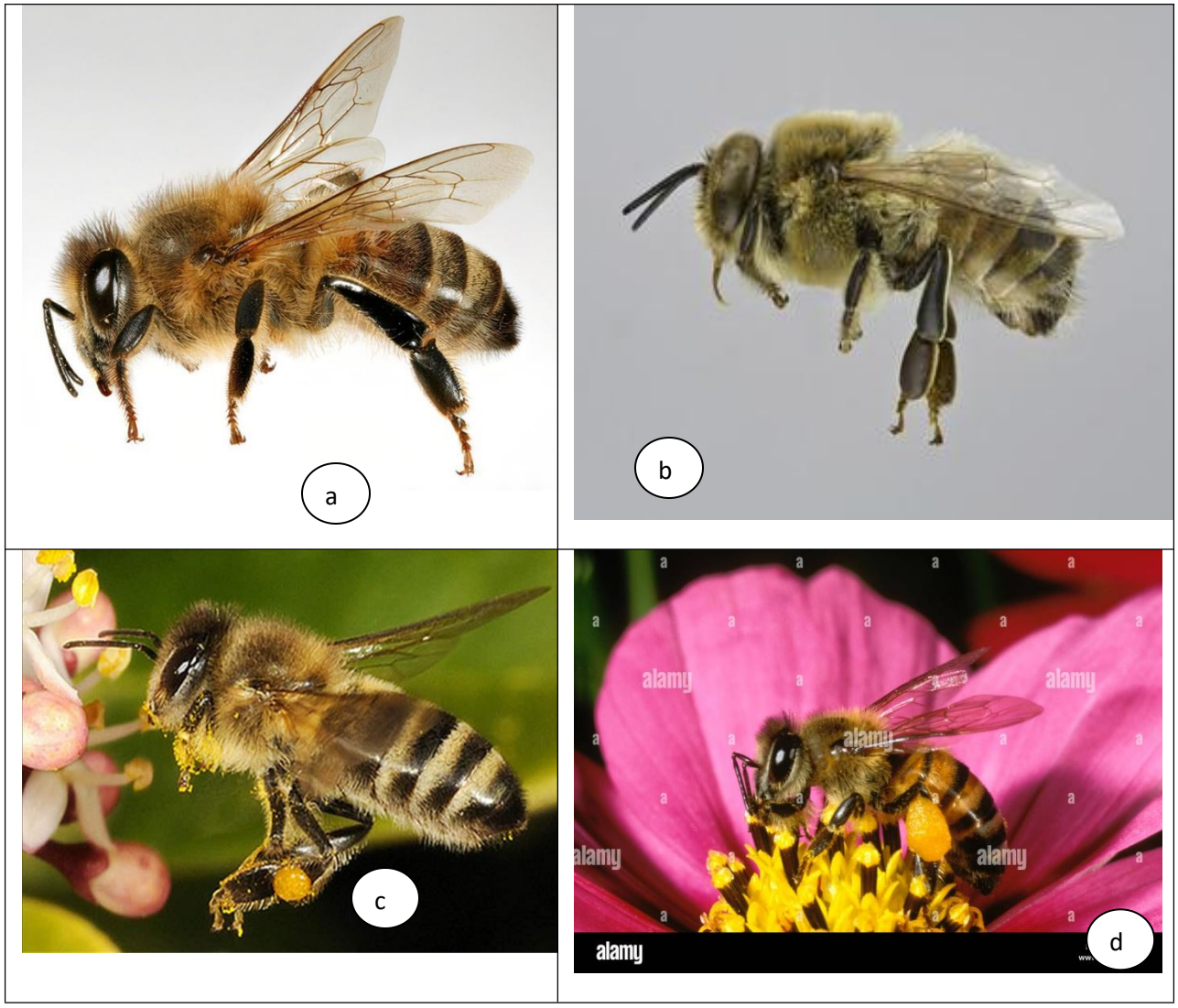


Figure 5.2: Apis mellifera Jemenitica (b), Apis mellifera monticola (c), Apis mellifera scutellata (a) Apis mellifera adansonii (d)

5.4.Site selection and nest configuration

Site selection and nest configuration are crucial factors to consider when setting up beehives for successful beekeeping. Here are some important criteria to consider:

- **Sun Exposure**: Bees thrive in warm conditions, so it is essential to select a site that receives ample sunlight throughout the day. Ideally, the hive should be placed in an area that gets morning sun, allowing the bees to warm up and become active early in the day.

However, in extremely hot climates, some shade during the hottest part of the day may be beneficial to prevent overheating.

- **Wind Protection**: Strong winds can disturb and stress the honeybees, so it is important to choose a location that provides some natural windbreak or create artificial windbreaks using fences, trees, or shrubs. This helps maintain a more stable hive environment and reduces the risk of wind-induced hive damage.
- **Accessibility**: The hive should be easily accessible for the beekeeper. This includes considering factors such as proximity to roads or paths for transporting equipment and ease of movement around the hive for regular inspections and maintenance.
- **Water Source**: Bees require a nearby water source for drinking and maintaining hive humidity. It is beneficial to have a clean and reliable water source, such as a pond, stream, or water trough, within a reasonable distance from the hive. Providing water near the hive reduces the chances of bees seeking water from undesirable locations, such as swimming pools or livestock watering areas.
- **Forage Availability**: Honeybees require a diverse range of nectar and pollen sources for their nutrition. It is advantageous to select a site with abundant floral resources nearby, including blooming trees, wildflowers, and agricultural crops. This ensures a constant and varied food supply for the bees throughout the year.
- **Pesticide Exposure**: Avoid locating beehives near areas with high pesticide use, such as agricultural fields sprayed with insecticides or herbicides. Pesticides can be harmful to bees, so it is important to choose a site where the bees are less likely to come into contact with chemical residues.
- **Hive Configuration**: The configuration of the hive should be designed to provide a suitable environment for the honeybees. This includes choosing the appropriate hive type (e.g., Langstroth, top-bar, or Warré hive) based on the beekeeper's preference and the local beekeeping practices. The hive should be properly ventilated, and entrance reducers can be used to regulate airflow and defend against intruders.
- **Hive Placement**: The hive should be raised off the ground to prevent moisture buildup and discourage pests from entering. Additionally, it is important to ensure a level and stable foundation for the hive to prevent tipping or instability.

By considering these criteria for site selection and nest configuration, beekeepers can create an optimal environment for their honeybee colonies, promoting their health, productivity, and overall success in beekeeping.

5.5.The three best types of hives

A beehive is a man-made structure or containers designed to house and manage a colony of honeybees. It serves as the living space for the bees, providing them with shelter, protection, and a place to store honey, pollen, and raise their brood (young bees). Beehives come in various designs and types.

There are several types of hives used in beekeeping, each with its own advantages and considerations. Here are three popular types of hives:

- **Langstroth Hive**: The Langstroth hive is one of the most widely used hive types in modern beekeeping. It consists of rectangular boxes (supers) with removable frames that hold the comb.
- **Top-Bar Hive**: The top-bar hive is a horizontal hive design that features bars placed across the top, on which bees build their comb.
- **Warré Hive**: The Warré hive, also known as the "People's Hive," is a vertical hive design that promotes natural bee behavior and requires minimal intervention. It consists of stackable boxes with top bars or starter strips for comb building.



Figure 5.3: Best beehive types (a) Langstroth Hive, (b) Top-Bar Hive and (c) Warré Hive

In Ethiopia, beekeepers utilize a range of hive types based on local practices and environmental conditions. Here are three commonly used hive types in Ethiopia:

a) **Traditional Skep Hives**: Traditional skep hives have a long history in Ethiopia and are still widely used, particularly in rural areas. These hives are typically made from woven grass or straw and have a domed or conical shape. Skep hives are inexpensive and readily available, making them accessible to beekeepers with limited resources. However, they lack the convenience of modern hive designs and require more invasive methods for honey extraction and hive inspection.

b) **Traditional Log Hives**: Log hives, also known as log gums, are another traditional hive type used in Ethiopia. They are made by hollowing out a section of a tree trunk or log, providing a natural cavity for the bees to inhabit. Log hives are relatively low-cost and can be found in forested areas where suitable logs are available. Similar to skep hives, log hives require more invasive methods for hive inspection and honey extraction.

c) **Modern Langstroth Hives**: In recent years, modern hive types like the Langstroth hive have gained popularity among Ethiopian beekeepers, especially in more commercial or semi-commercial operations. Langstroth hives provide several advantages, including standardized dimensions, removable frames, and efficient honey extraction methods. They are compatible with various beekeeping management techniques and facilitate colony growth and honey production. The use of Langstroth hives in Ethiopia is often associated with more intensive beekeeping practices and commercial honey production.

It's worth noting that beekeeping practices in Ethiopia can vary across different regions and among beekeepers. The choice of hive type depends on factors such as personal preference, financial resources, availability of materials, local beekeeping traditions, and the specific objectives of the beekeeper. The traditional skep and log hives retain cultural significance and are still commonly used, while modern hive types like the Langstroth hive offer advantages in terms of management and honey production.



Figure 5.4: Traditional and modern types of hives in Ethiopia

5.6.Feed preparation and honey bee feeding

Feeding honeybees may be necessary in certain situations, such as during periods of nectar dearth or when colonies are weak and need additional nourishment. Here are some considerations and methods for honeybee feed preparation and feeding:

- **Sugar Syrup**: Sugar syrup is a common feed for honeybees and is made by dissolving granulated white sugar in water. The ratio of sugar to water depends on the purpose of feeding. For general feeding, a common ratio is 1:1 (by weight) or 1:2 (by volume) of sugar to water. For stimulating brood rearing or winter feeding, heavier syrup with a ratio of 2:1 (sugar to water) is often used.
- **Pollen Substitute**: In some cases, beekeepers may provide pollen substitutes to colonies when natural sources of pollen are limited.
- **Fondant or Candy**: Fondant or candy is a solid feed commonly used for winter feeding or emergency feeding.
- **Protein Patties**: Protein patties or bee cakes are another form of supplemental feed that provides essential nutrients to honeybees.

When feeding honeybees, it is important to consider the timing and quantity of feed provided, as well as the overall health of the colony. Feeding should only be done when necessary and in accordance with local beekeeping practices and regulations. Additionally, ensuring that feeders and feeding equipment are clean and free from contaminants is crucial to maintaining colony health.

Feeding honeybees is sometimes necessary to support their health and survival, particularly during periods of nectar dearth, colony buildup, or when they are weakened due to various factors. Here are some key points to consider when feeding honeybees:

- ✓ Assess the Need
- ✓ Choose the Right Feed
- ✓ Feed Placement
- ✓ Feeding Techniques
- ✓ Timing of Feeding
- ✓ Water Sources
- ✓ Monitoring and Evaluation: Regularly monitor the colony's progress and feeding response. Assess the stored feed levels, overall colony health, and foraging activity. Adjust the feeding regimen as needed based on the colony's condition and external factors.

Remember, feeding honeybees should be seen as a temporary measure and should not replace efforts to promote healthy foraging environments, disease prevention, and proper hive management. Consulting with local beekeeping experts or organizations can provide valuable insights tailored to your specific region and conditions.



Figure 5.5:- Feeding of honey on sugar Syrup

- **Feeding and watering abnormalities**

Abnormalities in feeding and watering of honeybees can occur due to various factors, including environmental conditions, hive management practices, or underlying health issues within the colony. Here are some common abnormalities related to feeding and watering in honeybees:

- ✓ **Scouring**: also known as dysentery or diarrhea, is an abnormal condition that can affect honeybees. It is characterized by bees defecating outside the hive, resulting in noticeable streaks or splatters on the hive entrance or surrounding areas.
- ✓ **Ill thrift**": is a condition of poor growth or general unthriftiness in honeybee colonies. It is characterized by a lack of vigor, reduced population size, slow or stunted brood development, and overall poor performance of the colony.
- ✓ **Excessive robbing** or aggressive behaviors can lead to negative consequences, such as weakened colonies or increased stress levels within the apiary. Beekeepers often employ various management techniques to minimize the negative impacts of "greedy" or "bossy" behaviors, including proper Feeding
- ✓ **Feeding Imbalances or Deficiencies**: abnormal feeding practices or imbalances in the diet provided to honeybees can lead to nutritional deficiencies or health issues.
- ✓ **Fermentation of Stored Food:** Improper storage or excessive moisture in the hive can lead to the fermentation of stored food.

5.7.Health management and biosecurity programs

5.7.1. Health management in honeybee

Health management is essential for maintaining the well-being and productivity of honeybee colonies. Here are some key aspects of health management in honeybees:

- **Disease Prevention and Control**: Honeybees can be susceptible to various diseases, including American foulbrood, European foulbrood, Nosema, and fungal infections. Implementing disease prevention measures, such as regular colony inspections, maintaining hygienic hive conditions, and utilizing disease-resistant bee stock, can help reduce the incidence and impact of diseases. In cases of disease outbreaks, prompt diagnosis and appropriate treatments should be sought.

- **Nutrition**: Providing a balanced and diverse diet is vital for honeybee health. Bees require access to high-quality pollen and nectar sources for optimal nutrition. Promoting a diverse forage environment and supplementing with pollen substitutes or sugar syrup during periods of scarcity can help ensure bees receive adequate nutrition.
- **Hive Hygiene:** Maintaining clean and hygienic hive conditions is important for preventing the spread of diseases and parasites. Regularly cleaning and replacing old comb, removing debris and dead bees, and practicing good hive management techniques contribute to a healthy colony environment.
- **Queen Health and Replacement**: The queen bee is crucial for colony productivity and vitality. Regularly monitoring the queen's performance, assessing her overall health, and considering queen replacement if necessary ensures the colony has a strong and productive queen.
- **Swarm Control**: Swarming is a natural reproductive process of honeybees but can result in colony loss and reduced productivity. Implementing swarm control measures, such as providing ample space for the colony, performing timely colony inspections, and practicing techniques like swarm prevention splits or queen rearing, can help manage swarming tendencies.
- **Environmental Considerations**: Be mindful of the environmental factors that can impact honeybee health, such as pesticide exposure, extreme weather conditions, and habitat loss. Minimize pesticide use near bee colonies, provide protection from adverse weather, and support a diverse and pesticide-free forage environment.
- **Beekeeper Education and Training**: Continual education and training for beekeepers are crucial for staying updated on the latest research, best practices, and disease management techniques. Joining local beekeeping associations, attending workshops, and engaging with experienced beekeepers can provide valuable knowledge and insights.

Regular monitoring, careful observation, and timely intervention are essential components of health management in honeybees. It is recommended to work closely with experienced beekeepers, local beekeeping associations, or bee health experts who can provide guidance based on your specific circumstances and region.

5.7.2. Biosecurity programs in honeybee

Biosecurity programs in honeybees are designed to prevent the introduction and spread of diseases, pests, and pathogens in beekeeping operations. These programs aim to protect the health and productivity of honeybee colonies. Here are some key components of biosecurity programs in honeybees:

- **Quarantine and Testing:** Implementing a quarantine period for new colonies or bees introduced to the apiary helps prevent the introduction of diseases.
- **Hygienic Practices:** Practicing good hygiene is vital for preventing disease transmission. This includes maintaining clean hive equipment, regularly replacing old comb, and ensuring proper sanitation of tools and equipment used in hive management. Beekeepers should also practice proper hygiene protocols, such as handwashing and wearing clean protective clothing, when working with bees.

- **Colony Inspections and Monitoring**: Regular inspections and monitoring of honeybee colonies are essential for early detection of diseases and pests. Beekeepers should be familiar with the signs and symptoms of common diseases and pests and conduct thorough inspections to identify any issues. Monitoring techniques may include sampling for varroa mites, assessing colony strength, and observing behavioral changes.

- **Pest and Disease Management**: Implementing effective pest and disease management strategies is crucial for maintaining colony health. This may involve integrated pest management (IPM) techniques, such as monitoring mite levels, applying appropriate treatments, insect and birds control and using disease-resistant bee stock.

- **Controlled Access and Visitor Protocols**: Controlling access to the apiary and implementing visitor protocols can help prevent the introduction of diseases. Beekeepers should restrict access to authorized personnel only and enforce protocols such as footbaths/tire bath, hand washing, and protective clothing for visitors.
- **Equipment and Material Management**: Proper management of equipment and materials used in beekeeping is crucial for biosecurity.

- **Education and Training:** Continuous education and training are essential for beekeepers to stay updated on best practices, disease management techniques, and new research findings. Beekeeping associations, workshops, and educational resources provide valuable information to enhance beekeepers' knowledge and skills.



Figure 5.6:- Refreshing training for beekeepers to stay updated on best practices 3d

- **Collaboration and Reporting**: Beekeepers should collaborate with local beekeeping associations, veterinarians, and agricultural authorities to share information, report disease outbreaks, and seek guidance. Timely reporting of suspected or confirmed diseases is crucial for effective disease management and prevention.

Implementing robust biosecurity programs in honeybees requires a proactive and vigilant approach. Beekeepers should adapt their biosecurity practices based on local disease risks, regulations, and the specific challenges they face. Working with experts and local beekeeping communities can provide valuable support and guidance in developing and implementing effective biosecurity measures.

5.8.Honey/wax collection and marketing

- **Honey/Wax Collection:**
  - ✓ **Harvesting Honey**: Honey harvesting involves removing the frames or combs filled with mature honey from the beehive. Beekeepers typically wait until the honey is capped (covered with a layer of wax) by the bees, indicating its ripeness. The frames are carefully removed, and the bees are brushed or shaken off. The honey can then be extracted from the frames using various methods, such as centrifugal extraction or crushing and straining.
  - ✓ **Extracting Wax:** Beeswax is collected during honey extraction or through specific methods like solar wax melting. After the honey is extracted, the empty frames are often scraped to remove any remaining wax cappings. The cappings are then melted and filtered to separate the wax from impurities like bee parts and debris.

- **Marketing Honey/Wax:**
  - ✓ **Packaging and Labeling**: Once the honey is harvested and extracted, it can be packaged in jars, bottles, or other containers suitable for retail sale. Proper labeling is important, including information such as the honey's origin, floral source, production methods, and contact details of the beekeeper or producer.
  - ✓ **Branding and Differentiation**: Beekeepers can develop a unique brand or label for their honey or beeswax products to distinguish them in the market. This may involve creating a logo, designing attractive packaging, and emphasizing the unique qualities or production methods of their products.
  - ✓ **Direct Sales:** Beekeepers can sell their honey and beeswax products directly to consumers through various channels, such as farmers' markets, roadside stands, or on-farm stores. Direct sales allow for personal interaction with customers, enabling the beekeeper to share information about their products and beekeeping practices.
  - ✓ **Wholesale and Distribution**: Beekeepers can also explore partnerships with local food stores, specialty shops, or wholesalers to distribute their products on a larger scale. Developing relationships with retailers or distributors can help reach a broader customer base and increase sales volume.

- ✓ **Online Sales**: Establishing an online presence through a website or utilizing e-commerce platforms allows beekeepers to sell their honey and beeswax products to a wider audience. Online sales can be complemented by social media marketing and engaging with customers through digital platforms.
- ✓ **Certification and Quality Assurance**: Obtaining certifications, such as organic or fair trade certifications, can enhance the marketability of honey and beeswax products. Compliance with quality standards and maintaining good manufacturing practices are essential for building consumer trust and ensuring product quality.

Marketing honey and beeswax products involves understanding the target market, identifying unique selling points, and effectively communicating the quality and benefits of the products. Building a reputation for producing high-quality, sustainably sourced honey and beeswax can help beekeepers create a loyal customer base and establish a successful market presence

Self-Check – 5	Written test

Name_____ ID_____signature_____ date_____

Directions: Answer all the questions below according to the instruction

Part I. Choose questions (1pt each)

1) Which of the following are benefits of beekeeping and apiculture?
   a) Pollination of crops b) Honey production
   c) Beeswax and propolis production d) All of the above
2) How do bees contribute to agricultural productivity?
   a) By pollinating flowering plants, including crops
   b) By controlling pests and diseases in agricultural ecosystems
   c) By improving soil fertility through their activities
   d) All of the above
3) What is the role of bees in biodiversity conservation?
   a) Bees enhance the reproduction of wild plant species through pollination
   b) Bees provide food sources for other animals in the ecosystem
   c) Bees contribute to the maintenance of healthy ecosystems
   d) All of the above
4) Which of the following bee products have medicinal and therapeutic properties?
   a) Honey b) Royal jelly c) Bee pollen d) All of the above
5) How does beekeeping contribute to rural livelihoods and economic development?
   a) Beekeeping provides income through the sale of bee products
   b) Beekeeping creates employment opportunities
   c) Beekeeping enhances the value and productivity of agricultural systems
   d) All of the above

Test II Short Answer Questions (2pts each)

1) What are five common honey bee species found in Ethiopia?
2) Why is quarantine and testing important when introducing new honey bee colonies?
3) How does providing a diverse and abundant forage source contribute to honey bee health?
4) What factors should be considered when spacing and orienting honey bee hives within an apiary?
5) What are some key considerations when selecting a suitable site for honey bee apiaries, in terms of biosecurity and environmental factors?

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

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

Operation Sheet -5	

Procedures of bee wax collection and rendering using Tanganyika method (boiling with water)

A. Tools and equipments

I. PPE (gown, boots, gloves, head cover, apron.)

II. Boiler, sharp knife, excess water, combs with free of honey, electic source or fire

III. Wire gage strainer, or gauze/cloth)

B. Steps/procedures to measure temperature

I. Wear PPE

II. Put the combs inside the gauze/cloth and fold it

III. Insert the combs with gauze in to the boiler having water

IV. Boiling it and stirring it for some time and wait until boiled

V. Then the filtered mixture is allowed to cool slowly

VI. The finer mixtures will raise the surface and in due course the cake of the bees was can be removed the impurities below and above it, are scrapped off with sharp knife.

LAP TEST-5	

Name_____ ID_____ Signature_____-Date_____

Time started: 2:30 Time finished: 3:30 local time

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **1 hour**. The project is expected from each student to do it.

Task-1:-Collect and rendering honeybee wax using boiling with water (Tanganyika method)

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AKNOWLEDGEMENT

Ministry of Labor and Skills wish to extend thanks and appreciation to the many representatives of TVET instructors and respective industry experts who donated their time and expertise to the development of this Teaching, Training and Learning Materials (TTLM).

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