IVC
FIRST YEAR
Dairying
DAIRY
ANIMAL
MANAGEMENT
STATE INSTITUTE OF VOCATIONAL EDUCATION
DIRECTOR OF INTERMEDIATE EDUCATION
GOVT. OF ANDHRA PRADESH
1. INTRODUCTION - CONFIRMATION POINTS OF DAIRY ANIMAL

1.1 Dairy Statistics:

- World cattle population 1270 Millions
- World Buffalo Population 160.0 Millions.

- Cattle population in India 199.6 Millions.
- Buffalo population in India 80.68 Millions.
- Total bovine population in India 280.28 Millions.

India is having roughly 1/7th of World Cattle population India is having roughly 50% of world buffalo population.

- Cattle population in Andhra Pradesh: 12.375 Millions.
- 7th position in India.

- Buffalo population in A.P. 8.75 Millions.
- 2nd Position in India (After U.P.)

- Total Milk Production in the world: 580 Millions
- Total Milk production in India: 85.6 Million Tones.

India ranks 1st in the world in Milk Production.

- The per capital availability of milk in India is 204 grams per day / per person. But the I.C.M.R. has recommended a minimum of 280 grams
per day / per person. The per capita availability of milk in A.P. is 222 gms / per
day / per person and the highest per capital availability in India is Punjab (794
gms). The consumption pattern of milk in India is.

<table>
<thead>
<tr>
<th>Product</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Milk</td>
<td>46.0%</td>
</tr>
<tr>
<td>Ghee</td>
<td>28 %</td>
</tr>
<tr>
<td>Butter</td>
<td>6.5 %</td>
</tr>
<tr>
<td>curd</td>
<td>7.0 %</td>
</tr>
<tr>
<td>khoa</td>
<td>5.5 %</td>
</tr>
<tr>
<td>Milk powder</td>
<td>3.6 %</td>
</tr>
<tr>
<td>Cheese</td>
<td>2 %</td>
</tr>
<tr>
<td>Other products</td>
<td>1.4 %</td>
</tr>
</tbody>
</table>

1.2 Role of Dairying in Indian economy:

It is well established fact that India is basically an agriculture country.
Majority of its population live in village whose primary occupation is agriculture.
For a farmer dairying is a subsidiary source of income. It plays an important
role in the agriculture economy.

a) Dairying fits well in diversfield farming programs. It is highly recommended to have diversification many farms. This diversification will help to use the farm labour efficiently and dairying will be one such diversified activity in a farm. In addition to this it will be possible to have economic use of buildings and equipments. Since it is always risk to have only one source of income dairying helps in having an alternative source of income to the farmer.

b) Milk animals are efficient Consumers of roughages. The different types of roughages such as Paddy straw, Wheat straw etc. sometimes go waste on some farms. If the farmer has dairying these roughages can efficiently be converted into most nutrition’s milk. These roughages are bulky and it is not economical to transport them over long distances.
c) Dairying provides a stable income: The prices of most of the agriculture produce show great fluctuation. The prices of dairy products do not show such wide range of fluctuation in their prices.

d) Income is distributed throughout the year: If the farmer depends only on agriculture, he would be receiving income from his farm only on harvesting the crop. This would mean that the income of the farmer would only be seasonal. Since the produce from a dairy animal is distributed almost throughout the year.

e) Dairy production improves the family diet and reduces the food cost. Milk is a basic food and an important item in the family food budget. A small dairy enterprise can be justified on many farms if only for the production of milk products for family consumption. This is especially true when the family is big one.

f) Dairying aids in the maintenance of soil fertility. Legumes and grasses are grown on for from providing fodder to the animals. These crops are soil conserving and soil building crops. The manure provided is distributed on the land and returns plant food nutrients to the soil.

g) Supplies animals required for draft purpose. In our country most of the agriculture operations are still carried out by using bullock power. Unless a farmer has dairy animals with him, he cannot get the bullocks for replacing his old animals. Replacement of bullock by purchasing would be uneconomical for a small farmer. Hence dairying is useful as a source for such supplies.

1.3. Common Terms used in Dairy Management:

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALF</td>
<td>Young one of cow by birth to 6 Months of age is known as Calf</td>
</tr>
<tr>
<td>HEIFER</td>
<td>Female calf from the age of puberty to calving is known as Heifer.</td>
</tr>
</tbody>
</table>
BULL OR SIRE: A male calf from the age of puberty to castration is known as Bull or Sire. It is fit for servicing.

BULLOCK: A castrated bull is known as Bullock which is used for work or ploughing.

SCRUB BULL: A bull which is not having good progeny record non descriptive bull.

BREEDING BULL: A bull which is maintained for the purpose of breeding which is having good progeny record.

TEASER BULL: A caudectomised bull (after conducting cururectomy operation) which is used in the herd to detect the animals in heat.

COW: A femal or hifer after first calving is known as Cow.

MILCH COW: A cow which gives milk is known as Milch cow.

DRY COW: A cow which has stopped the milk is known as dry cow.

NOTE: The same terms are applied to the buffaloes with prefix of Buffaloes Eg. Buffalo calf, Buff Bull.

COLOSTRUM: The milk produced by a cow or buffaloe just after calving is known as Colostrum.

LACTATION: The period between the parturition or delivery of calf to stoppage of milk secretion of a cow is known as lactation.

GESTATION PERIOD: The duration of pregnancy is known as gestation period.
WEAVING : Separation of calf from the mother after parturition is known as weaning.

CULLING : Culling is a process in known the un-wanted, unproductive or uneconomic animals are removed from the herd or farm. This is done for economical.

BREEDING : Crossing of the male and female individuals of the same species to obtain the offspring of the desired characters is known as breeding.

OESTRUS OR HEAT PERIOD : The period during which the female animal accept the male for coitus or servicing and conception takes place.

A.I. : (Artificial Insemination) Introduction of semen into the female genital tract by means of instruments is known as A.I.

SERVICING : Mating of bull and cow in heat is known as servicing.

FREEMORTIN : When twin calves of opposite sexes are born to a cow, the female twin born is known.

VEAL : The meat of calf is known as veal.

1.4. External body parts of Dairy Animal:
SUMMARY:

Definition of different branches of diary science is explained in detail, dairy statistics and role of dairying in Indian rural economy is described in detail. The external body part of cow is shown drawing a figure of cow. Common terms which are used in dairy animal management has been described in details.

Short Questions:

1. Define dairy science?
2. Define dairy technology?
3. Define dairy bacteriology?
4. What is breeding bull?
5. Name the parts of in the head portion of the Cattle?
6. What is the total milk production in India?
7. What is the position of India in the milk production in world?
8. What is freemartin?
9. What is Artificial Insemination?

Long Questions:

1. Describe in detail the role of Dairying in Indian Rural Economy?
2. Draw a diagram of cow and label the external body part?
3. What are the common terms used in dairy animal management?
2. BREEDS OF DAIRY CATTLE AND BUFFALOS

DEFINITION AND INTRODUCTION:

A breed is a group of animals related similar characters like general appearance, size, features and configuration etc. A group of individual which have certain common characteristics that distinguish them from other groups of individuals is known as “Species”.

2.1 CLASSIFICATION OF CATTLE BREEDS:

Indian cattle breeds of cattle classified in three types

a) Milch breeds / Milk breeds
b) Dual Purpose breeds
c) Draught breeds

2.1.1 Milch Breeds / Milk Breeds:

The cows of these breeds are high milk yielders and the male animals are slow or poor work animals. The examples of Indian milch breeds are shahiwal, Red Sindhi, Gir and Deoni. The milk production of milk breeds is on the average more than 1600 kg per lactation.

2.1.2 Dual Purpose Breeds:

The cows in these breeds are average milk yielder and male animals are very useful for work. Their milk production per lactation is 500 kg to 150 kg. The example of this group are Ongole, Hariana, Kankrej, Tharparker, Krishna valley, Rathi and Goalo Mewathi.

2.1.3 DRAUGHT BREEDS

The male animals are good for work and Cows are poor milk yielders and their milk yield as an average is less than 500 kg per lactation.

They are usually white in colour. A pair of bullocks can haul 1000 kg. Net with an iron tyred cart on a good road at walking speed of 5 to 7 km per
hour and cover a distance of 30 to 40 k.m per day. Twice as much weight can be pulled on pneumatic rubber tubed carts.

2.2 INDIAN BREEDS OF DAIRY CATTLE

2.2.1 MILCH BREEDS/ MILK BREEDS:

(SAHI WAL: (Montgomery) The original tract of this breed is Montgomery district in Pakistan, but animals of this breed are found in Punjab and Haryana. Several pedigree herds are maintained in Punjab, Delhi, and North Bihar. (It is the highest milk yielding cattle breed in the Indian Sub Continent It is a medium sized breed, symmetrical body, broad fore head, thick short horns and fine loose skin

Dewlap is fine and ample in the male. Chest is broad and deep, legs proportionate to size with good feet In the male the sheath is pendulars, The tails is long with a black switch udder is large, broad and fine skin with prominent veins. Teats are good, uniform in size squary placed. Milk veins are large and prominent.

Fig.2.1.1 A Sahiwal cow
2.2.2 RED SINDHI:

This breed is from Sindh in Pakistan. The colour of the breed is deep dark red. The bulls are much darker than cows. A white marking on the forehead is common: The animals are medium sized, compact and symmetrical.

The head is of moderate size, forehead is broad and poll is prominent in between horns. Face is medium in length with well developed square black muzzle. Eyes are fairly large, and clear. Ears are medium sized, fine and alert. The horns are short and thick.

Dewlap is abundant in both males and females and hangs in folds, chest is broad and deep. Legs are medium in size. Tail is slender with black switch. The udder is large size with medium sized teats. Milk veins are well developed.

In India pedigree herds are found in Mysore, Tamilnadu, Orissa and Punjab.

Average weight of the male is 420 kg and the average weight of the female is 341 kg. The milk yield of selected village animal is 1100 kg in lactation period (300 days) and milk yield of well breeds herds is 1800 kgs in a lactation.
2.2.3 GIR

The native tract of this breed is Gir forest of Gujarat state. Animals of this breed are found in Punjab and Haryana. The popular colour is white with dark red or chocolate brown patches distributed over the body. The animals are medium sized with proportioned body. The head is moderately long, and massive and the forehead bulging. The face is narrow and clean. The nuzzle is square and black. The eyes are placed higher up in line with root of ears. Ears are large and pendulous. The horns are black, medium sized, shapely round medium heard, well set apart, and peculiarly curved. They take a down ward and backward curve and inline a little upwards and forwards taking a spiral inward sweep, finally ending in a fine taper.

Dewlap is thin and hanging not pendulous. Chest is deep, full and well ~ developed. Legs are well proportionate and muscular. The hump is ‘ medium sized and mark, edly developed. The barrel is deep, . long and proportionate. The back is long, strong and wide. The tail is long touching the ground. The udder is of medium size.

Average weight of the male is 545 kg. And that of the female is 386 kg. The average milk yield is 1590 kg. The bullocks are heavy and good for draught
2.2.4 DEONI:

ONGOLE

The home of this breed is Marathwada now in Maharashtra state. This breed is considered by some as a strain of Gir.

The colour of the animal is white and black patches or red and white patches. The animals resemble Gir breed to extent.

The forehead is less prominent. The ears are long and pendulous. The chest is heavy and deep, the dewlap is well developed and in the males the sheath is pendulous.

The head is medium sized, prominent forehead, the horns curving outwards and backwards. A wedge shaped barrel and well placed.

Deoni animals are fairly good milk producers and the average being 700 kg in 300 days, and in well breed herds the average milk yield is 1000 kgs. The bullocks are large sized and good for heavy work.

2.2.5. DUAL PURPOSE BREEDS:

ONGOLE:

The home of this breed is Ongole tract comprising of Ongole Guntur, Sathenapalli, Vinukonda and Kandukur taluks and Nellore districts of Andhra Pradesh! The cows are good for milk production, and the male are for good for work. The colour of the, animal is white

The animals are usually docile and bullocks are very powerful and good for heavy plough and Cart work India.

The forehead is broad and prominent between Eyes, Black Kazal mark in around the eyes are cc mon. Face is moderately long, with wide nostril and black long nuzzlears are moderately Ion Q. The horns are short an stumpy. Loose horns are common in this breed
lump is well developed and erect, dewlap is well developed giving folds extending to navel flap. Chest is deep and barrel is deep and long. The tail is long with black switch reaching below the hocks.

The udder is broad, extends well forwards and high up with moderate even sized quarters and teats are average size mammary veins are prominent. Bullocks are very powerful and Ongole is one of the heaviest breeds. The weight of the male is on the average of 545 kg to 682 kg. And that of the female is 432 to 455 kg. The average milk yield is 1600 kg in lactation.

2.2.6 HARIANA:

The home of this breed is Hariana state of India and distributed in Pubjab, Rajasthan and Uttarpradesh.

The colour of the breed is white or light grey. The head is light, and the face is long and narrow flat forehead. This eyes are large and bright expressive but not prominent in mature bulls. The horns are short and fine or moderately long, and they are generally 4 to 9 inches, long thinner in females than in males. Dewlap is small without flashy folds and large in males. The chest well developed.
Hump is large in males and medium sized in females. Legs are moderately long and lean and feet are small, hard and well shaped. In the males the sheath is short and tight and in the females the navel flap is not prominent. Tail is short, thin, reaching below the hock and tapering with black switch.

Udder is capacious with milk veins. Teats are medium sized and proportionate. The average weight of males is 371 to 490 kgs and that of the females is 265 kg.

The average milk yield of cows is 909 to 1364 kg. The bullocks are good for ploughing and road transport.

2.2.7 KANKREJ:

The home of this breed is Gujarat and distributed in Ahmedabad, Bombay and kutch. The colour of the female is Silver gray, iron or black. The males are darker than the females. It is one of the heaviest breed in India.

The forehead is broad slightly dished in the center. The horns are thick, strong and curved. Slightly symmetrical. The base of the horns are covered with skin (o a higher point that in other breeds. The body is powerful, with
broad chest. Straight back, well developed hump, pendulous sheath in males, and the tail is of moderate length with black switch extending below the hock.

The gait of the animal is peculiar and impressive with long and even strides known as 1 1/4 paces.

dewlap is thin and pendulous and hump is large and prominent. In cows udder is well shaped and slightly developed and carried more forward than behind.

The average weight of the male is 455 to 682 kg and of the female is 409 to 455 kg. The average milk yield is 1333 kg. In a lactation. The male are aSt, active, strong and good both for plough and cart.

Fig.2.2.7 KANKREJ COW
2.2.8. DRAUGHT BREEDS

MALVI:

The breed is found in Malwa tract in Madhya pradesh and Rajasthan. The bullocks are known for their draft qualities and the cows are poor milkers. The colour of the animals white to light grey, with black markings on neck, shoulders, hump and quarters. The colour changes with age.

The head is small and the face dished. The body is deep, short arid compact with short legs and the tail touching the fetlocks. Ears are short and alert. The sheath in the male and navel flap in the female are short. The horns are massively built. Black, upright and pointed at tips.

2.2.9. HALLIKAR

The home tract of this breed is Mysore, and Tumkur districts of Karnataka state, but the breed is widely distributed in South India.

The colour of the animal is Dark or Light grey with white patches round the face and dewlap. The bullocks are good for work, and the cows are poor milkers and the bullocks are suitable for both for road and field work. The head is long with bulging forehead furrowed in the middle. Horns are close together and spring perpendicularly from the head, carried backward with a graceful sweep on each side of the neck and curving upwards and terminate in sharp point. The body is long and compact with long and slender legs. The novel flap is tucked up and tail is thin.

![Fig. 2.2.9 HALLIKAR COW](image-url)
2.2.10 AMRIT MAHAL:

The home of this breed is Karnataka state. The colour of the animal is White and Grey. This is the best breed in India for drought purpose. The bullocks are and suited for quick transport and the cows poor milkers. The animals are active and fine in temperament.

The barrel is long, and well rounded, and the novel flap is tacked up. The head is well shaped, narrow, and the forehead is deeply furrowed. The eyes are bright. The legs are well proportioned and medium in length. The hooves are hard black with narrow clefts. The tail is fine and moderate in length. The udder is small compact with small hard teats.

2.2.11. KANGAYAM:

The home tract of this breed is kangayam division of Coimbattore district in Tamilnadu. The colour of the animals is White and Grey. But the cows are white with black markings in front of fetlocks or on knees.

The bulls are good for hard work and the cows are poor milkers. This is a medium sized draft breed. The bullocks are strong active and suited for heavy work and road transport. The head is short with a broad forehead. Horns curving outwards backwards and complete a circle at the point. The legs are short, the sheath in the male is small and the moderately long.

The udder is medium sized. Calves are red at birth and the colour changes to white when they are about 4 months of age.

2.3 EXOTIC DAIRY BREEDS

The European breeds of dairy cattle belong to the species of Bas Taurus. They are humpless generally large spread with a fine coat, short ears, without a pendulous, dewlap:

They are less heat tolerant and less disease resistant when compared to Indian cattle, but are superior in milk production,
Breeds of dairy cattle and buffalos

Exotic breeds of cattle have been used in India on a fairly extensive scale with a view to improve the milk yielding capacity of the indigenous cows.

The important European breeds of dairy cattle are Holstein brown Swiss, Jersey Guernsey and Ayrshire.

Out of the above breeds there is greater demand and use of H.F and Jersey breeds for crossing with the indigenous cows in India.

2.3.1. HOLSTIEN FRIESEAN

This is the world's highest milk yielding breed through the fat percentage of milk is very low. The home of this breed is Holland, the provinces of north Holland and wear Fries land. Animals of this breed are the largest among the European breeds. This breed of animals are imported by many countries in the world.

The colour of the animal is clearly defined. Black and white markings and re switch is always white. The animals are the largest with large barrel rid udders. The head is long and narrow. The cows are docile. The heifers are bred at 18 to 21 months of age. The calves are stronger, vigilours weighing on the average about 40 kg at birth Some pure bred animals may be solid black. Holestein Fresian Heifers mature much later than the other European breeds. Fresiani.

The ideal body weight of a cow is 682 kg and that of bull is 1000 kg. The cows are heavy milkers and the average lactational yield is 4295 kg in laction, with milk fat of 3.4 percentage. Individual animals touched 19,995 kg of milk in a lactation period of 365 days (One year).

The milk of these animals are used for cheese making as the fat percentage is low. This breed is also good for beef production, because of its fast growth and body fat. It is good for veal production due to good birth weight and growth rates of calves.
Fig. 2.3.1 HOLSTEIN FRIESIAN HEIFER
The Brown Swiss breed of cattle was developed in the mountainous area of Switzerland. The color varies from light brown to almost black. The muzzle is of light color. And also along the backbone a light-colored stripe is present. It is the oldest of dairy breeds.

Brown Swiss animals are large in body size, Brown Swiss animals with very good birth weight of calves, and white color of the body, Bro Swiss heifers mature and reach peak production at an earlier age than other dairy breeds.

Brown Swiss animals, originally grazing on mountain slopes in their natural environment, made them excellent grazers. The breed was developed for cheese production and so emphasis was given for high milk production, with low fat content and the milk fat is 4%.

**Figure 2.3.1 C HOLSTEIN FRIESIAN HEIFER**
2.3.3 JERSEY

The home of this breed is Jersey Island in the channel Islands. This breed is popular and widely distributed all over the world.

Jersey is the smallest of the European dairy breeds, and the earliest maturing among them. The heifers are bred at an age 14 to 18 months.

The colour of the animals is brown with variation of brown to black and vary from white spotted to solid in marking. The switch is white or black. The animal is small in size, with a good capacity for milk production. The milk fat is high i.e. 5.3% and milk solids are 15%. It can be said that the Jersey milk has the highest milk fat percentage. And the highest percentage of SNF out of the five European breeds. Jersey milk is yellow in colour due to high carotene and is good for butter making. Since Jers animals are relatively small in size, and as the body fat is yellow in colour, they are not good for beef and veal production.

Jersey animals are well adapted to tropical conditions in India. It is the smallest of the dairy breeds. It is economically well worth maintaining.

The average milk yield of the cow is 2727 kg in a lactation. Individual yields 13.296 kg in 365 days.

Fig. 2.3.3 JERSEY COW
2.3.4 GUERNSEY:

The home of this breed is Guernsey Island of the Channel islands.

The colour of the animal varies from light brown to almost red with white markings. White markings are usually found on face, Legs flank and switch. The nose may be cream or buff coloured, having smoky colour is permitted. The skin is yellow. This breed is little heavier than Jersey.

Heifers are generally breed at the age of 17 to 18 months. This breed is noticed for uniformity of typed. The milk was’ primarily used for butter as the milk colour is more yellow than the jersy milk due to higher carotene content and the butter colour will be golden yellow.

The milk fat and SNF percentages are slightly lower than Jersey milk. The Guernsey is less rugged than Holstein F-resian—more rugged than Jersey. The udder is less symmetrical than Jersey. Cows are active and alert but not nervous and can be easily maintainen.

The birth weight of calves in this breed is slightly more than, that of the Jersey breed. The small body size and yellow body fat makes this breed unsuitable for beef and veal production. The animals do not have good growing ability Guernsey heifers mature slightly later than the Jersey heifers.

The milk fat is nearly 5 %. Individuals cows have given 14,562 kg of milk in 365 days. Average birth weight of calves is 34 kg. Cows weight is about 455 to 545 kg and bulls weight 727 kg.

The average milk yield of cows is 2909 kg per lactation with 5°l° fat.

2.3.5 AYRSHIRE:

The home of this breed is Ayr in Scotland. These animals are distributed all over the world. The colour of the animals is red or white, with markings or, with white spottings. The red colour may be very light to almost red.

The animals are beautiful with shortest top lines, leveled rumps, and good udders. Horns are long and turned upwards. The animals are alert and active and they are good grazers. Heifers are generally bred at an age o” 18 to 20 months.
Average weight of the females is 455 kg and for males it is from 545 to 682 kg. The calves born are strong, vigorous and easy to raise and their birth weight is 32 to 36 kg. The average milk yield of cows is 3664 kg with 4% to 6% fat in a lactation. Individual animals give 14,625 kg of milk in 30 days.

2.4 INDIAN BUFFALO BREEDS:

The buffalo is known as Water buffalo. There are many buffalo breeds in India. But true to type and descriptive breeds are Murrah Jaffrabadi, Nili-Ravi, Mehsana.

2.4.1 MURRAH

The home tract of this breed is Rhotak, Hissar and Jind districts of Haryana State, Punjab and Delhi animals are distributed throughout India.

The animals are noted for milk and fat production. The colour of the animal is jet black with white marking on the tail, forehead and extremities. The skin is soft and smooth.

The she buffalo had a deep massive frame with a comparatively light neck and head. The horns are short and tightly curled. The forehead is broad and slightly prominent in males. Face is fine without white markings and, striae are wide apart, eyes prominent and bright in females. But not so prominent in males. The tail is long reaching the fetlock, with switch Ears are small thin and pendulous. The udder is well developed with prominent veins and good sized teats. Average weight of the buffalo is from 409 kgs to 500 kg, and that of a buffalo bull is 545 kg to 682 kg.

The average milk yield is 1364 kg to 1820 kg for a lactation period of 300 days. The milk fat percentage is about 7-9%
2.4.2 JAFFRA BADI

The native tract of this breed is Gir forest of Kathiawar. They are very massive animals with large body size requiring large quantities of fodder.

The colour of the animals is black, with white patches on face and legs. The forehead is prominent, with heavy horns which are inclined to swoop on each side of the neck, and then turn up at the points but not in such a tight curl as in murrah buffaloes. Head and neck are more massive, thari; murrah the body is longer but not so compact dewlap and udder are well developed and the body frame is loose. They body is wedge shaped and; the udder is large and well developed for this breed. The milk yield is high and also the milk fat is high. On an average the females weight 364 to 455 kg and the male weights 545 kgs.

Average milk yield of she buffaloe is 1820 kg to 2275 kg per lactation, The bulls are good for heavy road work.
2.4.3 NILI - RAVI

This breed of animals are found in the tract of Montgomery and Multen districts of Pakistan and Ferozopur District of Punjab state. The name Nili-Ravi comes from the supposedly blue waters of Ravi and Sutlez rivers. Animals of this breed are distributed all over India and Pakistan.

The colour of the animals is black with white markings on the forehead, face muzzle and legs black eyes and white switch of the tail are the important physical features of this breed.

The animal is large sized like murrah, and the head is long and cover on its upper third, the udder is well developed. The tail is long with white markings and white swiw;h and almost touching the ground.

The average milk yield of the she buffaloes is 1600 kgs in a lactation period of 250 days. The buffaloes are heavy miikersandthe male animals are used for heavy road works.
The home of this breed comprises of Kaira and Baroda districts of Gujara! State. The average fat percentage of milk is about 7.5%. Because of their medium size, Surthi buffaloes are economical producers. The eyes are, round and bulging. Horns are of medium length and sickle shaped, taking of a downwards and backward direction and then turning upwards at the tip forming a hook.

The colour of the animals is black or brown with two white collars - One around the jowl and, another around the brisket, the back is verl, straight.

The females are imported to Bombay city in large numbers. The bod colour being black or brown the hair is seanty and coloured silivery c brown.

The breed is smaller than murrah. The udder and teats are moderate i size. Average milk yield of well breed animals is about 2200 kg to 250 kg and under village conditions the average milk yield of animals is 1004 kg. Females
weight 365 kg to 455 kg and male weight about 545 kgs.

Fig.2.4.4 A BURFALO

Fig.2.4.4 A SURTI MALE
2.4.5 MEHSANA

The native tract for this breed is Mehsana District and Banaskantha districts of Gujarat state and also found in Baroda and Rajasthan.

The colour of the animal is black with some White markings on the face, leg and tip of the tail. The horns are curled at the tip but not so tightly curled as in murrah.

The animal is of medium size, with heavy tong face, long wedge shaped showed body. The udder is well developed well shaped with well placed teats.

The she Buffaloes are different milk producers with longer lactation lengths, and shorter dry periods. The breed is considered to have resulted from interbreeding of Surti and Murrah breeds and the animals in this breed have characteristics of both the breeds. The breed resembles Murrah having bulging eyes. Horns vary from Sickle type of Surti to curled type of murrah. The tail is long with black switch. The milk has high fat percentage. A white coloured hair is present round the neck and reaches the Shoulder. The animals are valued, for early maturity and persistence in milk production, and regularly in breeding.

Average weight of the female is about 455 kg and that of male is about 545 kg to 682 kg. The average milk yield of the She buffaloes is about 1820 kgs in a lactation.

Fig.2.4.5 MEHSANA BUFFALO
2.4.6. NAGPURI:

This breed is of lighter type and comes from Central and Southern India. The buffaloes are long parallel horns.

The head is long with a broad forehead, and the horns-are long. Curved back on each side of neck behind the shoulders. Barrel is long and deep with light limbs. The bull is comparatively short.

The males are largely used for draft purpose and the females are fair milkers and the daily average milk yield is 5 to 8 kgs.

SUMMARY:

The classification of Indian Cattle breeds was given in detail depending upon the milk production i.e. Mileh, dual and draught breeds. Under milch breeds the characters of Shahiwal, Red Sindhi, Gir and Deoni were explained in detail with the help of figures. Under dual purpose breeds Ongole, Tharparkar Hariana, Kankrej, Rathi, Krishna Valley and Goala breeds and under draughts breeds Malvi, Haltikar, Amrit Mahal, Kangyam and Khiflari are explained. Indian buffalo breeds i.e. Murrah, Nili-Ravi, Jaffarbadi, Nagapuri Mehsana, Surti were explained. The character of exotic cattle breeds i.e. H.F. Jersey, Aeryshire, Brownswiss and Guernsey were explained. This will give clean cut idea for the students to identify and differentiate different breeds of cattle and buffaloe.

Short Question:

1. Define breed.
2. Give two important milch breeds of India?
3. Which breed yields highest milk production in the world?
4. Under Indian Cattle breeds, which is popular
5. What is the breed of buffalo which is popular in India?
6. What is the average milk production of Murrah buffalo?
7. Name two important exotic breeds of cattle?
LONG QUESTIONS

1. Classify Indian breeds of Cattle with suitable examples?
2. Briefly write about the characteristics of the following breeds?
   a) Shahiwal
   b) Ongole
   c) Amrit
   d) Mahal
   e) Murrah
   f) Holstein-Friesian
   g) Jersey
3. BREEDING OF DAIRY ANIMALS AND FARM RECORDS

3.1. SELECTION METHODS OF DAIRY ANIMALS:

This selection is based on information available on the ancestors like parents, grand parents and great grand parents. The contribution beyond three generations is not much to be considered in pedigree selection. Pedigree selection enabled selection at an early age, and selection of males which do not express the traits like milk production through they transmit the genes for the traits.

3.1.1 INDIVIDUAL SELECTION:

Selection is based on the individuals own milk vein, teats, pelvic cavity and udder. This is ideal for characters with high heritabifity. Where as in dairy cattle most of the economic traits have low to moderate heritabilities.

3.1.2 FAMILY SELECTION:

Whale families are selected or rejected as units according to the man-phenotypic value of the family. The families may be full sibs or half sibs. The method is useful when the character for which selection is made has’ low heritability. Two modifications of family selection applicable to dairy cattle are sib selection and progeny testing.

3.1.3 SIB SELECTION :

This is a type of a selection where in the selected individuals do not contribute to the family means. This applies to selection of males which do not express the characters and selection of females at an early age.

3.1.4 PROGENY TESTING

The criteria of selection is the mean value of an individuals progeny which comes closet to the breeding value. The value of an individual is judged by the mean value of its progeny known as breeding value. It is equal to the sum of average effects of genes, the individual carries. Progeny testing pronongs the generation interval. As the bull had to await its progeny test result before its use, but it is more than made up by the increase in accuracy of selection. A higher intensity of selection is also possible by employing Artificial insemination with pedigree semen.
3.1.5 PRODUCTION RECORDS:

In advanced dairy countries large number of breeds are tested in dairy herd improvement programmes. During 1972 more than 2,66,001 lactation records were reported by supervisors of D.H.I.A (Dairy Herd Improvement Association) in U.S.A. A large number of pure bred cow were on official tests supervised by the various breed associations.

Other selection methods are Herd book registers, Physical appearance and selection and Dairy Cow unified score card methods.

3.2 CULLING OF DAIRY ANIMALS:

Culling is elimination or weeding out of undesirable animals from the herd, for reasons of uneconomic, poor production, or very poor reproductive ability, with sterility problems and breeding, irregularities, very poor conditions, stunted growth, suffering from incurable illness, or disease animals found to be positive for serious infections diseases like Tuberculosis, Johnes disease, Brucellosis, lost one or more quarters and teats of the under due to chronic mastitis resulting in marked reduction in milk production. Undesirable breed characters present in young animals# When the herd is a pure bred herd leading to disqualifications family lines, exhibiting heritable characters like supernumerary teats, loose horns in cows of certain breeds. Disable animals due to injury or loss of organ, extreme lameness leading to un maintainable conditions, un healed fractured animals etc., come under the animal proposed or culling. The culled animals carry lower values and a separate list is made for such called animals and it is known as culling list.

When the culling cows for poor production, the entire lactation yield is considered and preferably first two lactations are observed and if the lactational yield is less than what is expected from the breed or herd, The animal is included in the culling list.

Very old animals are culled, as their maintenance will be uneconomical. Male animals or other animals surplus in the farm or not useful in the farm and they are culled. Calves born with congenital defects like congenital efferiosis of the eye, total blindness or some other defects are included in the culling. Calves born much below the normal birth weight are included in the culling. Yearlings~animals male or females, stunted much below their normal body weight, Pot bellied conditions)bad confirmation are culled.
Valuation and culling is done on the farms every year at least once in year. In some farms culling is done twice a year however doing it once a year is must.

3.3 Economic characters in Dairy Cattle

The various economic characters in Dairy Cattle management are

1. Lactation yield
2. Lactation period
3. Persistency of yield
4. Age at first calving
5. Service period
6. Dry period
7. Inter calving period
8. Reproductive efficiency
9. Efficiency of feed utilization
10. Disease resistance.

1. Lactation yield:

The lactation yield in a lactation period is known as lactation yield. The lactation yield in Indian breeds is very low compared to exotic breeds. This is dependent on no. of calving, frequency of milking, persistency of yield (Normally in dairy cattle 30-40% increase in milk production from first lactation to the maturity is observed. After 3 or 4 lactation the production starts declining. For comparison of milk yield of different breeds and animals the milk yield should be converted into fat corrected milk (FCM).

\[ 4\% \text{ FCM} = 0.4 \text{ total milk} + 15 \text{ total fat}. \]

After parturition the milk yield per day will be increased and reaches peak within 2-4 weeks after calving. This yield is known as peak yield. The maintenance of peak yield for more time is importance for better milk production. The lactation period in Indian breeds is low and so the production is also less and conversion.

2. Lactation period:

The length of milk producing period after calving is known as lactation period. The optimum lactation period is 305 days. The milk production will
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be less, if this period is shortened”. Indian breeds will have less lactation period, but in some breeds this period is more with very little milk production

3. Persistency of Milk Yield:

During lactation period the animal reaches maximum milk yield per day with in 2-4 weeks which is called peak yield. For high level of lactation yield, this peak yield should be maintained for longer period as far as possible. The maintenance of peak yield for long period is known as persistency, slow decrease in dairy milk yield after reaching peak yield in necessary. High persistency is necessary to maintain high level of milk production

4. Age at first calving

The age of the animal at first calving is very important for high life time production. The desirable age at first calving in Indian breeds is 3 years, 2 years in cross breed cattle and 3 1/2 years in Buffaloes. Prolonged age at first calving will have high production in the first lactation) but the life time production will be decreased due to less no of calvings. If the age at first calving is below optimum, the calves born are weak, difficulty in calving and less milk production in first lactation.

5. Service period:

It is the period between date of calving and date of successful conception. The optimum service period helps the animal to recover from the stress of calving and also to get back the reproductive organs back to normal. For cattle the optimum service period is 60-90 days. If the service period is too prolonged the calving interval prolonged, less no. of calvings will be obtained in her life time and ultimately less life time production.’ If the service period is too short, the animal will become weak and persistency of milk production is poor due to immediate pregnancy.

6. Dry Period

It is the period from the date of drying (stop of milk production) to next calving. When the animal is in pregnancy, before next calving. The animal should be given rest _period to compensate for growth of foetus. A minimum of 2 - 2
½ months dry period should be allowed. If the dry period is not given or too low dry period, the animals suffer from stress and in next lactation, the milk production drops substantially and also it gives weak calves. On the other hand if the dry period given is too high, it may not have that much effect on increasing milk yield in the next lactation, but it decrease the production in the present lactation.

7. Intercalving period:

This is the period between two successive calvings. It is more, profitable to have one calf yearly in cattle and at least one calf for every 15 months in buffaloes. If the calving interval is more, the total no. of carvings in the life time will be decreased and also total life production of milk decrease.

8. Reproductive Efficiency:

The reproductive efficiency means the more number of calves during life time, so that total life time production is increased. The reproduction or breeding efficiency is determined by the combined effect of hereditary and environmental factors. Several measures of breeding efficiency like number of services per conception, calving interval, days from first breeding to conception are useful.) Reproductive efficiency has generally a low heritability value indicating that most of the variations in this trait is due to non genetic factors. In adverse environmental conditions, the poor milk producing animals may not be much effected compared to high effect in high milk yield.

9. Efficiency of Feed Utilization and Conversion into Milk:

The animal should utilize the feed efficiently to convert into the milk.

10. Disease Resistance:

Indian breeds are more resistant to majority of disease compared to exotic cattle. Cross breeding helps to get this character.

3.4 SYSTEM OF BREEDING

Breeding is defined as the crossing of the male and the female parents to get the off spring for the characters desired.
Breeding methods are generally classified into two broad categories: In Breeding and Out Breeding. These categories can be further divided into Close in Breeding, Line Breeding, and Out Breeding respectively.

### BREEDING METHODS

- **In Breeding**
  - Close in Breeding
  - Line Breeding
  - Pure Breeding
  - Hybridization

- **Out Breeding**
  - Line Crossing
  - Out Crossing
  - Cross Grading up Species
  - Back Crossing
  - Forward Rotational Introduction
  - Criss crossing
  - Second exotic Breed

### 3.4.1 INBREEDING:

Inbreeding is the mating of closely related individuals, whose relationship is more than the average relationship of the population. The example is the individual having one or more common ancestors or relatives. The measures of inbreeding is the coefficient of inbreeding. In breeding may be mild, or close inbreeding and line breeding.

### 3.4.2 CLOSE INBREEDING:

In this type inbreeding mating is made between very closely related individuals such as full brothers are crossed with full sisters, or offsprings are crossed with parents.

**Advantage of Inbreeding**:

i) Undesirable recessive genes may be discovered and eliminated by further testing in this line.
ii) The progeny are more uniform than and breed progeny. It increases homozygosity and decreases genetic variance.

iii) Breaking down of population into different inbreed lines.

**Disadvantages:**

1. The progeny becomes more susceptible to diseases.
2. Breeding problems and reproductive failure usually increases.
3. It is difficult to find out the stage of breeding at which it should be discontinued, in order to avoid the bad effects of the system.
4. It depresses vitality in early life than in later life.
5. A small breeder stands a good chance of gain by doing too much in breeding. A rule to follow is never to inbreed more than 12% and then only in exceptional cases.
6. In breeding appears to have little value in dairy cattle breeding programmes, because of its numerous detrimental effects.

**3.4.3 LINE BREEDING:**

It is repeated back crossing to one outstanding ancestor, so that its contribution to the progeny is more.

In this type of breeding matings are made to concentrate, the inheritance of desired characters of some favoured individuals.

a) It brings about the uniformity of the required type.

p) The dangers involves in case in breeding can be reduced.

The breeder will select the animal for its pedigree giving due consideration for the individual merit. This may result in very little benefit in new generation, in some case having the benefit.
3.4.4 OUTBREEDING:

It is the opposite of inbreeding. Mating unrelated animals is known as outbreeding. It is divided into six classes as detailed below:

1. Pure breeding
2. Line Crossing (Crossing of inbreed lines)
3. Out Crossing
4. Cross Breeding
5. Grading up
6. Species Hybridisation

3.4.5 PURE BREEDING:

It is mating of male and female belonging to the same breed. Pure breeding is a sort of outbreeding. The examples of pure breeding are:

- Ongole Cow X Ongole bull
- Jersey Cow -x Jersey Bull
- Murrah she buffalo x Murrah bull

The outstanding advantage of pure breeding is for production of bulls for breeding purpose only pure breeding is to be followed in almost all the breeds except in case of inter-se-mating. It avoids mating of closely related individuals.

3.4.6 LINE CROSSING:

Crossing of inbred lines: In this method of breeding closely inbred lines by intensive inbreeding of more than 5 generations is done to develop inbred lines, from unrelated line for the male and for the female. The unrelated inbred
line male is matted to the inbred lines of female and the offspring born out of such mating becomes a hybrid which exhibits heterosis or hybrid vigour. Heterosis is the phenomenon where in the crosses between inbreed lines or parned populations are exceed., Even the better of the two parental populations, it is caused by the non-additive genetic effects. At luminance and epistasis, which arise from increased heterozygosity.

4.6.7 OUT CROSSING:

It is mating of unrelated pure bred animals in the same breed. The animals do not have common ancestors on either side of their pedigree upto 4 to 6 generations and the offsprings of such a mating is known as the Out cross.

Advantage: It is an effective system for genetic improvement if carefully combined with selection. It is also pure breeding.

4.6.8 CROSS BREEDING:

It is mating of animals of different breeds. Cross breeding is followed for breeding animals for milk production and meat production. In India zebu breeds of cows and nondescript cows are crossed with exotic breeds like Holstein Fresian, Brown Swiss and Jersey bulls or their semen, to enhance the milk production potential of the progeny.

Advantage:

1. The desirable characters of the exotic parent are transmitted to the progeny which the indigenous parent does not have.

2. In India Cross-breeding and cows is done by using the exotic bulls and the progeny inherit the desirable characters of the parent like high milk yield early maturity, higher birth weigh of calves, better growth rates, better reproductive efficiency and indigenous parents characters like, heat tolerance, disease resistance ability to thrive on scanty feeding and coarse fodder etc.

3. In pairs the way to evolve new breeds with desirable characters.
   Hybrid vigour is made use of in the progeny

4. Results are seen more quickly in characters like milk yield in the cross bred progeny.
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Disadvantages:

1. The breeding merit of cross breed animals may be slightly reduced.

2. Cross breeding requires maintenance of two or more pure breeds in order to product the cross breeds.

As selection is a slow process of genetic improvement cross breeding has been taken up as the national breeding for improving milk production in India. Cross breeding word was initiated at NDR I Bangalore, Live Stock farm and allahabad Agricultural Institute. At present cross breeding work is going on at Military dairy farms, NDRI Karnal, All India coordinated Research projects on Cattle, Collaboration projects like Indo-Swiss, IndoAustralian, Indo-Danish, projects and also in the field in farmer’s he.

The feeding and management of the crosses would be better, to enable them to express their production potential.

In general the cross breeds were found to have higher birth weight, faster growth rate, earlier age at first calving, higher weight; at first calving, higher lactational yield, longer lactation period) shorter service period, dry period and milk production and breeding efficiency.

There are several exotic breeds being used in cross breeding programme, namely Holstein Fresian, Jersey, Brown Swiss and Red dan e Halstein Fesian is found to be best suited for fluid milk supply in cities, and where higher feed inputs can be provided and where the temperature is temperate or sub-tropical. In contrast Jersey crosses are ideal when the milk is meant for product manufacture and where feed inputs are limited and the climate is tropical.

3.4.9 GRADING UP:

Grading up is the practice of breeding in which the sires of the exotic breed are mated with the non-discript females and their off-spring from generation to generation. After five or six generations of grading up-a population resembling the exotic breed results. This is the breeding policy that is pursued in India. Females of less developed breeds or nondescript buffaloes are continuously breed by Murrah bulls. After 5 to 6 generations the grades carry 96.9% to 98.4% of exotic inheritance respectively:
Advantages:

1. After 5 to 6 generations grades resembling pure bred animals in matter of physical appearance and production can be obtained.

2. Grading up avoids colossal expenditure of purchasing the exotic females herd of animals as grading up is carried on with a few exotic bulls and the indigenous female animals.

3. It proves the breeding merit of the exotic bulls used.

4. The value of the graded animals is much enhanced.

Disadvantages:

1. The graded males are useless for breeding purpose.

2. The climate and the environment that is suitable for the exotic breed only is suitable for grading also. If the place is not suitable for the exotic breed it is not suitable for grading with that breed.

3.5 STATE AND NATIONAL BREEDING POLICIES:

The present breeding policy for Bovines in Andhra Pradesh was formulated basing on existence of three main types of bovines, non-descriptive buffaloes, non-descript cattle & recognized indigenous cattle breeds such as, Ongole and Deoni. Seven regions were identified in the state for implementing the state breeding policy. They are coastal Andhra-North, Coastal Andhra-Delta and south, Rayalaseema, Telangana without Medak, tribal areas and pocket areas with better management levels. The breeding policies for cattle in different regions are

1. Coastal Andhra (North)
   a) Jersey bulls mated to non-decript cows.
   b) Jersey cross breed bull (50% exotic) mated to jersey cross-breed cows.
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2. Coastal Andhra (Delta and South)
   a) Holstein Fresian bulls mated to non-descript and Ongole type cows in delta area.
   b) Holstein Fresian cross breed bulls (50% exotic) mated to Holstein Fresian cross breed cows.
   c) Jersey bulls mated to indigenous cows in upland areas. Jersey cross breed bulls mated to
   d) jersey cross breed cows. Ongole bulls mated to Ongole type cows in ongole tract.

3. Rayalaseema
   a) Jersey bulls mated to indigenous cows.
   b) Jersey cross-breed bulls (50%) mated to Jersey cross breed cows.
   c) Ongole bulls mated to Ongole type cows in parts on Kurnool and

4. Telangana (except Medak district)
   a) Jersey bulls mated to indigenous cows,
   b) Jersey crossbreed bulls (50% exotic) mated to jersey crossbreed cows.
   c) Holstein Fresian bulls mated to cows in Hyderabad city and surroundings.
   d) Holstein Fresian crossbreed bulls (50% exotic) mated to Holstein

5. Medak district
   a) Holstein Fresian bulls mated to non-descript cows.
   b) Holstein Fresian crossbreed bulls (50% exotic) mated to Holsein resian crossbeed cows.
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c) Deoni bulls mated to Deoni type cows in Zaheerabad and Narayankhed taluks.

6. Tribal areas

a) Jersey cross bred bulls (50%) exotic for natural service.

b) Deoni bulls for pure breeding in selected areas.

7. Areas with better management levels

a) Jersey cross bred bulls (75% exotic) mated to Jersey cross bred cows (50%)

b) Holstein Fresian cross-bred bulls (70%) exotic mated to HF crossbred cows (50%)

The state breeding policy for buffaloes is

1) Pure bred Murrah bulls mated continuously to non-descript and graded she-buffaloes (up grading).

2) Graded Murrah bulls mated to non-descript and graded shebuffaloes in dry and drought prone areas with limited fodder resources.

The National level consensus evolved on the breeding policy for the improvement of cattle and buffaloes is as follows.

1) In the selected breeding tracts, such as Hariana, Gir, Kankrej, Tharparker and Ongole, pure breeding should be resorted to, by providing germplasm of superior bulls in these breeding tracts. This is to maintain and improve these well-defined reputed breeds.

In the tracts where adequate inputs could be made available, the recommended policy is to resort to cross breeding with Holstein-Fresian. To main 50% level of exotic inheritance cross bred bulls to be provided for inter-se-mating among the cross bred fressians.
In the other areas with the low inputs, the policy is to resort to cross breeding with Jersey animal and maintain half bred Jersey inheritance by providing germplasm of selected pedigreed Jersey cross bred bulls.

In the native tracts of well-defined buffalo breeds, germplasm of superior bulls of respective buffalo breeds are to be supplied. In other places,

grading up with well defined buffalo breeds is to be undertaken. The most commonly recommended breed is Murrah. Medium type breeds are recommended in certain regions.

**SUMMARY**

In this chapter selection methods for dairy cattle and buffaloes are discussed in detail. Culling of dairy animals explained which is useful for removal of unproductive animals from the herd. Mendal laws of heritance were explained to give an idea to the student about the heritance. Economic characters which affect the profitability of dairy farm’ are explained. Different types of breeding methods are simply explained. how the inheritance is followed. Goals of cattle breeding programmes and State and national breeding policies are explained which are at present followed.

**SHORT QUESTIONS**

1. Name different methods of dairy cattle selection.
2. What is mono hybrid cross?
3. What is dihybrid cross?
4. What is law of independent resortment?
5. What is law of segregation?
6. What is heritability?
7. What is Repeatability?
8. What do you mean by culling?
9. What is line breeding?
10. What is grading up?
LONG QUESTION

1. Discuss in detail various types of selection of dairy cattle?
2. Explain Mendal's first law (Law of Segregation) with the help of examples
3. Explain law of independent assortment with the help of examples?
4. Explain the different economic characters in dairy cattle?
5. Briefly write about cross breeding?
6. Explain in detail grading up?
7. Explain briefly state and national breeding policies?
8. What are the goals of cattle breeding programmes.
4. HOUSING OF DAIRY CATTLE

4.1 Selection of Site for Dairy Farm:

The points which should be considered before the erection of dairy buildings are as follows:

1. **Topography**:

   A dairy building should be at a higher elevation than the surrounding ground to offer a good slope for rainfall and drainage for the wastes of the dairy to avoid stagnation within. A levelled area requires less site preparation and thus lesser cost of building. Low lands and depression and proximity to places of bad odour should be avoided.

2. **Soil Type**:

   Fertile soil should be spared for cultivation. Foundation soil as far as possible should not be dehydrated or desiccated. Such a soil is susceptible to considerable swelling during rainy season and exhibit numerous cracks and fissures.

3. **Exposure to the sun and protection from wind**:

   A dairy building should be located to a maximum exposure to the sun in the north and minimum exposure to the sun in the south and protection from prevailing strong wind currents whether hot or cold. Buildings should be placed so that direct sunlight can reach the platforms, gutter and mangers; in the cattle shed. As far as possible, the long axis of the dairy barns should be set in north-south direction to have the maximum benefit of the sun.

4. **Accessibility**:

   Easy accessibility to the buildings is always desirable. Situation of a cattle shed by the side of the main road preferably a distance of about 100 meters should be aimed at.
5. Durability and Attractiveness:

It is always attractive when the buildings open upto a scenic view and add to the gradeur of the scenery. Along with this, durability of the structure is obviously an important criteria in building a dairy.

6. Water Supply:

Abundant supply of fresh, clean and soft water should be available at a cheap rate.

7. Surrounding:

Areas infested with wild animals and ‘daoits; should be avoided. Narrow gates, high manger curbs, loose hinges, protruding nails, smooth finished floor in the areas where the cows move and other such hazards -should be eliminated.

8. Labour:

Honest, economic and regular supply of labour be available.

9. Marketing:

Dairy buildings should only be in those areas from where the owner can sell his products profitability and regularly. He should be in a position to satisfy the needs of the farm within no time and at a reasonable price.

10. Electricity:

Electricity is the most important sanitary method of lighting a dairy. Since a modern dairy always handles electric equipments which are also economical, it is desirable to have an adequate supply of electricity.

11. Facilities, labour and food:

Cattle yards should be so constructed and situated in relation to feed storages, hay stacks, silo and manure pits as to effect the most efficient utilisation of labour. Sufficient space per cow well arranged feeding mangers and resting areas contribute not only to greater milk yield of cows and make the work of
the operator easier but also minimise feed expenses. The relative position of the
feed stores should be quite adjacent to the cattle barn. Noteworthy features of
feed stores are given below.

a) Feed storages should be located at hand near the centre of the cow barn.
b) Milk house should be located almost at the centre of the barn.
C) Centre cross-alley should be well designed with references to feed
storage, the ‘stall areas and the milk house.

4.2 SYSTEMS OF HOUSING - LOOSE HOUSING SYSTEM
CONVENTIONAL DAIRY BARN.

The most widely prevalent practice in this country is to tie the cows with
rope on a Katcha floor except some organised dairy farms belonging to
government, co-operatives or military where proper housing facilities; exist. It
is quite easy to understand that unless cattle are provided wit good housing
facilities, the animals will move too far in or out of th standing space, defeating
all round and even causing trampling an wasting of feed by stepping into the
managers. The animals will be exposed to extreme weather conditions all leading
to bad health and lower production.

Dairy cattle may be successfully housed a wide variety of condition,
ranging from close confinement to little restrictions except at milking time.

1. The loose housing barn in combination with some type of milking barn or
parlour.
2. The conventional diary barn.

4.2.1 LOOSE HOUSING SYSTEM

Loose housing may be defined as a system where animals are kept loose
except milking and at the time of treatment. The system is most economical.
Some features of loose housing system are as follows.

1. Cost of construction is significantly lower than conventional type.
2. It is possible to make further expansion without change
3. Facilitate easy detection of animal in heat.
4. Animals feel free and therefore, proves more profitable with even minimum grazing
5. Animals get optimum excise which is extremely important for better health production.
6. Over all better management can be rendered.

4.3. SANITATION IN DAIRY FARM

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

4.3.1 CLEANING OF ANIMAL SHEDS:

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

4.3.2 SANITIZERS:

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

This is also called calcium hypo chloride. It contains upto 39 % available chlorine which has high disinfecting activity.

Iodine and lodophor :-

This is commercially available as lodophores and contains between 1 and 2 % available Iodine which is an effective germicide.

4.3.4 SODIUM CARBONATE:

A hot 4 % solution of washing soda is a powerful disinfectant against many viruses and certain bacteria.

4.3.5 SLAKED LIME AND QUICK LIME :

White washing with these agents makes the walls of the sheds and the water troughs free from bacteria.

4.3.6 PHENOL :

Phenol or carbolic acid is a very disinfectant which destroy bacteria as well as fungus.

4.3.7 - INSECTICIDE :

Insecticides are the substances or preparations used for killing insects. In order to control flies and disease transmitting ticks, insecticides are used in dairy farms. Ticks usually hide in cracks and crevices of the walls and mangers. Smaller quantities of insecticide solutions are required for spraying. Liquid insecticides can be applied with a powerful sprayer, hand sprayer, a sponge or brush, commonly used insecticides are BHC, DDT, Gramaxane wettable powders, malathion, surriithion, Sevin 50 % emusifying concentration solutions. These are highly poisonous and need to be handled carefully and should not come in contact with food material, drinking, water,milk etc.
Precautions While using disinfection I Insecticide.

* Remove dung and used bedding completely.
* Avoid spilling of dung and used bedding while carrying it out.
* Avoid the use of dirty water in cleaning the sheds.
* Never put the fresh fodder over the previous day’s left over fodder in the manger.
* Prevent algae to grow in the water troughs
* Use proper concentration of disinfectant / insecticide solutions to avoid any toxic effects poisoning.
* Avoid the mat the milking time as milk absorbs these quickly.

PROCEDURE:

* Remove the dung from the floor and urine channel with the help of a shovel and basket (iron) and transfer it to the wheel - barrow. Remove the used bedding and leftovers from the mangers in a similar way.

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

* Wash the water trough with clean water and white wash it with the help of lime mixture once a week.
  * Scrape the floor with a brush and broom and wash with water.

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

* Remove the cobwebs periodically with the help of a wall brush.

* Sprinkly one of the available disinfecting agent in the following concentration. Bleaching powder should have more than 30% available chlorine. Phenol 1-2% solution. Washing Soda (4% solution).
* Allow adequate sunlight to enter into the shed.
* Spray insecticides at regular intervals specially during the rainy season (Fly season).
* White wash the walls periodically by mixing insecticides in it to eliminate ticks and mites living in cracks and crevices.

**SUMMARY**

In this chapter different points to be considered while selecting the site for establishment of dairy farm are explained. Different housing systems are explained in detail to know the advantages and disadvantages in different systems. For different climatic conditions, the alterations or provisions to be made are explained to protect the animals during different climatic condition. The animal responses for environmental changes are discussed. Different steps to be followed for good sanitation in dairy farm will give guide to maintain dairy farm.

**SHORT QUESTION**

1. What is loose housing system?
2. What is conventional dairy barn?
3. During winter what alteration to the floor of shed is required?
4. What arrangement should be done to the roof of animal shed during summer?
5. What is sanitizer?
6. Give two sanitizers used in animal sheds.

**LONG QUESTIONS**

1. What are the points to be considered while selection of site for dairy farm?
2. Write in detail about loose housing system “?”
3. Briefly discuss about conventional dairy barns?
4. What are the changes adopted to suit for different climatic conditions?
5. Briefly write about sanitation in a dairy farm shed?
6. What are the animals responses for environmental changes?
5. CARE AND MANAGEMENT OF DAIRY ANIMAL

5.1 CARE AND MANAGEMENT OF CALF:

We must give good feeding and management for the calves so that they develop well and, useful for replacement stock. The feeding and care of the calf begins before its birth. The dam should be dried 6-8 weeks before expected calving and should be fed well. Underfed animals will give weak and smaq calves.

A) Early Management:

1) Immediately after birth remove any mucous or phlegm from those nose and mouth.

2) Normally the cow licks the calf immediately the birth. This helps’ dry off the calf and helps in stimulating breathing and circulation. When the cows does not lick or in cold climate, rub and dry the calf with a dry cloth or gunny bag. Provide artificial respiration by compression and relaxing the chest with hands.

3) The Naval should be tied about 2-5 cms away from the body and cut 1cm below the ligature and apply Tr. Iodine or boric acid or any antibiotic.

4) Remove the wet bedding from the pen and keep the stall very clean and dry in condition.

5) The weight of the calf should be recorded.

6) Wash the cow’s udder and teats preferably with chlorine solution and dry. Allow the calf to suckle the first milk of the mother i.e. Colostrum.

7) The calf will be standing and attempts to nurse within one hour. Otherwise help too weak calves.

B) Feeding of Calves:

1) Feed colostrum i.e. the first milk of the cow for the first 3 days. The colostrum is thick and viscous. It contains higher proportions of Vit A
and proteins. The proteins are immune globulin which gives protection against many diseases. Colostrums contain antitrypsin which avoid digestion of immunoglobulins in the stomach and is absorbed as it is.

2) Whole milk should be given after 3 days it is better to teach to, drink the milk from the pail or bucket. Feed twice a day which should be warmed to body temperature. For weak calves feed thrice a day.

3) The limit of liquid milk feeding is 10% of its body weight with a maximum of 5-6 litres per day and continue liquid milk feeding for 6-10 weeks. Over feeding causes ‘Calf Scours’.

4) The milk replaces can be given to replace whole milk.

5) Give calf starter after one month of age.

6) Provide good quality green fodder and hay from 4th month afterwards.

7) Feeding of antibiotics to calves improves appetite, increases growth rate and prevents calf scour. E.g. aureomycin, Terramycin etc.

**OTHER MANAGEMENT PRACTICES.**

1) Identity the calf by tattooing in the ear at birth, and branding after one year.

2) Dehorn the calf within 7-10 days after birth with red hot iron or caustic potash stick or electrical method.

3) Deworm the calf regularly to remove worms using deworming drugs. Deworm at 30 days interval.

4) Fresh water should be given from 2~d week onwards.

5) House the calves in individual calf pens for 3 months afterwards in groups. After six months males and females calves should be housed separately.

6) Weigh the calves at weekly interval upto 6 months and at monthly interval afterwards to know the growth rate.
Mortality in calves is more in first month due to pneumonia. Diarrhea (calf scours) and worms. House them under warm condition, clean condition to avoid above condition.

Extra teats beyond 4 should be removed at 1-2 months of age.

8-9 weeks of age, males should be castrated.

Keep the body clean and dry to avoid fungal infection.

Mineral-blocks should be provided, so that the calves lick and no changes for mineral deficiency.

Wean the calf from the mother and feed through pail feeding system.

5.2 CARE AND MANAGEMENT OF HEIFER

Better Care and Management of heifer will give high quality replacement stock to the dairy farm. The following care and Management practices are recommended for a heifer.

Feed the heifer sufficiently to produce normal growth. During the early stage relatively more protein than energy is needed. Most heifers grow well if excellent hay is given as much they can eat. The amount of growth depends upon the quality of forage fed.

The heifers should be provided with a dry shelter free from drafts. A loose housing system with a shelter open to one side is sufficient.

The size rather than the age of a dairy heifer at breeding time is important. Breeding under sized animals is never profitable. They may be stunted or slow to reach maximum size. Small heifer are more likely to have difficulty in calving. Though the heifer that is bred to calve at an older age yields higher milk yield in the first lactation, the total milk produced by such a cow will be less when compared to the heifers that freshens at an early age. Usually the heifer is bred to freshen at 24-30 months of age.

The heifer should be growing and in good flesh at calving time. This is necessary so that she can produce milk at the most profitable level.
5. Place the heifer in a separate shed about 6-8 weeks before she is due to calve.

6. Feed 2 - 3 kgs of concentrate daily and all the forage she eats.

7. Before calving let the heifer becomes accustomed to handling and to the procedures used in the milking herd. Always handle her gently and with kindness.

8. Maintenance of health among heifers is very important for proper growth. The health among the heifers is maintained by hygienic housing, water balanced feeding and taking necessary preventive steps against common diseases.

9. Periodically the heifers in the herd should be checked for their proper growth and other progress. Animals lagging behind below the required standards should be removed from the herd.

10. For the heifer the calving is first time and it may have difficulty in calving. So take extra care during calving.

5.3 CARE AND MANAGEMENT OF MILCH ANIMAL:

To get high milk during any lactation, the milch animal should be properly fed and necessary care and managerial practices should be followed.

1. Provide green succulent forage together with leguminous hay or straw to the extent of animal can consume, so that all its maintenance requirements are met through forage only. Extra concentrate at the rate of 1 kg for every 2 to 2.5 liters of milk should be provided. Salt and mineral supplements should be given to maintain the lactation.

2. Never frighten or excite the animals. Always treat them gently and with kindness.

3. With proper feeding and care, a cow will come to heat within 16 days of calving. Do not withhold service unnecessarily after the signs of heat are noticed in a cow. The shorter the interval between calvings,
the more efficient the animal is as a milk producer. By maintaining proper records of breeding and calvings of the animals will ensure a study flow of milk through out the year.

4. Individual attention to feed each animal according to its production is a must. For this purpose maintain individual production records.

5. Keep up regularity of feeding. Concentrate mix is fed before or during milking, when as roughages after milking. This practice will avoid dust in the shed.

6. Water should be provided to drink at will or at frequent intervals. It is more beneficial, if the animal is maintained on paddy straw as sole rough age..

7. Regularity in milking is essential. Increase of milk in the udder will reduce further secretion of milk. Milking thrice is better than twice since 10 - 15 % more milk can be produced.

8. Rapid, continuous, dry hand milking should be practiced without undue jerking of teats. milking should be done with whole hand, but not with thumb and index finger.

9. Cows should be trained to let down milk without calf suckling. This will held to wean the calves early.

10. Loose housing with shelter during hot part of the day should be provided. The animals will get maximum exercise in loose housing system.

11. Grooming of the cows and washing of the buffaloes before milking help in clean milk production. Daily brushing will remove loose hair an dirt from the coat. Grooming will also keep the animal hide pliable.

12. Wallowing of buffaloes or water spraying on their bodies will keep the buffaloes comfortable especially in summer.

13. Common ailments should be properly detected and treated.

14. Common vices should be properly detected and care should be taken. Eg. Kicking, licking, suckling etc.
5.4. **CARE AND MANAGEMENT OF DRY AND PREGNANT ANIMAL**

The good care and managerial practices given to pregnant animal will give good calf and also high milk yield during the successive lactation.

1. Extra concentrate mix of 1.25 to 1.75 kgs should be provided for pregnant animal as pregnancy allowance. Feed good quality of leguminous fodder. The animal should not be not - lean - not fat’ condition.

2. Provide clean drinking water and protection from thermal stress.

3. Do not allow them to mix with other animals that have aborted or that are suffering from or carriers of diseases like brucellosit.

4. Allow moderate exercise, which helps in calving normally. Do not tire them by making long distances especially on uneven surfaces.

5. Do not allow them to fight with other animals and take care that they are not chased by dogs and other animals.

6. Avoid slippery conditions, which causes the animal to fall receiving fractures, dislocation etc.

7. If accurate breeding records are available, calculate the expected date of calving. Separate it one or 2 weeks before and shifted to individual
parturition pens. These pens are thoroughly cleaned and fresh bedding may be provided.

8. Feed one kg extra concentrate during last 8 weeks of gestation. Feed laxative about 3 - 5 days before and after calving (Wheat bran 3 kgs + 0.5 gs of Groundnut cake + 100 gms of mineral mixture of salt).

9. Symptoms of delivery may be observed i.e. swelling of external genitalia, swelling of udder, usually majority of animals will deliver without any help. If there is any difficulty, provide veterinary help.

10. After parturition external genitalia, flank should be cleaned and protect the animal from chill and give warm wafer.

11. Placenta will normally leave the cow within 2 - 4 hours after calving. It not take the help of a veterinarian.

12. Take care of the animal before calving from milk fever. Give calcium supplement.

13. Some times the udder will be swollen just before calving. Remove the milk partially.

14. Take care, of the animal, if at all any abortion.

15. Provide always free access to drinking water.

5.5 CARE AND MANAGEMENT OF BULLS AND BULLOCKS

5.5.1 CARE AND MANAGEMENT OF BULL:

The maintenance of breeding bulls in good condition and suitable for breeding is highly essential requirement for the success of breeding programmes. A rising condition is better for reproduction than a falling one. Fat males may produce semen of inferior quality or they may be slow or fail at service.

Breeding bull should receive plenty of exercise, will usually produce large ejaculation containing more sperms of higher activity.
A breeding bull should housed separately known as “Bull Shed” with sufficient area of floor and proper covering. It is sound practice to provide cool conditions and adequate drinking water.

A balanced rations should be fed containing adequate energy, proteins, minerals, and vitamins. Green fodder must be available both before and during breeding season.

Most of the bulls are ferocious and so control them properly using nose rings etc. It is of great importance that males should be fed regularly and not too much at one time, and too little at another. For bulls two mating a day has been found to be openings.

Moderate exercise should be provided to keep the breeding bull in active and non fatty conditions. Regular grooming of the breeding bull be practiced. In buffalo bulls regular shaving may be practiced.

5.5.2 CARE AND MANAGEMENT OF BULLOCK

Bullocks are normally used for agricultural operations and or transport purpose. Some bullocks are ferocious and so control them properly with nose rope or nose rings. The hooves of the bullocks should be provided with metal shoes to protect the hooves from wear and tear.

The working hours for bullocks are recommended as follows:

a) Normal Work - 6 hours of carting or 4 hours of ploughing.

b) Heavy Work - 8 hours of carting or 6 hours of ploughing.

Sufficient roughages and 1-2 kgs of concentrates may be provided for feeding of bullocks during break period in works, the animal may be left for free grazing.

The bullocks are housed in separate sheds with sufficient space and protection from hot and cool conditions. Free access to drinking water is essential. Regular grooming of animals should be practiced.
SUMMARY

In this chapter, Care and Management of all classes of dairy-cattle i.e. calves, heifer, Milch animal, dry animal, bulls and bullocks are discussed to give an idea about different practices to be followed for profitable dairying. Herd management activities like exercise, grooming, washing etc. are explained which helps to maintain good health of the herd.

SHORT QUESTIONS

1. What is Phlegm?
2. How do you provide artificial respiration for a new born calf?
3. What is the antiseptic applied to the naval after cutting?
4. For how many days colostrum should be fed to the new born calf?
5. How much milk should be fed to the calf during first few days after birth?

LONG QUESTIONS

1. Describe in detail the care and management practices of calf.
2. Describe in detail the care and management practices of calf, management practices of pregnant animal
3. Describe in detail the care and Management of Milch animal.
4. Describe in detail the care and Management of sick animal.
5. Write short notes over:
   - Exercise
   - Grooming
   - Washing
7 REPRODUCTIVITY SYSTEM - ARTIFICIAL INSEMIN

7.1 REPRODUCTIVE ORGANS OF COW AND BULL:

7.1.1 REPRODUCTIVE ORGANS OF COW:

The re-productive organs or genital organs of a cow consist of Ovary, Fallopian tubes, Uterus, Cervix, Vagine and Vulva. Each of these plays a vital role in the reproductive phenomena.

Ovaries:

The ovaries are two in numbers, and almond shaped situated at a distance of 40 - 45 cm from the opening of the valva. It is about 3.5 cm long 2.5 cm wide and 1-2 cm thick. The ova develop in structural units known as follicles which looks like pimples on the quarian surface known as Graffian follicles. Female reproductive graffion follicle also produce female sex hormone known as Oestrogen matured follicles blusts and release ova and the process is ovulation at the site of rupture new cells grows as corpuslutium which secrets progentrone hormone, which helps in preparing the uterus to receive fertilizers ovum. When the heifer attains proberty, the functioning of the ovaries and the ova commences.
The activity of the ovary is associated with the appearance of heat.

7.1.2 FALLOPIAN TUBES:

These are two in number. These connect the ovary at the horns of the uterus on either side. Funnel shaped end of fallopian tube is known as infundibulum which receives ova. In fallopian tubes the ovum is fertilized by the sperm, and the cilia of the fallopian tube helps upward movement of the sperm. The fallopian tubes are also known as Ovarian tubes or oviducts.

7.1.3 UTERUS:

The uterus is a hollow organ with a body and two horns. The body of the uterus is 3 to 5 cm in length and the horn is about 35 to 40 cm long. The foetus is developed in the uterus. The walls of the uterus are thick and muscular with numerous cotyledons. Villi of placenta is lodged in cotyledons for nourishment of the foetus.

7.1.4 CERVIX:

Cervix is about 10 - 12 cm in length wise between uterus and vagina and also known as neck of the womb. The wall of cervix is firm and curvical canal or OS of the uterus is tightly closed. It is slightly relaxed during the heat period. The cervix is wall secrets, thick mucus, forming seal to uterus during the pregnancy.

7.1.5 VAGINA:

The vagina is a muscular passage, which accommodates the penis of the bull during coitns, and a passage for the expulsion of foetus from the uterus, during delivery. Extending from the Cervix posteriorly upto urogenital or vestibule from which it is separated by the hymen. It is highly elastic organ and is responsible for the secretion of the mucous.

7.1.6 VULVA:

Vulva or labis majora is the terminal -portion of the female genital tracts. It has two lips. When lips are drawn apart the glans clitoris is seen, which is the rudimentary penis in females.
7.1.2. REPRODUCTIVE ORGANS OF BULL:

The reproductive organs of bull or an ox consists of Testicles, Epididymis, vasdeferens, siminal vesicles, prostate glands, coopers glands, urethra and penis.

7.1.3 TESTICLES:

Testicles are known as Testes. These are the primary organs of reproduction in male. These are two in number. The bag like covering of testes is known as scrotum. Testes contains long coiled tubes known as semineferous tubes which produces ‘sperms’. Between these tubeces interstitial or leydig cells which produces male hormone as testosterone.

7.1.4 EPIDIDYMIS:-

The epididymis is highly coiled tube attacked to the testes along its posterior border. It has head, body and tail. The tail ~is attached to the lower side of the testes. The main function of the epididymis are to store the spermatozoa and to provide nourishment to the sperm during the process of their maturing.
7.1.5 VASDEFERENS:-

It is a long narrow duct connecting to epididymis and its lower part and moving up through ingrinal canal to join urethra posterior to the bladder.

Fig. 3. Arrangement of tubules and ducts in the testis

7.1.6 SEMINAL VESICLES:-

Seminal vesicles have lobulates surfaces. Seminal vesicles secrets alkaline thick viscous fluid which is the largest part of the seminal plasma.

7.1.7 PROSTATE GLAND:

It is an accessory gland situated at the neck of the bladder surrounding the urethra. It is compound gland having many tubules. It secrets a substance which absorb CO₂ given off by the sperm.

7.1.8 COMERS GLANDS:

These are two small glands situated one on each side of the urethra. Each gland has a duct which directly opens into the urethra. The secretion of these glands facilitate movements of the sperms by smoothing the passage.
7.1.9. URETHRA:

The urethra is a very long tube of musculature, extending from the bladder to the glans penis. The urethra serves as a passage both for urine and semen.

7.1.10 PENIS:

The penis of the male copulatory organ and the urethra is run through it. The length of the penis is about 90 cm. The tips of the penis is about 5 cm long and it is known as glans penis. The penis has segmoid flexure just behind scrotum. It is made up of muscular and erectile tissue that becomes engorged with blood when the animal is sexually stimulated during copulation whole segmoid flexure of penis is straightens. Its main function is to deposit the sperms in the vagina of the cow and pass urine.

7.2 OESTROUS CYCLE - SYMPTOMS OF HEAT:

The combination of physiological events which take place starting with estrous and ending with the next oestrous is termed as oestrous cycle. The length of oestrous is 21 days. The oestrous cycle is divided into 4 phases i.e. Proestrous, Oestrous, Metoestrous, and Dioestrous. Proestrous makes the animal coming to heat. During this phase the graffian follicle will grow containing hormone oestradiol. This hormone is observed in blood and passed to oviduct and causes the growth of cells lining the oviduct, which facilitates transport of ova.

Oestrous or heat is the period in which female shows desire to be mated by the male. This period lasts for 24 - 36 hours. During this period the animals shows almost all heat symptoms. At the end of oestrous period ovulation will occur.

Metoestrous is the period just after the ovulation during which period level of oestrogen and leutixizing hormones fall and corpusluteum begins to functions. Dioestrous period predominated by the influence of the progesterone from the corpus leuteum. If the fertilization takes place the pregnancy, with the accompanying high level of progesterone will stop the formation and development of new graffion follicles in the ovaries.
7.2.1 SYMPTOMS OF HEAT

The various symptoms of heat are

1. The animal will be excited condition. The animal will be in restlessness and nervousness.

2. The animal will be bellow frequency.

3. The animal will reduce the intake of feed.

4. Peculiar movement of lumbosacral region will be observed.

5. The animals which are in heat will lick other animals and smelling other animals.

6. The animals will try to mount other animals

7. The animals will standstill when other animal try to mount. This period is known as standing heat. This extends 14-16 hours.

8. Frequent micturition (urination) will be observed.

9. Clear mucous discharge will be seen from the vulva, sometimes it will be string like the mucous will be seen stick to the near the pasts of valva.

10. Swelling of the valva will be seen.


12. The tail will be in raised position.

13. Milk production will be slightly decreased.

14. On Palpation uterus will be turgid and the cervix will be opened.
7.3. A.I. ADVANTAGES - DISADVANTAGES

Advantages and disadvantages:

Artificial insemination (A.I.) is deposition of semen into the female genital tract by means of instruments.

ADVANTAGES OF ARTIFICIAL INSEMINATION:

There are several advantages by artificial insemination over natural mating or servicing.

1. There is no need of maintenance of breeding bull for a herd; hence the cost of maintenance of breeding bull is saved.

2. It prevents the spread of certain diseases and sterility due to genital diseases. E.g. contagious abortion, vibriosis.

3. By regular examination of semen after collection and frequent checking on fertility make early detection of interior males and better breeding efficiency is ensured.

4. The progeny testing can be done at an early age.

5. The semen of a desired size can be used even after the death of that particular sire.

6. The semen collected can be taken to the urban areas or rural areas for insemination.

7. It makes possible the mating of animals with great differences in size without injury to either of the animal.

8. It is helpful to inseminate the animals that are refuse to stands or accept the male at the time of oestrus.

9. It helps in maintaining the accurate breeding and cawing records

10. It increases the rate of conception.
11. It helps in better record keeping.
12. Old, heavy and injured sires can be used.

**Disadvantages of A.I:**

1. Requires well-trained operations and special equipment.
2. Requires more time than natural services.
3. Necessitates the knowledge of the structure and function of reproduction on the part of operator.
4. Improper cleaning of instruments and in sanitary conditions may lead to lower fertility.
5. If the bull is not properly tested, the spreading of genital diseases will be increased.
6. Market for bulls will be reduced, while that for superior bull is increased.

**7.3.1 EMBRYO TRANSFER TECHNOLOGY:**

**Definition:**

It is a technique by which fertilized embryos are collected from donor female and transferred to a recipient female that serves as a surrogate mother for the remaining period of pregnancy.

**Advantages:**

1. It is used for rapid multiplication of genetically superior females.
2. It is used for rapid determination of genotype of an animal, specially when the characters being investigated are dependent on dominant genes.
3. Using genetically unreliable mothers as forer mothers for embryo of superior genetic make up.
4. For economic and safe transfer of exotic germplasm from one country to another.

5. For increasing the litter size in sheep and pigs

6. For production of twin calves in cattle.

7. For production of identical offsprings which are useful as research material.

8. For production of young ones with a sex of choice.

9. For production of chimeras

10. To study the material influence on the fetus

11. Rapid multiplication of endangered, rare and commercially desirable breed

12. Production of transgenic livestock.

**Disadvantages:**

1. Paucity of progeny tested bull frozen semen.

2. The superovulatory response of the donor cows under local agro climatic conditions may be far lower than what is possible in foreign countries. High atmospheric temperature and poor nutrition will have adverse effect on super ovulatory response, fertilization and embryonic development.

3. Embryo transfer technology is very expensive due to low survival rate of embryos. The hormones are very costly and they have to be imported. A modest estimate to superovulate a donor cow and synchronize 4 recipient cows will be about Rs. 1500/-

4. Embryo transfer Technology reduces highly technical skills.

**Stages in Embryo transfer Technology :**

1. Super ovulation of donor cow with follicular stimulating hormone at 32 mg.
2. Inseminating superovulated cow twice on the day of oestrous.

3. **Embryo collection**: There are two methods:

   a) **Surgical method**: Flush 2 to 20 ml of flushing medium (Dul becco’s phosphate buffered saline) through the oviduct from the upper part of uterine horn towards the fimbriae using a syringe and blunt needle. Collect flushings through a small glass tube inserted into the infundibulum (in cattle, sheep, goat & rabbit)

   Another method of surgical method is flush with 15 - 20 ml of medium through the oviduct from infundibulum, through the uterotubal Junction and into upper part of the uterine horn using a small glass tube attached to a springs. Collect flushings through a blunt needle or fine glass tube inserted into the uterine lumen through a punctuated wound. (This is used for mares and pigs)

   b) **Non surgical method**: Dilate the cervix (heifer) with cervical dilator, insert foley catheter into uterine horn by manual guidance per rectum, In that balloon with air, irrigate uterine horn with 100 - 800 ml of flushing medium. In cattle inflate balloon at base of uterine horn each time 30 -60 ml of medium is infused into the horn.

**Preparation of donor**:

i. donor cow is placed in atrevis

ii. The perinium of the donor cow is cleaned and scrubbed with antiseptic solution. Epidural anaesthesia is given.

iii. It cervix is introduced into the uterine horn,

iv. Foley’s catheter is introduced in to the uterine horn.

v. The plastic balloon is inflated to seal off the horn of the Uterus. Embryos are flushed out with culture media and collected in petric disher.
4. Selection of Embryo for transfer:

It can be screened by 200m stereo microscope. The embryo should be morphologically normal. Blastomeres should be in uniform six. It should not possess cellular debris in the morula. It should not have fragmentation of cytoplasmic and nuclear material. No vacuoles in the blastomeres.

5. Selection and preparation of recipients:

Recipients should be a regular (good breeder). It should have infection free genital tract. It should have called 3 moths back. (Post partum period 90 days). Recipients should be sexually matured, cycling normally, physical condition should be good and should not be fatty.

6. Synchronization of estrous between donor and recipient:

For successful of embryo transfer, synchronization between the stage of embryo and the stage of reproductive tract of recipient in necessary. For good results, the recipient should be in estrous with in 12 hours of the donor. This can be achieved by using synchronizing agents (PG F₂ α)

7. Transfer of embryos:

Two methods are there:

a) Surgical transfer:

Laporotomy will be performed under local anaesthesia. The tip of uterine horn is exposed through the incision in the flank. The embryo is deposited in the uterine lumen.

b) Non surgical method:

It is preferred in cattle. Embryo is deposited in the uterus through cervix with an A.I. gun (E.T. gun) loaded with straw which contains embryo, 6 days after estrus. The embryos at the time of examination and selection can be manipulated for Invitroculture of embryos for preservation.
Success rate:

The average number of calves produced per super ovulation is 3-4. It is possible to induce superovulation in a cow for 4-5 times per year. 10 calves can be obtained cow per year on an average.

7.4 SEMEN COLLECTION METHODS AND EVALUATION:

Various methods of collection of semen have been devised from time to time. The older unsatisfactory methods have gradually replaced by the new modern techniques.

There are three common methods.

1. Use of artificial vagina
2. By Electro-stimulation method.
3. By massaging the ampulae of the ductus differences through rectal wall.

The ideal method of semen collection is use of artificial vagina which is safe for sire and the collector also.

7.4.1 ARTIFICIAL VAGINA METHOD:

The artificial vagina has the following parts:

1. A heavy hard rubber 2" lose, open at both ends with a nostle for air and water in and outlet.
2. Inner sleeve of rubber or rubber liner.
3. The semen receiving cone or rubber cone.
4. Semen collection tube made of glass or plastic graduate in cc and its fraction correct to 0.1 CC

5. Insulating bag

Before using for semen collection all the parts are washed thoroughly and sterilized properly, and assembled as artificial vagina, the rubber liner is inserted into the hose; inverting both ends back by folding back from either side opening, and fastening with rubber bands. Now the space between the hard rubber hose and inner rubber liner forms a water tight compartment. The nostle at one end of the hose can be fixed or removed by

**PARTS OF A.V.**

turning through the threaded nut up or down. The water jacket of the Artificial vagina is filled with hot water at a temperature of 45°C (113°F) by opening the nostle.

The graduated semen collection tube is fixed to the narrow end of the Artificial vagina hose, and fastened by a rubber band. The inner side of the rubber liner on the anterior side of the artificial vagina is lubricated with sterile jelly to a length of 3 to 4 inches. Air is blown through the nostle into the water jacket, to create pressure in if, and the same is exerted the rubber linear, to simulate natural vagina.

The temperature of the artificial vagina is to be checked, at each collection, and it should simulate natural vagina at mounting time. If the artificial vagina is
too hot it will burn the penis of the bull, and the b.—II refuses to mount later. If it is too cold ejaculate may not be there after a

thrust, or even if ejaculate is there; it may be contaminated with urine, and becomes unfit for use.

SEMEN COLLECTION
METHOD. (A.V.)

The cow or dummy is secured in service create. The artificial vagina assembled is held at 45° angle from the direction of penis, and the thrust is that angle. The artificial vagina is held with the left hand by a right handed person; and when the bull mounts the cow, the sheeth of the bull will be graphed by the operator, directing the glans penis into the artificial vagina, and then the bull gives a thrust to ejaculate.

The operator should evince care so as not to touch the exposed past of the penis. After the bull dismounts, the artificial vagina is taken off from penis and the airvent is opened to release the pressure from the jacket. The water from the jacket is also drained by opening the nostle. This allows the ejaculate to flow from the cone to the semen collection tube. The semen collection tube is detached from the cone, plugged with cotton wool, and taken to the laboratory for examination.

The rubber cone and the semen collection tube can be protected from external contamination or heat or higher, by covering with an insulation bag with zip.
7.5 INSEMINATION METHODS:

There are different methods insemination in different species of animals i.e. speculum method, vaginal method and recto vaginal method.

7.5.1 RECTO VAGINAL METHOD:

In cattle the safe and best method of insemination is “Recto vaginal method of insemination”.

Cow which is in heat is well controlled placing it in a Travis. The inseminator will get ready by wearing a plastic apron, gumboots and gloves. The semen straw after thawing (i.e keeping the semen straw in warm water for a minute to convert the freezed semen into liquid and the sperms become motile) is loaded in a sterilised A.I. gum and is covered with a plastic sheeth.

The inseminator will insert the gloved left hand into the rectum after applying the soft soap or other lubricant on the glove and back racked the animal, and the hand is further inserted and will catch hold the cervix through rectal wall. The A.I gum loaded with semen straw is passed
through the vulva to vaginal and cervix and observed with the hand in rectum that the A. I gum reaches the cervix, then the semen is deposited by injecting the gun, and after depositing the semen the gun is removed, the empty straw and sheath are disordered:

7.5.2 SPECTRUM METHOD:

In this method spectrum is placed in the vagina of the cow, which provides passage outside to the site of insemination, then inseminating tube is passed through the speculum and semen is deposited at the cervix INSEMINATION METHOD

7.5.3 VAGINAL METHOD:

Hand is passed through the vagina and the inseminating tube is guided by hand to the site of insemination and semen is deposited. Here there is a risk of contamination and injury of female genitalia.

7.6 FROZEN SEMEN AND STORAGE:

Freezing of semen for successful preservation of spermatozoa, for long periods, is of great importance in livestock breeding and farm management. It has made it possible to make available the use of outstanding proven sires for larger number of cows, covering larger area, frozen semen shipment has become possible to different continents in the globe to any place connected with any service. Now a days if farmer wants to use of an outstanding size for inheritance of high milk yield, he can go in for frozen semen service provided his area is, covered by Artificial insemination, with supply of frozen semen.

At present frozen semen is used in most of the states in India. The technique of semen preservation in straws was developed in France. Freezing of semen is done with a special diluent, which has the following composition.
Sodium citrate dihydrate (angular) 2.4 y. 2.0 gms 8.0 ml
25.0% by volume 50,000 units per 100 ml of semen

Fructose
Glycerol Egg
Yolk Penicillin diluent.

Dihydro-streptomycin 50.0 mg per .100m1 of semen diluent.

Distilled water double glass distilled 100.0m1.

The addition of glycerol to the diluent makes the cells more resistant to the rigours of freezing and icy crystals, which form are smaller and smoother thus creating less damage to the spermatozoa. The addition of fructose to the diluent luprores sperm resistance to glycerol; and also provides nutrition.

Frozen semen is packed in single dose glass vials or plastic straws at +5°C. The final level of glycerol should be 7.0 to 7.6% during the freezing process. The antibiotics are added to inhibit bacteria and to kill pathogenic organisms. The semen to be diluted in such a way that one ml. of extended semen will contain 20 million motile spermatozoa. The semen must be cooled carefully for spermatozoa to remain with life. The final temperature is lowered to -79°C or still lower. Quick freezing is done for a period of 3 to 5 minutes to -75°C with the help of atmosphere created by liquid nitrogen. In the slow freezing technique cooling is done at the rate of 1 °C per minute from +5°C to -15°C. From -15°C to -31 °C at the rate of 2°C per minute. From -31°C to 75°C at the rate of 4 to 5°C per minute. Thus taking 40 minutes in total, further cooling to -96°C can be done quickly as it is not critical after freezing. Before freezing the diluted semen in equilibrated for 3 to 5 hours or for the best 16 j0 20, hours period in refrigerator at 5°C.

Frozen semen facilitates the cent percent use of the semen diluted and frozen, and thus the delivery price is reduced, and it can be supplied with the gaps of months to the A.I technicians as against the supply of fluid semen every days or alternate days.
Liquid nitrogen plays a vital role for storing the frozen semen straws, at a temperature of -196°C for longer periods.

7.7 PREGNANCY DIAGNOSIS:

Pregnancy can be diagnosed by

1. By observing the signs of pregnancy.
   a) The animal will not come to heat again
   b) The animal tends to become sluggish in temperament and tractable
   c) The animal has tendency to grow
   d) Increase in the volume of abdomen
   e) Increase in body weight
   f) The mammary gland become firm, enlarged and tats takes waxy appearance.

2. Examination of Uterus spectrum

   a) Ovaries contains corpus luteum throughout the gestation period; C.L. is firm, rounded at the top and slightly elevated from the surface of the ovary.

   b) From the beginning of 2"d month middle of 2"d month one horm of the Uterus is enraged. It enlarged horn is allowed to slide between the thumb and the first two fingers, a sphere can be felt, which has characteristic slippery feeling at the end of 2nd month sensation of foctal membrance can be felt.

   By third month uterus detention can be seen. If distended horn is tapped with fingers reveals like a piece of wood floating in fluid beneath. Early in 4th month cotyledons can be felt. By the d of 4tn month uterine artery starts enlarging if the artery is slightly compressed between the fingers and thumb, continuous vibrating fermitus (uterine thrill) can detected which latter changes to pulsation. From 5th month onwards uterus sinks below the pervic cavity until middle of 6th month. After wards presence of calf can be easily detected.
3. Laboratory tests

a) Serum of pregnant cows contains globulins.

b) Barium chloride test: 4 to 5 drops of barium chloride when added to urine of the same volume from a pregnant cow does not affect the colour, but it becomes turbid with non pregnant.

c) Specific gravity test: 0.25ml of cervical mucoses is placed in copper sulphate with 1.008 specific gravity. If it sinks —→ pregnant Floats 4 non pregnant

d) Sodium hydroxide test : 0.25ml of cervical mucosa is added to 5ml of 10% sodium hydroxide solution and heat over flame till boiling. Development of orange colour indicates positive and pale colour indicates negative.

e) Oxidation reduction test: To 3ml of urine 0.6ml of sodium benzoate indicator is added in a test tube. Tubes are inverted and allowed to stand for 30 minutes green colour is developed. If the colour is permanent positive for pregnancy, where as with non pregnant green colour returns to original colour.

7.8 PARTURITION - PRECAUTIONS:

Parturition is the expulsion of the foetus and its membranes from the uterus through the birth canal. This process is also known as calving in cattle. In cows the gestation period will be 275 - 285 days and in buffaloes 300 - 310 days.

The pregnant animals kept under careful observation when they are approaching parturition, and after seeing the symptoms of parturition i.e developed udder, enlargement of vulva etc., the pregnant animal is kept in a calving pen with sufficient bedding of” soft straws. The concentrate feeding should be given separately to the animals near parturition with extra rations developing the previous production of the animal.

The calved animal is kept warm. The cow should be given plenty of...
warm water to drink. The cow is washed with clean water and sufficient quantity of green grass and food is supplied. After parturition due to straining some times prolapse of uterus or vagina is seen, in such cases it should be immediately referred to a qualified veterinarian. Some times heavy milking cows will show the symptoms of “Milk fever” which has to be attended by a veterinarian to give 300-500ml of cal Borogluconats IV, after parturition or delivery the placenta is not expelled (Retained placenta), in such cases it is removed manually after 24 hours.

**SUMMARY**

Artificial insemination ‘A.I’ is the deposition of semen into the female genital tract by means of instruments. The advantages and disadvantages of A.I is described. Methods of semen collection. The superior is Artificial vaginal method is described in detail. Physical examination, chemical examination and bacterial examination of semen and semen dilutions, preparation of frozen semen and its storage and methods of insemination and cleaning and sterilization of a. Equipment, Fertilization , embrogenesis, pregnancy diagnosis and precautions to be taken before and after parturition is described in detailed

**Short Question:**

1. What is A.I.?
2. What is frozen semen?
3. What is parturition?
4. What is Fertilization?
5. Give the temperature of storage for frozen semen.
6. Name the different semen collection methods.
7. What is the popular method of insemination in cattle?
8. Name two important semen diluent.
9. What is the function of semen dilutor?
10. Expand E.T.T.
11. Define E.T.T.
Long Question

1. Describe in detail the advantages and disadvantages of A.I.
2. Describe in detail the preparation and storage of Frozen semen.
4. Describe the precautions to be taken before and after parturition.
5. Write about fertilization in a cow?
6. What are the advantages and disadvantages of E.T.T.?
8- LACTATION

8.1 MAMMARY GLAND, STRUCTURE AND DEVELOPMENT:

The udder is a skin gland and is located entirely outside the abdominal cavity. It is supplied by blood vessels i.e. mammary artery and mammary vein. It is composed of two halves, the right and left, divided by a median suspensory ligament. Each half is further divided into two separate quarters by thin membranes. There is no communication among the four quarters of the udder. Each quarter is composed of secretory tissue and some supporting connective tissue. The secretory tissue consists of numerous “Alveoli” or tiny chambers lined with many secretory cells. Each Alveolus is supplied with tiny capillaries which lie outside the secretory cells. Small muscle fibres, called myoepithelial cells also surrounding each alveolus, which causes contraction of the alveoli and produce “Let-down” of milk.

Each alveolus is drained by a small duct called Aruminal duct. A cluster of alveoli and their ducts resembling a bunch of grapes constitute a lobule. A group of lobules are surrounded by a septum of connective tissue and form a “Lobe”. The terminal ducts unite to form interlobular duct. These ducts unite successively to larger ducts called interlobular (between lobules), intralobular (within lobe) and interlobar (between lobes). The interlobular ducts units successively to form galactophores that empty into the glands cistern or milk cistern as sinus at the tip of the udder which is continuous with teat cistern. The teat cistern is joined with ‘STREAK CANAL’ a narrow tube that opens at the lower end of the teat. The teat canal is surrounded by ‘muscular sphincter’ which remains constricted and prevents leakage of milk until milking commences. The streak canal and sphincter are also responsible for preventing entrance of bacteria and other contaminants in the teat.

The blood to the udder is carried by pair of external pudic arteries (majorly) and parineal arteries. The blood is carried away from the udder by a pair of external pudic veins and one subcutaneous abdominal vein. In addition to the arteries and veins, there are numerous lymph vessels, which carry lymph away from the udder to the supramammary lymph glands. Blockage of lymph vessels may result accumulation, which is commonly seen in heifers before causing.
THE MAMMARY GLANDS OF THE COW

CONNECTION OF THE DUCTS WITH THE LOBULE – ALVEOLAR SYSTEM
8.2 LACTOGENESIS AND GALACTOPOIESIS:

LACTOGENESIS:

Synthesis of milk: Milk is synthesised in the cells of alveoli from various, blood constituents. Some of the milk components are taken as such from the blood such as water, vitamins and minerals while others are synthesized by the alveoli cells from the ingredients picked up from the blood. Thus once the milk is formed in very small droplets in the alveolar cells, it migrates towards the apex of the cells, where is finally ejected into the lumen of the alveoli. It is estimated that 500 volumes of blood flows through the udder for each volume of milk synthesized. Hormones that induce lactogenesis vary from species to species. In general it appears that prolactin and adrenal corticoids are mainly involved: The Estroegeur progesterone which are secreted in large quantities during pregnancy, tender the lactogenesis effect of prolactin of adrenal murrums. At the time of parturition a rise of prolactin adrenal corticoids occurs with concomitant decline in estrogen and progesterone, resulting in the initiation of lactation.

GALACTOPOIESIS:

Maintenance of Lactation is known as Galactopoiesis. Milk production increases rapidly following parturition and replace a peak in 2 to 4 weeks where it remains for a short period and then gradually declines. Many factors are there to influence the level at which the lactation is maintained. The sucking stimulus and intra mammary pressure are two important factors are among them. The stimulus of sucking or milking causes release of almost all the hormones which is accumulated in the udder is also important.

Each alveolus is drained by a small duct called terminal duct. A cluster of alveoli and their ducts resembling a bunch of grapes constitute a lobule. A group or lobules are surrounded by a septrum of connective tissue and form a “Lobe”. The terminal ducts unite to form intralobular duct. These ducts units successively to larger ducts called inter tubular (between lobular), intra lobar (within lobe) and inter lobar (between lobes). The inter lobar ducts units successively to form galactophores that empty into the gland cystern or milk cystern, a sinus at the tip of the udder which is continuous with teat system. The teat cystern is joined with ‘STREAK CANAL’, a narrow tube, that opens at
the lower end of teat. The teat canal is surrounded by ‘muscular sphincter’ which remains constricted and prevents leakage of milk until milking commences. The streak canal and sphincter are also responsible for preventing entrance of bacteria and other contaminants in to the teat.

The blood to the udder is carried by pair of external pubic arteries (majority) and perineal arteries. The blood is carried away from the udder by a pair of external pubic veins and one subcutaneous abdominal veins. In addition to the arteries and veins, there are numerous lymph vessels, which carry lymph away from the udder to the supramammary lymph glands. Blockage of lymph vessels may result accumulation, which is commonly seen in heifers before calling.

8.3 MILK LET DOWN:

The milk ‘letdown, mechanism. When milk secretion has continued for considerable time after milking, the alveoli, ducts and gland and teat cisterns are filled with milk. Milk in the cisterns and larger ducts can be removed readily. Milk in the smaller ducts and alveoli does not flow out easily. However, the cow and other animals have developed a mechanism for releasing milk from the mammary gland.

Stimulation of the central nervous system by something associated with the milking process is necessary to initiate the reaction. Stimulation of nerve endings in the teats that are sensitive to touch, pressure, or warmth is the usual mechanism. The sucking action of the ‘calf is ideal for this. However, massaging the udder or washing with warm water is also equally effective. Stimulation is carried by the nerves to the brain which is connected with the pitutary gland located at its base. Mechanisms are activated in the pitutary gland which cause the liberation of a hormone oxytocin from its posterior lobe. Oxytocin is carried by the blood stream to the udder where it acts on the small muscle cells surrounding the alveoli, causing them to contract. The pressure thus created forces the milk out of the alveoli and smaller ducts as fast as it can be removed from the teat.

The letting down process can be stimulated within half to one minute’s time. The effective time of the hormone is limited and milking should be completed within seven minutes if all the milk is to be obtained.
8.4. MILK METHODS:

In India hand milking of cows is still the most common practice. Cows are milked from left side. The order of milking the various teats also differs. Teats may be milked cross-wise or fore quarters together and then hind quarters together or teats appearing most distended milked first. The milk must be squeezed and not dragged out of teats. The first few streams of milk from each teat should be let on to a stripcup (see Chapter 7) to see clues in milk for possible incidence of mastitis. This also helps in getting rid of bacteria which have gained access and collected in the teat canal.

Stripping and full-hand milking are the two commonly used methods of milking. Stripping (Fig. 8.42) consists of firmly seizing the teat at its base between the thumb and forefinger and drawing them down the entire length of the teat pressing it simultaneously to cause the milk to flow down in a stream. The process is repeated in quick succession. Both hands may be used, each holding a different teat, stripping alternately.

The full-hand method comprises holding the whole teat in the
fist, fingers encircling the teat (Fig. 8.43). The base of the teat is closed in the ring formed by the thumb and fore finger so that milk trapped in the teat sinus may not slip back into the gland cistern. Simultaneously, teat is squeezed between the middle, ring and little fingers and the hollow of palm, thus, forcing the milk out. This process should be repeated in quick succession. By maintaining a quick succession of alternate
compressions and relaxations the alternate streams of milk from the two teats sound like one continuous stream. Many milkers tend to bend their thumb in, against the teat while milking (Fig. 8.44). This practice should be avoided as it injures the teat tissues.

Full-hand milking removes milk quicker than stripping because of no loss of time in changing the position of the hand. Cows with large teats and she-buffaloes are milked by full-hand method; but stripping has to be adopted for cows with smaller teats for obvious reasons. Full-hand method is superior to stripping as it simulates the natural sucking process by calf. Stripping causes more irritation to teats due to repeated sliding of fingers on teats; and so discomfort to cows. In spite of these drawbacks when all milk that is available is drawn out by full-hand method, stripping should be resorted to with a view to milk the animal completely; the last drawn milk is called strippings and is richer in fat.

In India, milkers are mostly accustomed to wet hand milking. They moisten their fingers with milk, water or even saliva, while milking. This should be avoided for the sake of cleanliness. Wet-hand milking makes the teats look harsh and dry chafes, cracks and sores appear, which are painful to animal. The hands should be perfectly dry while milking.

When cracks and sores are noticed on teats, some antiseptic ointment or cream should be smeared over them after milking.

8.5 CLEAN MILK PRODUCTION:

Milk containing dirt, dust, foreign materials high bacterial count and with off-flavour is called a contaminated milk. Milk is contaminated by various sources like Udder, Exterior of cows body, milking barn, flies, milker, utensils etc. On consumption of contaminated milk, one may get a number of health problems. The sources for contamination are discussed below with their relative importance.

8.5.1 UDDER

UnSanitary conditions of milking barns and bedding of the animal causes bacterial growth. Such bacteria may enter in to the udder through teat canal, which causes infection the udder like mastitis resulting contamination of milk.
The fore milk may be discarded as it contains high bacterial count. Complete milking should be done. Incomplete milking may lead to infection of the udder.

**8.5.2. EXTERIOR OF COW’S BODY:**

Bacteria present on the animal body may enter into the milk at the time of milking. Maintenance of clean skin, washing flank and *udder with clean damp cloth before milk reduces the contamination from this source.

**8.5.3 MILKING BARNs**

Milking barns with good ventilation and neat flooring avoid contamination from these sources. Dry feeds or forage should be fed after milking.

**8.5.4 FLIES AND OTHER VERMIN:**

External parasites like flies, lice; mosquitoes etc may enter into the milk. So care should be taken to avoid these parasites from the barn by spraying fly spoors or by fly traps. Breeding places for these parasites like stagnant water, moist atmosphere etc may be avoided.

**8.5.5 MILKER**

Milker is directly responsible in producing good quality milk. Dirty hands and clothing of the milker may be the source of contamination. Several bacterial diseases may transmit from the milker, or handler to the consumer through milk. Persons suffering from diseases like T.B, Typhoid fever, diphtheria may not be employed for milking. Dirty habits like smoking, drinking should be avoided.

**8.5.6 UNTENSILS:**

Utensils are the containers or equipments in which the milk is handled, processed, stored or transported. Clean sanitized, smooth copper free and dry utensils may be used for handling milk.
8.5.7 MILKING METHODS

Wet hand milking and fist ing causes contamination of milk. Milkers in rural moisten their fingers with milk, water or even saliva, while milking. This should be avoided. Wet hand milking should be avoided. Wet hand milking makes the teats look harsh and dry chokes, cracks and sores appear which causes contamination.

twisting causes damages to the teat tissue which leads to udder infection. So dry hand milking may be practiced to avoid contamination of milk. Major contamination of milk is caused by bacterial entry. So steps re to be taken to, monitor such bacterial entry like avoiding insanitary conditions of the barn. Milker, Utensils and avoiding unflair milking ractices.

2 STEPS IN CLEAN MILK PRODUCTION

1. The animal should be washed before milking.
2. Washing of cows is best practice to minimise the bacterial entry.
3. If calf is allowed for sucking, udder may be moist, cleaned with weak disinfectant solution later with fresh, clean water and wiped dry with a smooth and clean cloth.
4. Hands of the milker should be clean and dry. Wet hand milking may result in high bacterial count in the milk.
5. Nails of hands of the milker should be well trimmed.
6. Milker should be free from all diseases.
7. Dusty feed like Rice polish should not be fed to the animal at the time of milking.
8. Milking barns should be well ventilated free from flies.
9. Utensils used for milking should be clean, stanitized, smooth and copper free.
10. Flavour producing feeds should be fed only after milking so that flavours will not appear in milk.

11. The hind legs and the switch of the animal be tightened with the help of a milk man’s rope at the time of milking.

12. Milk is kept in cool place to maintain the flavour and keeping quality.

13. Milk should be covered with lids to avoid dust, dirt, entry hot, or cold, day light or strong artificial light, all of which tend to decrease milk quality. Raw milk with not exceeding 2,00,000 specific count in one ml of milk can be graded as very good raw milk.

**FACTEROLOGICAL STANDARDS OF RAW MILK**

<table>
<thead>
<tr>
<th>SPCL ML</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not exceeding 2,00,000</td>
<td>Very good</td>
</tr>
<tr>
<td>Between 2,00,000 and 10,00,000</td>
<td>Good</td>
</tr>
<tr>
<td>Between 10,00,000 and 50,00,000</td>
<td>Fair</td>
</tr>
<tr>
<td>Above 50,00,000</td>
<td>Poor</td>
</tr>
</tbody>
</table>

**SUMMARY**

The secretion of milk from the memory gland of a female animal after parturition is known as lactation. The mammary gland is composed of two halves, the right and left, and each half is further divided into two separate quarters, thus there are four quarters in a mammary gland. Lactogenesis is the initiation of lactation and lactogenesis is the initiation of lactation and Galactopoiesis is maintenance of a lactation. The secretion of milk is depend on hormonal function of prolaction, ACTH and adrenal hormone. The let down of milk or milk ejection is depend upon the suckling and intra-mammary pressure. There are so many factors affecting the quality and quantity of milk such as species, breed. Individual health, age, stage of lactation, season of
calving, milking intervals frequency of milking level of feeding, heat period and exercise. Use of moet, BST hormone will increase the milk production in our country.

**SHORT QUESTIONS:**

1. What is Lactation ?
2. What is Lactogenesis ?
3. What is Galactopoiesis ?
4. Name different hormones concerned with lactation.
5. What is lobule and lobe ?
6. What is MOET ?
7. What is BST ?

**LONG QUESTION**

1. Describe in detail the factors affecting the quality and quantity of milk ?

2. Write short notes on the following ?

   a) Lactogenesis  
   b) Galactopoiesis  
   c) Milk let-down

3. Explain the structure of udder with the help of sketch diagram.

4. What are the recent techniques used for increasing milk production in India.