1.1 Live stock Statistics

As per the 2003 livestock census:

- World cattle population is 1371.10 Million
- World Buffalo Population is 170.7 Million.
- Cattle population in India is 185.18 Million.
- Buffalo population in India is 97.92 Million.
- Total bovine population in India is 283.10 Million.
India is having roughly 1/7th of world cattle population and 50% of world buffalo population.

- Cattle population in Andhra Pradesh: 9.3 Million and 7th position in India.
- Buffalo population in Andhra Pradesh: 10.60 Million and 2nd Position in India (After U.P.)

**As per FAO statistics 2008**

- Sheep population of the world is 1078.20 million
- Goat population of the world is 861.90 million
- Sheep population in India is 65.00 million
- Goat population in India is 125.70 million
- India is having 6% of the sheep and 14.6% of the goat in the world
- Sheep population in Andhra Pradesh is 21.38 million (2003 All India livestock census)
- Goat population in Andhra Pradesh is 6.28 million (2003 All India livestock census)
- Amongst the States, Rajasthan has the maximum number of Sheep.
- Jammu and Kashmir has the highest number of cross bred sheep in India

**1.1.2. Milk Production Statistics.**

As per the FAO 2009 statistics

- Total Milk Production in the world: 704 Million Metric Tons
- Total Milk production in India: 112 Million Metric Tons and ranks 1st in the world

Out of the total milk production in India.

- 56.1% is contributed by buffaloes
- 40.26% by cows
- 3.60% by sheep, goat and miscellaneous.

The Milk production in Andhra Pradesh: 7.64 Million Tonnes and ranks 7th in India.
1.1.3 Meat Production Statistics

• Sheep and goat contributes 5 and 10 per cent of total meat production respectively, in India

• According to FAO the world production of Sheep meat was 8.63 million tons and Goat meat was 4.94 million tons in 2006.

• India ranked seventh in sheep and second in goat meat production.

1.1.4 Wool Production Statistics

• India is the seventh largest producer of wool and contributes 1.8% to total world production.

• The production of indigenous raw wool in 2006-07 was 45 mn.kg.

• Of the total production of raw wool, 5% is apparel grade, 85% carpet grade, and 10% coarse grade.

1.1.5 Per Capita Availability of Milk and Meat in India

• The per capital availability of milk in India is 229 grams per day / per person and in Andhra Pradesh 286 grams/day.

• I.C.M.R. has recommended a minimum of 280 grams per day / per person.

• The highest per capital availability of milk in India is Punjab (794 gms).

• Per capita consumption of meat increased from 870 grams in 2000 and expected to reach 2 Kg during 2009.

1.1.6 The Consumption Pattern of Milk in India

• Liquid Milk: 46.0%

• Ghee: 28%

• Butter: 6.5%

• Curd: 7.0%

• Khoa: 5.5%

• Milk powder: 3.6%

• Cheese: 2%

• Other products: 1.4%
1.1.7 Meat Trade

- The production of meat has increased 1.9 million tonnes to 23 million tonnes from 2001 to 2007.
- The export of buffalo meat was increased from 343817.08 tonnes (value Rs 1536.77 crore) in 2003-04, to 483478 tonnes (Rs.3549.70 crore) in 2007-08.
- The export of sheep/goat meat is increased from 16820.53 tonnes (Rs 110.39 crore) in 2003-04 to 8908 tonnes (Rs.134.09 crore) in 2007-08.
- With rapid urbanization, higher income levels and changes in lifestyle, market for scientifically produced and hygienically packed meat and meat products are expanding rapidly. Today, the increasing demand of the meat and meat products for in domestic and foreign market, particularly to the Gulf and West Asia and neighboring countries. The processed meat export was 986.13 tonnes (Rs 7.63 crore) in 2003-04 and now it is 1245 tonnes (value Rs 12.96 crore).

1.2 Role of Livestock in Indian Economy

- Livestock sector plays an important role in the national economy and in the socio-economic development of the country. It also plays important role in the rural economy as supplementing family income and generating gainful employment in the rural sector, particularly among the landless labourers, small and marginal farmers and women’s.
- Apart from the food, it is an important source of draught power, manure for crop production and fuel for domestic use.
- The growth in the livestock subsector is expected to contribute to poverty alleviation, as the livestock elements are largely concentrated among the marginal and small farmers in rural areas. Near about 70% of livestock market in India is owned by 67% of small and marginal farmers and by the land less.
- This sector contributed important share in export of Indian international trade. The livestock sector contributed over 5.26 per cent to the total GDP during 2006-07. According to estimates of the Central Statistical Organization (CSO), the value of output from livestock and fisheries sectors together at current prices was about Rs.2,82,779 crore during 2007-08 which is about 31.6 per cent of the value of the output of Rs.8,94,420 crore from agriculture & allied Sector.
India, which has 66 per cent of economically active population, engaged in agriculture, derives 31 per cent of GDP from agriculture. The share of livestock product is estimated at 21 per cent of total agricultural sector.

- Animal Husbandry sector provides large self-employment opportunities.
- Livestock Sector not only provides essential protein and nutritious human diet through milk, eggs, meat etc but also plays an important role in utilization of non-edible agricultural by-products.
- Livestock also provides raw material/by products such as hides and skins, blood, bone, fat etc.
- Livestock provides subsidiary occupation to a large section of the society particularly to the people living in the drought prone, hilly, tribal and other remote areas where crop production on its own may not be capable of engaging them fully.
- In the adverse climatic conditions and national calamities like drought, flood etc., animal husbandry practices shall be proved to be boon for sustaining the livelihood of the landless and marginal farmers in the state.

1.2.1 Role of Dairy Animals

- India continues to be the largest producer of milk in the world and produced 13.1 per cent of the total milk produced in the world. Hence, India has attained the first rank in milk production in the world.
- This has not only placed the country on top in the world, but also represents sustained growth in the availability of milk and milk products for the growing population of the country. Concentrated dairy products such as skimmed milk continues to be the largest item of export, which together accounts for nearly 78% of net milk and milk product exports during 2007-08.
- Dairy farming has been recognized as an important source of income and is more remunerative in comparison to crop production in India. 70 million rural households primarily, small and marginal farmers and landless labourers in the country are getting employment opportunities in dairy. Dairying has become an important secondary source of income for millions of rural families.
- Milk production in India is predominantly the domain of small farmers in mixed farming system. The importance of dairying in lies not only in products but also it brings about significant changes in socio-economic structure of rural economy.
The National Commission on Agriculture observed dairy farming as an additional source for improving the status of rural masses, especially weaker sections, consisting of small, medium & landless labourers. More than 2,445 million people economically active in agriculture in the world, probably 2/3 or even more than ¾ of them are wholly or partly dependent on livestock farming.

1.2.2 Role of Sheep and Goat

- Sheep and goat contribute greatly to the agrarian economy, especially in the arid/semi-arid and mountainous areas where crop and/or dairy farming are not economical.
- They play an important role in the livelihood of a large percentage of small and marginal farmers and landless labourers engaged in sheep rearing.
- A number of rural-based industries use wool and sheep skins as raw material.
- Sheep manure is an important source of soil fertility, especially in southern states.
- Sheep in India are mostly maintained on natural vegetation on common grazing lands, wastelands and uncultivated (fallow) lands, stubbles of cultivated crops and top feeds (tree loppings).
- Sheep are mostly reared for wool and meat. Sheep skins and manure constitute important sources of earning, the latter particularly in southern India.

1.3 Common Terms used in Farm Animal Management

- CALF: Young one of cow by birth to 6 Months of age is known as Calf
- HEIFER: Female calf from the age of puberty to calving is known as Heifer.
- BULL OR SIRE: A male calf from the age of puberty to castration is known as Bull or Sire which is fit for servicing/breeding.
- BULLOCK: A castrated bull is known as Bullock which is used for work or ploughing
- SCRUB BULL: A bull which is non descriptive and not fit for breeding.
- BREEDING BULL: A bull which is maintained for breeding purpose, which usually have a good pedigree record
- TEASER BULL: A vasectomised bull which is used in the herd to detect the animals in heat.
COW: A female or heifer after first calving.

MILCH COW: A cow which has been giving 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 Buffalo.

COLOSTRUM: The milk produced by a cow or buffalo immediately after calving

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

WEANING: Separation of calf from the mother after parturition is known as weaning.

CULLING: Culling is a process in which the un-wanted, unproductive or uneconomic animals are removed from the herd or farm.

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 accepts 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 cow in heat with bull is known as servicing.

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

VEAL: The meat of calf is known as veal.

EWE: Adult female sheep

RAM: Uncastrated adult male sheep

DOE: Adult female goat

BUCK: Uncastrated adult male goat

LAMB: Young sheep of less than one year

KID: Young goat of less than one year
LAMBING: Act of parturition in sheep
KIDDING: Act of parturition in goat
WEDER/WEDDER: Castrated male sheep
1.4.1 Body Parts of Sheep

Fig. 1.2 Body Parts of Sheep

1.4.2 Body Parts of Goat

Fig. 1.3 Body Parts of Goat
1.5 Summary

Lilve stock statistics and the role of live stock in Indian rural economy is described in detail. Common terms which are used in dairy animal management have been described in details. The external body parts of cow, sheep and goat shown in drawing.

Short Answer Type Questions

1. What is Eve?
2. What is the per capita consumption of Milk in India?
3. What is the Sheep and Goat population in India?
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 milk production in the World?
8. What is freemartin?
9. What is Artificial Insemination?

Long Answer Type Questions

1. Describe in detail about the role of live stock in Indian Rural Economy?
2. Draw a diagram of cow and label the external body parts?
3. What are the common terms used in diary animal management?
2.1 Definition of breed - Classification of Indian Cattle Breeds

A breed is a group of animals having 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”.

Indian cattle breeds of cattle classified in to three types

(a) Milch breeds / Milk breeds
(b) Dual Purpose breeds
(c) Draught breeds
2.2 Indian Breeds of Dairy Cattle

2.2.1 Milch Breeds / Milk Breeds

The cows of these breeds are high milk yields 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.

2.2.1.1 Sahiwal (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 Indian sub continent.
- It is a medium sized breed, having 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 pendulous.
- The tails is long with a black switch. Udder is large, broad and fine. Teats are good, uniform in size and squarely placed. Milk veins are large and prominent.
- Milk yield – 1400-2500 kgs
- Age at first calving - 37-48 months; Calving interval – 430-580 days
- A new breed called Jamica Hope has been evolved out of Sahiwal and Jersey crossbreeds in Latin America and West Indies.

Fig. 2.1 Sahiwal Cow
2.2.1.2 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 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 and well developed milk veins.
- 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 1.100 kg in a lactation period (300 days) and milk yield of well bred herds is 1800 kg in lactation.

![Red Sindhi Cow](image)
2.2.1.3 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 proportionate 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, well set apart, and peculiarly curved. They take a downward and backward curve and in line 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 markedly 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 work.

Fig. 2.3. Gir Cow
2.2.1.4 Deoni

- The home of this breed is Marathwada now in Maharashtra state.
- This breed is considered 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 some 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.

Fig. 2.4 Deoni Bull
2.2.2 Dual Purpose Breeds

The cows in these breeds are average milk yielders and male animals are good work animals. Their milk production per lactation is 500 kg to 1500 kg. The example of this group are Tharparker, Ongole, Hariana, Kankrej, Krishna valley, Rathi and Gaoalo and Mewathi.

2.2.2.1 Tharparker

- Originated from Sind of Pakistan. Herds are found in Jodhpur, Jaisalmer of Rajasthan. Average animals of the Tharparkar breed are deep, strongly built, medium-sized, with straight limbs and good feet, and with an alert and springy carriage.

- The usual color of the cattle is white or gray. In males, the gray color may deepen, particularly on the fore and hind quarters. All along the backbone there is a light gray stripe. The color of the cattle deepens during the winter months and also when the cows are pregnant.

- The head is of medium size, the forehead broad and flat or slightly convex above eyes: the front of the horns and face are practically on one plane.

- Horns are set well apart curving gradually upwards and outwards in the same line as that of the poll with blunt points inclined inwards. A small portion of the skin with hairs extends over the base of the horns.

- The dewlap is of medium size and the skin is fine and mellow.

- The sheath in the males is of moderate length, and is semi-pendulous.

- The navel flap in the females is prominent. Shoulders are light and legs are comparatively short, but in good proportion to the body.

- The colour of the skin is black, except on the udder, under the belly, on the lower part of the dewlap and inside the ears where it is rich yellow.

- Tharparkar cows average 138 cm in height and an average weight of 408 kg. When left on arid pasture the milk production is approximately 1135 kg per lactation, while those animals maintained in the villages average 1980 kg.
2.2.2.2 Ongole

- The home of this breed is Ongole tract comprising of Ongole, Guntur, Sathenapalli, Vinukonda and Kandukur talluks and Nellore districts of Andhra Pradesh.
- The cows are good for milk production and the males 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 marking around the eyes is common.
- Face is moderately long, with wide nostril and black nuzzle
- Ears are moderately long
- The horns are short andstumpy. Loose horns are common in this breed.
- Hump is well developed and erect, dewlap is well developed and 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.
• The bullocks are very powerful and good for heavy work.
• Ongole is one of the heaviest breeds in India. 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.

Fig. 2.6 Ongole Bull and Cow
2.2.2.3 Hariana

- The home of this breed is Hariana state of India and distributed in Punjab, Rajasthan and Uttar Pradesh. The colour of the breed is white or light grey.
- The head is light and the face is long and narrow, flat forehead.
- The 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 and 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.

![Fig. 2.7 Hariana Bull and Cow](image_url)
2.2.2.4 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 centre.
- The horns are thick, strong and curved and slightly symmetrical. The base of the horns are covered with skin to a higher point than 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 cow the 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 males are active, strong and good both for plough and cart.

Fig. 2.8 Kankrej bull
2.2.3 Draught Breeds

The male animals are good for work and cows are poor milk yielders. Their milk yield on an average is less than 500 kg per lactation. They are usually white/grey in colour. A pair of bullocks can pull 1000 kg, net weight with an iron tyre cart on a good road at walking speed of 5 to 7 km per hour and cover a distance of 30 to 40 km per day. Twice as much weight can be pulled on pneumatic rubber tube carts.

2.2.3.1 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 is 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 and 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.
- Cows are poor milkers but bullocks are good work animals

![Fig 2.9 Malvi bull](image-url)
2.2.3.2 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 sprung 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.

![Hallikar Cow](image_url)

Fig. 2.10 Hallikar Cow

2.2.3.3 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 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.

2.2.3.4 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 having 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 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.
2.2.4 New Breeds Developed in India

2.2.4.1 Karan Swiss

- Evolved by cross breeding American Strain Brown Swiss with Sahiwal and Red Sindhi at NDRI, Karnal.

- The overall inheritance of Brown Swiss is 50%. Out of interse mating uniform breed characters evolved.

- The colour is red dun. It resembles sahiwal in its body size and general appearance.

- AFC: 32 months; Lactation yield: 3000-4500kg with 4.2-4.4% fat. Calving interval is 400-425 days.
2.2.4.2 Karan Fries

- Evolved by cross breeding Tharparkar and H.F at NDRI, Karnal.
- The overall inheritance of H.F is 50%.
- The breed carries black patches and sometimes is completely dark with white patches on the fore head and switch of the tail.
- Udder also contains dark with white patches on the teats.
- The animals are extremely docile.
- AFC: 30-32 months; Milk production 3700 kg with 3.8 to 4.0% fat. Calving interval is 400-430 days.

2.2.4.3 Frieswal

- New breed developed at Military Farm.
- It will have around 62% HF and 38% indigenous germplasm.
- Milk production 4000 kg with 4% fat.

2.3 Exotic Dairy Breeds

The European breeds of dairy cattle belong to the species of Bos Taurus. They are hump less, 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. Hence, 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 Friesian, 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 Holstein Friesian

- 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.
- Animals of this breed are the largest among the European breeds.
- This breed of animals is imported by many countries in the world.
- The colour of the animal is black and white markings and the switch is always white.
- The animals are the largest with large barrel and 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, weighing on the average about 40 kg at birth.
• Some pure bred animals may be solid black.
• 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 lactation yield is 4295 kg, with milk fat of 3.4 per cent.
• Individual animals touched 19,995 kg of milk in a lactation period of 365 days.
• 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 rate of calves.

Fig. 2.14 Holstein Friesian
2.3.2 Brown Swiss

- These cattle were developed in mountains area of Switzerland.
- Colour varies from light brown to almost black.
- The muzzle is of light colour and along the back bone a light coloured stripe is present.
- This breed is oldest of dairy breeds.
- It is the second-heaviest to the Holstein Friesian breed.
- White or off colour spots, above the underside of the belly or white colour in the switch are not desired by the pure bred breeders.
- Brown Swiss animals are large in body size and produce calves with good birth weight.
- The heifers mature and reach peak production at a later age than other dairy breeds.
- Brown Swiss animals originally grazing on mountain slopes in their tract made them excellent grazer.
- 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%.

Fig. 2.15 Brown Swiss
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 earlier 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 of the tail 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%.
- Compared to other European milch breeds, Jersey milk has the highest milk fat and SNF per cent.
- Jersey milk is yellow in colour due to high carotene and is good for butter making.
- Since Jersey 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 extensively used for cross breeding programme in India.
- The average milk yield of the cow is 2727 kg in lactation. Individual yielded 13,296 kg in 365 days.

Fig. 2.16 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 are usually found on face, legs, flank and switch. The nose may be cream or buff coloured. The skin is yellow.
- This breed is little heavier than Jersey. Heifers are generally bred at the age of 17 to 18 months.
- The milk was primarily used for butter as the milk colour is more yellow than the jersey 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 Frisian and more rugged than Jersey. The udder is less symmetrical than Jersey.
- Cows are active and alert but not nervous and can be easily maintained.
- 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.
- Guernsey heifers mature slightly later than the Jersey heifers.
- The milk fat is nearly 5 %. Individual 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.

Fig. 2.17 Guernsey Cow
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 with white markings. The red colour may be very light to almost red.
- The animals are beautiful with shortest top lines, levelled 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 of 18 to 20 months.
- Average weight of the females is 455 kg and for males is from 545 to 682 kg.
- The calves born are strong, vigorous and their birth weight is 32 to 36 kg.
- The average milk yield of cows is 3664 kg with 4% butter fat in lactation.
- Individual animals give 14,625 kg of milk in 365 days.

![Fig. 2.18 Ayrshire Cow](image-url)
2.4 Indian Buffalo Breeds

The Indian buffalo is known as Water buffalo. There are 14 buffalo breeds present in India. But the most important 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. This breed is distributed throughout India.

- The animals are noted for good milk yield and fat per cent.

- The colour of the animal is jet black with white switch of the tail which is long and reaching the fetlock. 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 eyes prominent and bright in females.

- The udder is well developed with prominent milk veins and good sized teats.

- Average weight of the buffalo is from 490 kg 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 per cent is about 7-9
2.4.2 Nili Ravi

- The animals of this breed are found in the tract of Montgomery district of Pakistan and Ferozepur District of Punjab state.

- The name Nili-Ravi comes from the supposedly blue waters of Ravi and Sutlej 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.

- Wall eyes and white switch of the tail are the important physical features of this breed.

- The animal is large sized like Murrah and the udder is well developed.

- The average milk yield of the she buffaloes is 1600 kg in a lactation period of 250 days.

- The buffaloes are heavy miikers and the male animals are used for heavy road works.

Fig. 2.20 Niliarvi Bull and Buffalo

2.4.3 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 and 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.

• On an average the females weigh 464 to 555 kg and the male weigh 545 to 750 kgs. Average milk yield of she buffalo is 1820 kg to 2275 kg per lactation.

• The bulls are good for heavy road work.

![Jaffrabadi buffalo and bull](image)

**Fig. 2.21** Jaffrabadi buffalo and bull

### 2.4.4 Surti

• The home of this breed comprises of Kaira and Baroda districts of Gujarat State.

• The average fat percentage of milk is about 7.5%.

• Because of their medium size, Surti 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 body colour is black or brown and the hair is scanty and coloured silvery to brown.
• The breed is smaller than Murrah.
• The udder and teats are moderate in size.
• Average milk yield of well breed animals is about 2200 kg to 2500 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. 2.22 Surthi buffalo

2.4.5 Mehsana
• The native tract for this breed is Mehsana 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 long face, long wedge shaped body.
• The udder is well developed, well shaped with well placed teats.
• The she buffaloes are good 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 kg in lactation.

2.4.6 Nagpuri
• This breed is of lighter type and comes from Central India.
• 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 kg.
2.5 **Summary**

The classification of Indian Cattle breeds was given in detail depending upon the milk production i.e. Milch, 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 Gaolao breeds and under draught breeds Malvi, Hallikar, Amritmahal, Kangyam and Khillari are explained. The character of exotic cattle breeds i.e. H.F. Jersey, Aeryshire, Brownswiss and Guernsey were explained. Indian buffalo breeds i.e. Murrah, Nili-Ravi, Jaffarbad, Nagapuri, Mehsana, Surti were explained. This will give a clear idea for the students to identify and differentiate different breeds of cattle and buffalo.

**Short Answer Type Questions**

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 breed?
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 Answer Type 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) Amritmahal
   (e) Murrah
   (f) Holstein - Friesian
   (g) Jersey
Selection is a process in which certain individuals in a population are preferred to others for the production of next generation. There are different methods of selection being used for dairy animals. These are

3.1.1 Individual Selection

Selection is based on the individuals own milk yield and physical characters. This is ideal for characters with high heritability. In dairy cattle most of the economic...
traits have low to moderate heritabilities. Hence, the individual selection is of little use for selecting the animals for milk production.

3.1.2 Family Selection

Whole families are selected or rejected as units according to the mean breeding 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 Sub 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 criterion of selection is the mean value of an individual’s progeny which comes closest 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 prolongs the generation interval. The bull has to wait its progeny test result before its use. 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 numbers 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 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 body conditions, stunted growth, suffering from incurable illness, or disease.
- Animals found to be positive for serious infectious 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 animas when the herd is a pure bred herd leading to disqualifications of family lines, exhibiting heritable characters like supernumerary teats, loose horns in cows of certain breeds.

- Disabled 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 for 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 of cows carried for poor production, the entire lactation yield is considered and preferably first two lactations are observed and if the lactation 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 fibrosis of the eye, total blindness or other congenital defects are included in the culling.

- Calves born much below the normal birth weight are included in the culling.

- Yearling 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

- Lactation yield
- Lactation period
- Persistency of yield
- Age at first calving
3.3.1 Lactation Yield

The milk 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 number of calving, frequency of milking, persistency of yield. Normally in dairy cattle 30 - 40% increase in milk production from first lactation to 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% FCM = 0.4 total milk + 15 total fat. After parturition the milk yield per day will be increased and reaches peak within 40-50 days after calving. This yield is known as peak yield. The maintenance of peak yield for more time is known as persistency which is important for more lactation yield.

3.3.2 Lactation Period

The length of milk producing period after calving is known as lactation period. The optimum lactation period is 305 days. Indian breeds will have less lactation period compared to the exotic dairy breeds. More lactation length with high milk yield is desirable. More lactation length with less milk production in some Indian dairy animals due to delay in service is not economical and desirable.

3.3.3 Persistency of Milk Yield

During lactation period the animal reaches maximum milk yield per day within 40-50 days after calving 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. High persistency is necessary to maintain high level of milk production.

3.3.4 Age at first Calving

The age of the animal at first calving is very important for high lifetime 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 results in high production in the first lactation but the life time production will be decreased due to less no of calvings. Good feeding and management of the female calves right from the birth decreases the age at first caving in dairy animals.

3.3.5 Service Period

It is the period between date of calving to 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 also prolonged results in 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.

3.3.6 Dry Period

It is the period from the date of drying (stop of milk production) to next calving. When the animal is in pregnant, the animal should be given rest before next calving to compensate lost body resources and for the growth of foetus. A minimum of 60 days dry period should be allowed. If the dry period is not given or too low, 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 increases the calving interval and decrease the lifetime production which is not economical.

3.3.7 Calving Interval

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 14 months in buffaloes. If the calving interval is more, the total number of carvings in her life time will be decreased and also total life production of milk will be decreased.

3.3.8 Reproductive Efficiency

The reproductive efficiency means the number of calves produced during life time of an animal, so that it determines the total life time production of the animal. The reproduction or breeding efficiency is determined by the combined effects of hereditary and environment. Several measures of reproductive 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 affected compared to high milk yielding animals.

3.3.9 Efficiency of Feed Utilization and Conversion into Milk

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

3.3.10 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 - Inbreeding and Cross Breeding

Breeding is defined as the crossing of the male and the female parents to get the off spring for the characters desired.

The main breeding methods are

(1) In Breeding
(2) Out Breeding

They are further classified as given below

1. In Breeding
   Close in Breeding
   Line Breeding

2. Out Breeding
   Out Crossing
   Cross breeding
   Grading up
   Species Hybridization

3.4.1 Inbreeding

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

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

**Advantage of Inbreeding**

- Undesirable recessive genes may be discovered and eliminated by further testing in this line.
- (ii). It increases homozygosity and decreases genetic variance in the population resulting the progeny are more uniform
- Breaking down of population into different inbreed lines.

**Disadvantages:**

- The progeny becomes more susceptible to diseases.
- Breeding problems and reproductive failure usually increases.
- 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.
- It depresses vitality in early life than in later life.
- In breeding appears to have little value in dairy cattle breeding programmes, because of its numerous detrimental effects.

3.4.1.2 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 mating is made to concentrate the inheritance of desired characters of some favoured individuals.
- It brings about the uniformity of the required type.
- The dangers involves in case of 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 breeding is mostly used for the production of inbred lines.

3.4.2 Out Breeding

It is the opposite of inbreeding. Mating unrelated animals is known as out breeding. It is divided into six classes as detailed below:
· Line Crossing (Crossing of inbreed lines)
· Out Crossing
· Cross Breeding
· Grading up
· Species Hybridisation

3.4.2.1 Line Crossing

Crossing of inbred lines is called as line crossing. In this method of breeding, inbred lines of male and females were developed by intensive in breeding for more than 5 generations. The unrelated inbreed lines of male and female is matted and the offspring born out of such mating becomes a hybrid which exhibits heterosis or hybrid vigour and are superior to either of the parents which is due non-additive genetic effects.

3.4.2.2 Out Crossing

It is the mating of unrelated pure bred animals of the same breed. The animals do not have common ancestors on either side of their pedigree up to 4 to 6 generations and the offspring of such a mating is known as out cross. It is an effective system for genetic improvement if carefully combined with selection. It is also called as pure breeding.

3.4.2.3 Cross Breeding

· It is the mating of animals belongs to different breeds.
· Cross breeding is an important tool for breeding animals for high milk and meat production. In India, zebu breeds of cows and nondescript cows are crossed with exotic breeds like Holstein Friesian, Brown Swiss and Jersey bulls or inseminated with their semen to enhance the milk production potential of the progeny.
· As the selection method is a slow process of genetic improvement, cross breeding has been taken up as an important programme for improving milk production in India.
· At present cross breeding work has been going on at Military dairy farms, NDRI Karnal, All India Coordinated Research Projects on Cattle, Collaboration projects like Indo-Swiss, Indo-Australian, and Indo-Danish projects and also in the field by the farmers.
· The feeding and management of the crosses should 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 lactation yield, longer lactation period, shorter service period, dry period and higher milk production and breeding efficiency. There are several exotic breeds being used in cross breeding programme, namely Holstein Friesian, Jersey, Brown Swiss and Red Dane.

- Holstein Friesian 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.

**Advantage**

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

- In India Cross-breeding of cow 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 weight 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.

- This method is useful to evolve new breeds with desirable characters.

- Results are seen more quickly in characters like milk yield in the cross bred progeny.

**Disadvantages**

- Adaptability of the crossbred under tropical climate of India is poor when the exotic inheritance exceeds more than 50%

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

3.4.2.4 Grading Up

Grading up is the practice of breeding in which the sires of the superior breed are mated with the non-descript females and their off-spring from generation to generation. After five or six generations of grading up, the non-descript population improved and resembling the superior breed. This is the breeding policy for buffaloes of non-descript in Indian and AP. 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 which closely resembles the Murrah breed.

**Advantages:**

- After 5 to 6 generations, grades resembling pure bred animals in matter of physical appearance and milk production.
- Grading up avoids the expenditure of purchasing the high producing pure animals as grading up is carried with a few superior pure bred bulls on the non descript indigenous female animals.
- It proves the breeding merit of the exotic bulls used.
- The value of the non descript animals is much enhanced.

**Disadvantages:**

- The graded males are useless for breeding purpose
- The genetic improvement is very slow.

### 3.5 State and National Breeding policies for Enhancing Milk Production

The present breeding policy for bovines in Andhra Pradesh was formulated basing on existence of three main types of bovines, nondescript 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:

#### 3.5.1 Coastal Andhra (North)

- Jersey bulls mated to non-descript cows.
- Jersey cross breed bull (50% exotic) mated to jersey cross-breed cows.

#### 3.5.2 Coastal Andhra (Delta and South)

- Jersey bulls mated to indigenous non descript cows in upland areas.
- Jersey cross breed bulls mated to jersey cross breed cows.
- Ongole bulls mated to Ongole cows in Ongole breeding tract.
3.5.3 Rayalaseema

- Jersey bulls mated to indigenous cows.
- Jersey cross-breed bulls (50%) mated to Jersey cross breed cows.
- (c) Ongole bulls mated to Ongole cows in parts of Kurnool and Anantapur.

3.5.4 Telangana (Except Medak district)

- Jersey bulls mated to indigenous non descript cows.
- Jersey crossbreed bulls (50% exotic) mated to jersey crossbreed cows.
- Holstein Friesian bulls mated to non descript cows in Hyderabad city and surroundings.
- Holstein Friesian crossbreed bulls (50% exotic) mated to Holstein Friesian crossbreed cows.

3.5.5 Medak District

- Holstein Friesian bulls mated to non-descript cows.
- Holstein Friesian crossbreed bulls (50% exotic) mated to Holstein Friesian crossbreed cows.
- Deoni bulls mated to Deoni type cows in Zaheerabad and Narayankhed Taluks.

3.5.6 Tribal Areas

- Jersey cross bred bulls (50% exotic) for natural service on non descript cows.
- Deoni bulls on Deoni cows for pure breeding in selected areas.

3.5.7 Areas with Better Management Levels

- Jersey cross bred bulls (75% exotic) mated to Jersey cross bred cows (50%)
- Holstein Fresian cross-bred bulls (75% exotic) mated to HF crossbred cows (50%)

3.5.8 The State Breeding Policy for Buffaloe is

- Pure bred Murrah bulls mated continuously to non-descript and graded she buffaloes (up grading).
Graded Murrah bulls mated to non-descript and graded she buffaloes in dry and drought prone areas with limited fodder resources.

### 3.5.9 The National level consensus evolved on the breeding policy for the improvement of cattle and buffaloes are as follows

- 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-Friesian. To maintain 50% level of exotic inheritance interse-mating among the cross bred Friesians being carried out.

- In the other areas with the low inputs of feeding and management, 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 buffalo breed for grading up of nondescript buffalo in India is Murrah. Medium type breeds are recommended in certain regions.

### 3.6 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. Economic characters which affect the profitability of dairy farm are explained. Different types of breeding methods are simply explained. Goals of cattle breeding programmes and State and national breeding policies for cattle and buffalo are explained.

### Short Answer Type Questions

1. Name different methods of dairy cattle selection.

2. What do you mean by culling?

3. What is line breeding?

4. What is grading up?
Long Answer Type Questions

1. Discuss in detail about various types of selection of dairy cattle.

4. Explain the different economic characters in dairy cattle.

5. Briefly write about cross breeding.

6. Explain in detail about grading up.

7. Explain briefly state and national breeding policies.

8. What are the goals of cattle breeding programmes in India.
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 too 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 up to a scenic view. Along with this, durability of the structure is obviously an important criterion in building a dairy farm.

6. Water Supply

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

7. Surrounding

Areas infested with wild animal 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 should be available.

9. Marketing

Dairy buildings should only be in those areas from where the owner can sell his products profitably 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 for Improved labour Efficiency

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.

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

4.2 Systems of Housing - Loose Housing System

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 with good housing facilities, the animals will move too far in or out of the standing space, defecating all rounds and even causing trampling and wasting of feed by stepping into the managers. The animals will be exposed to extreme weather conditions 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. The housing systems of cattle are of two types.

- The loose housing
- The conventional barn.

4.2.1 Loose Housing System

Loose housing may be defined as a system where animals are kept loose except at the time of milking and at the time of treatment. The system is most economical. Some features of loose housing system are as follows.
· In loose housing dairy animals are keeping loose in an open paddock except at milking time.

· The open paddock is provided shelter along one side and enclosed with half walls / wire fences / GI pipes.

· Common watering tank and manger is provided.

· Separate milking parlor is constructed for milking purpose.

**Advantages of loose housing system**

· Cost of construction is significantly lower than conventional type.

· It is possible to make further expansion without change

· Facilitate easy detection of animal in heat.

· Animals overcome heat stress better by voluntary movement and more comfortable in the loose house

· Animals get optimum exercise which is extremely important for better health and production.

· 10-15% more stock than standard can be accommodated for shorter periods.

**Space requirements for different classes of animals in loose housing system (BSI)**

<table>
<thead>
<tr>
<th>Type of Animal</th>
<th>Space Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Covered area (m2)</td>
</tr>
<tr>
<td>Cattle</td>
<td>3.5</td>
</tr>
<tr>
<td>Buffalo</td>
<td>4.0</td>
</tr>
<tr>
<td>Breeding bull</td>
<td>12.0</td>
</tr>
<tr>
<td>Advanced Pregnant</td>
<td>12.0</td>
</tr>
<tr>
<td>Young calves</td>
<td>1.0</td>
</tr>
<tr>
<td>Heifers</td>
<td>2.0</td>
</tr>
</tbody>
</table>
4.2.2 Conventional Barn

- Animals are confined on a platform and secured at neck by neck chains.
- The barns are completely roofed and the walls are also complete with windows / ventilators located at suitable places.
- Animals are fed and milked in the same place.
- Conventional barns may be preferred in Temperate Himalayan region where the winters are prolonged and severe. In warm parts, the air in the barns tends to be humid and floors become damp during autumn and rainy seasons.
- There shall be individual standings of stalls for stanchions in one or two rows.
- Double rows of stanchions can be arranged either tail to tail or head to head.
- Length and width of standing is 1.5 to 1.7 and 1.05 and 1.20 meters respectively.
- The width of standing is 80% of length.
- Width of central passage is 1.5 to 1.8 m and shall have a gentle slope of one in 40 from centre towards the drain.
Dairying

- Two continuous mangers one on each side along the head side of the standing rows and 0.75m wide feed alley beyond each manger present.
- "U" shaped drain of 30cm on either side of the central passage is present.
- The eaves of the roof shall project 50cm beyond the side walls.

Plan (1) and section (II) of a single row milking barn. A. Feed Alley, B. Manager, C. Standing, D. Standing partition, E. Gutter and F. Passage

Plan (1) and Section (II) of a double row tail to tail type milking barn. Legend same.

4.3 Cleaning and sanitation in Dairy Farm

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 disposal 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 trough eliminates the growth of algae, bacterial and viral contamination and thus keeps the animal healthy.

4.3.2 Sanitation in Dairy Farm

Sanitation is necessary in the dairy farm houses for eliminations of all microorganisms 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 eg. Babesiosis, Theileriosis etc.

4.3.2.1 Sanitizers

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

- **Bleaching Powder**
  This is also called calcium hypo chloride. It contains up to 39 % available chlorine which has high disinfecting activity.

- **Iodine and Iodophor**
  This is commercially available as iodophores and contains between 1 and 2 % available Iodine which is an effective germicide.

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

- **Slaked Lime and Quick Lime**
  White washing with these agents makes the walls of the sheds and the water troughs free from bacteria.

- **Phenol**
  Phenol or carbolic acid is very powerful disinfectant which destroys bacteria as well as fungus.

4.3.2.2 Insecticides

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, Gamaxane wettable powders,
malathion, sumithion etc. 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 Disinfectants and Insecticides.**

- 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.
- Avoid the use of disinfectant solution at 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.

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

- Bleaching powder should have more than 30% available chlorine.
- Phenol 1-2% solution.
- Washing Soda (4% solution).
· Allow adequate sunlight to enter into the shed.

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

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

4.4 Summary

In this chapter the 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. Different steps to be followed for good sanitation in dairy farm will give guide to maintain dairy farm.

Short Answer Type Questions

1. What is loose housing system?

2. What is conventional dairy barn?

3. What arrangement should be done to the roof of animal shed during summer?

4. What is sanitizer?

5. Give two sanitizers used in animal sheds.

Long Answer Type 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. Briefly write about sanitation in a dairy farm shed.

5. What are the animal responses for environmental changes?
**5.1 Care and Management of Calf**

Good feeding and management are essential for the calves during their growth, so that they attain mature body weight earliest and will be useful as replacement stock. The feeding and care of the calf begins before its birth. The dam should be dried 6-8 weeks before expected date of calving and should be fed well. Underfed animals will give weak and small calves.

**(A) Early Management**

- Immediately after birth remove any mucous or phlegm from the nose and mouth.
Normally the cow licks the calf immediately after birth. This helps in dry off the calf and also stimulates breathing and circulation. When the cow doesn’t lick the calf 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.

- The naval should be tied about 2-4 cms away from the body and cut 1 cm below the ligature and apply Tr. Iodine or boric acid or any antibiotic.

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

- The weight of the calf should be recorded.

- Wash the cow’s udder and teats preferably with chlorine solution and dry off with a clean cloth. Allow the calf to suckle the first milk of the mother i.e. Colostrum.

- Normally the calf will be standing and attempts to nurse within one hour. Otherwise help the calf to take colostrum.

(B) Feeding of Calves

- 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. Colostrum contains antitrypsin which avoids digestion of immunoglobulins in the stomach and therefore absorbed as it is.

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

- 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’.

- The milk replaces can be given to the calves after 2 weeks to replace whole milk which reduces the cost of feeding.

- Give calf starter after one month of age.

- Provide good quality green fodder and hay from one month afterwards for the early development of the rumen.
Feeding of antibiotics to calves during early life improves appetite, increases growth rate and prevents calf scours. E.g. aureomycin, Terramycin etc.

(C) Other management practices

- Identity the calf by tattooing on inside of the ear after birth and tagging or branding after one year.
- Dehorn the calf within 7-10 days after birth with red hot Iron or caustic potash stick or with electric dehorner.
- Deworm the calf regularly to eliminate internal parasites using appropriate deworming drugs. Deworm should be done at 7 days after birth, and later every 20 days interval up to 3 months and for every month up to 6 months and for every 3 months up to 1 year.
- Fresh water should be given from 2nd week onwards.
- House the calves in individual calf pens up to 3 months and afterwards in groups. After six months males and females calves should be housed separately.
- Weigh the calves at weekly interval up to 6 months and at monthly interval afterwards to know the growth rate.
- Mortality in calves is more during first month due to worms (Ascariasis), Diarrhea (calf scours) and pneumonia. Proper deworming and housing under clean conditions is important to prevent mortality in the calves.
- Wetness should be avoided in the calf pen to prevent bloody diarrhoea (coccidiosis).
- Extra teats beyond 4 should be removed at 1-2 months of age in the female calves.
- At 8-9 weeks of age all the surplus male calves should be castrated.
- Keep the body of the calves clean and dry to avoid fungal infection.
- Mineral-block licks should be provided to the calves to prevent mineral deficiency.
- Wean the calf from the mother immediately after birth and feed them 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 required.
- Most heifers grow well if excellent legume hay is given as much they can eat. The amount of growth depends upon the quality of forage fed.
- When the quality of forage is not good, 1 - 2 kg concentrate feed supplementation if required.
- 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 successful. They may be stunted or slow to reach maximum size. Small heifer is 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 when they attain 60% of its mature body weight.
- 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.
- Place the heifer in a separate shed about 6-8 weeks before she is due to calve.
- Feed 2-3 kgs of concentrate daily along with adlibitum forage.
- 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.
- Maintenance of health among heifers is very important for proper growth. The health among the heifers is maintained by hygiene housing, watering balanced feeding and taking necessary preventive steps against common diseases.
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.

For the heifer that is calving first time may have difficulty in calving. So take extra care should be taken 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 managemental practices should be followed.

- 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 with through forage only. Extra concentrate at the rate of 1 kg for every 2 litres of buffalo milk and 2.5 litters of cow milk should be provided. Salt and mineral supplements should be given to maintain the lactation.

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

- With proper feeding and care, a cow will come to heat within 60 days of calving.

- Do not with hold service unnecessarily after the signs of heat are noticed in a cow. Early service of the milch animal reduces the calving interval.

- By maintaining proper records of breeding and calvings of the animals will ensure a study flow of milk throughout the year.

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

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

- Water should be provided to drink at all times.

- 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.

- Rapid, continuous, dry hand milking should be practiced without undue jerking of teats. Milking should be done with full hand milking method, but not with stripping and knuckling.
Cows should be trained to let down milk without calf suckling. This will help to wean the calves early.

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

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

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

Common ailments should be properly detected and treated.

Common vices should be properly detected and care should be taken. E.g. Kicking, licking, suckling etc.

Provide at least 60 - 90 days dry period between calvings. If the dry period is not sufficient, the milk yield in subsequent lactation will be reduced.

Vaccinate the cows - against important diseases and also guard against insects and pests.

Every animal should be numbered and particulars pertaining to milk, fat %, feed taken, breeding, drying and calving dates should be recorded.

Check for mastitis regularly.

### 5.4 Care and Management of dry and Pregnant Animal

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

Extra concentrate mix of 1 to 2kgs should be provided for pregnant animal as pregnancy allowance. Feed good quality of leguminous fodder. The animal should not be lean or fat condition.

Provide clean drinking water and protection from thermal stress.

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

Allow moderate exercise, which helps in calving normally. Do not tire them by making long distances especially on uneven surfaces.
· Do not allow them to fight with other animals and take care that they are not chased by dogs and other animals.

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

· 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.

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

· 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.

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

· Placenta will normally shed by the cow within 2- 4 hours after calving. If it fails to shed even after 12 hours, take the help of a veterinarian

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

· Sometimes the udder will be swollen just before calving. Remove the milk partially.

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

· 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 be housed separately in a bull shed with sufficient area of floor and proper covering.

It is sound practice to provide cool conditions and adequate drinking water.

A balanced ration 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 matings a day has been found to be optimum.

Moderate exercise should be provided to keep the breeding bull in active and non fatty conditions.

Regular grooming of the breeding bull should be practiced.

In buffalo bulls regular shaving may be practiced around prepuse.

5.5.2 Care and Management of Bullock

Bullocks are normally used for agricultural operations and 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

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

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

Sufficient roughages and 1-2 kg 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.
5.6 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 managemental activities like exercise, grooming, washing etc are explained which helps to maintain good health of the herd.

Short Answer Type 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 Answer Type Questions

1. Describe in detail about the care and managemental practices of calf.
2. Describe in detail about the management of pregnant animal
3. How do you feed and manage the milch animal?
4. Describe in detail about the care and management of sick animal.
5. Write short notes on:
   (a) Exercise
   (b) Grooming
   (c) Washing
UNIT 6

Activities in Dairy Farm

Structure

6.1 Dairy farm routine
6.2 Restraining methods of dairy animal
6.3 Dentition and ageing of animals
6.4 Methods of identification of dairy cattle
6.5 Records to be maintained in a dairy farm
6.6 Common vices of dairy animals
6.7 Weaning of calf
6.8 Castration and dehorning
6.9 Deworming and vaccination program.
6.10 Summary

6.1 Dairy Farm Routine

The various practices to be carried out on the dairy farm daily or periodically should be well planned and carried out punctually in the following manner.
<table>
<thead>
<tr>
<th>TIME</th>
<th>FARM OPERATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:00 A.M to 4:30 A.M</td>
<td>• Cleaning milch animals</td>
</tr>
<tr>
<td></td>
<td>• Offering half of the daily concentrate Feed</td>
</tr>
<tr>
<td></td>
<td>• Morning milk</td>
</tr>
<tr>
<td>4:30 A.M to 5:30 A.M</td>
<td>• Milk disposal</td>
</tr>
<tr>
<td></td>
<td>• Washing and disinfection of the milking barn</td>
</tr>
<tr>
<td></td>
<td>• Heat Detection with teaser bull/ observation.</td>
</tr>
<tr>
<td>5:30 A.M to 6:30 A.M</td>
<td>• Cleaning of the milch cow sheds</td>
</tr>
<tr>
<td></td>
<td>• Feeding of dry/green fodder to the milch stock</td>
</tr>
<tr>
<td></td>
<td>• Isolation of the sick animals</td>
</tr>
<tr>
<td></td>
<td>• Offering concentrate to calves and pregnant animals.</td>
</tr>
<tr>
<td>6:30 A.M to 8:00 A.M.</td>
<td>• Cleaning other age group Animals</td>
</tr>
<tr>
<td></td>
<td>• Treating of ailing animals</td>
</tr>
<tr>
<td></td>
<td>• Artificial insemination</td>
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<td></td>
<td>• Vaccination / Deworming</td>
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<tr>
<td></td>
<td>• Harvesting green fodder</td>
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<td></td>
<td>• Transportation of fodder</td>
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<tr>
<td></td>
<td>• Fodder chaffing</td>
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<tr>
<td></td>
<td>• Feeding green fodder to live stock</td>
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<tr>
<td></td>
<td>• Cleaning of entire premises and sheds</td>
</tr>
<tr>
<td></td>
<td>• Disposal of dung to vermi compost / bio gas</td>
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<tr>
<td></td>
<td>• Spraying disinfectant</td>
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<tr>
<td></td>
<td>• Spraying insecticides</td>
</tr>
<tr>
<td></td>
<td>• Vermi composting</td>
</tr>
<tr>
<td>8:00 A.M to 12:00 Noon</td>
<td>• Lunch cum rest period for labourers</td>
</tr>
<tr>
<td>12:00 P.M to 1:00 P.M</td>
<td>• Miscellaneous jobs: Identification, preparation of concentrate feed, repair of farm equipment, weekly scrubbing and white washing of feed mangers and water troughs, halter making etc.</td>
</tr>
<tr>
<td>1:00 P.M to 2:00 P.M</td>
<td>• Cleaning of milch animals</td>
</tr>
<tr>
<td></td>
<td>• Offering concentrate feed to milch animals</td>
</tr>
<tr>
<td>3:30 P.M to 4:30 P.M</td>
<td>• Offering green fodder to other age groups</td>
</tr>
</tbody>
</table>
6.2 Restraining Methods of Dairy Animals

Handling cattle and buffalo is required when they are vaccinated, examined or undergo other treatments. It may lead to stress and injuries especially if the animals are not properly handled and the handler is not experienced.

There are different techniques used to restrain and cast (throw) these large ruminants.

6.2.1 Methods of Restraining (controlling) cattle and buffalo

6.2.1.1 Trevis

Made of wood or metal used for restraining cattle and buffaloes for a brief period of time.

6.2.1.2 Restraining of Head

(A) Halter

- The primary method of restraint used in dairy cattle is the halter.
- The halter can be made of cotton, nylon, twine, etc.
- It is mainly used to control the head and once the head is controlled, the animal can be handled with relative ease.
- The proper placement of the halter is important and it begins with making sure the lead is placed on the left side of the animals head.
· Correctly place the halter on the head i.e. “the part that draws goes under the jaws.” This leaves the top part of the halter to go over the poll and behind the ears.

![Fig. 6.1 Haltering Large Ruminants (Cattle and Buffalo)](image)

· In the absence of the halter or nose holder, the cattle can be handled by taking a firm grip of the nostril using the thumb and forefinger of one hand while holding the horn or the ear with the other hand.

![Fig. 6.2 Nose Holder](image)

6.2.1.3 Handling of Tail

The purpose of this restraint is to keep the cow’s tail out of the way when a placenta is being removed or the udder is being treated or while handling the hind part of the animal.
6.2.1.4 Front Leg

- This restraint can also be used to make a cow stand still and to keep her from kicking with a hind leg.
- A rope with an eye in one end is used to form a loop around the pastern. The other end of the rope passes over the withers where it should be held by an assistant so that it can be released quickly if the cow starts to go down.
6.2.1.5 Rear leg

(B) Manual rising

In using this simple method one is less likely to injure the cow than in using the beam hook or a more elaborate method. A nose lead is used and the cow’s head pulled to the side opposite that of the foot to be lifted. The operator grasps the leg at the pastern with his left hand.

With his left shoulder he pushes the cow’s flank so that her weight will be shifted to the other rear leg and at the same time he raises her rear leg.
He adjusts the position of the cow’s leg so that his own leg is holding the weight of it and his left hand is only needed to hold it steady. His right hand is then free to work.

Fig. 6.7 Lifting and flexing of hind leg
(C) Beam Hook Method

- This is a method of raising a cow’s foot off the ground and holding it in a position which will permit one to examine it or to treat it.

- It is particularly useful for the treatment of hoof rot in dairy herds as it can be applied to animals in stanchions.

- By means of a nose lead the cow’s head is pulled to the side opposite the leg which is to be lifted and made fast to a stanchion.

- A set of beam hooks is fastened to a beam above and somewhat behind the cow.

Fig. 6.8 Lifting of hind leg by beam hook method
A 30 foot piece of rope with an eye or a quick-release honda is used to make a loop around the cow’s leg below the fetlock. The free end of the rope is passed upward through the ring of the beam hook so that it goes in a direction toward the head of the cow. Passing down from the beam hook, the end is brought around the leg above the hock, going from the inner to the outer side and back around the standing part of the rope to form a half hitch. It is then carried forward and wrapped once around a part of the stanchion. The cow’s foot is lifted off the ground and the slack in the rope taken up. The animal may struggle; but if her foot is lifted and the rope tightened simultaneously, the foot can be raised high enough to permit one to work on it. The end of the rope is then made fast with a halter tie to hold the foot at the desired height.

6.2.1.6 Examination of Mouth

For any thorough examination of a cow’s mouth one should use a mouth gag and have a good strong light.

The mouth gag with its two arms together is slid into the mouth and then fastened by a strap around the neck. It may be opened to the desired width by a ratchet on the side. This mouth gag has a wide space between its arms so that even the corners of the mouth can be seen easily and the teeth can be approached from any direction.

Fig. 6.9 Application of mouth gag
To hold the mouth open in a case of bloat or to pass a stomach tube, a probang gag may be used. The wooden block is placed in the mouth and the strap fastened behind the horns.

6.2.1.7 Casting the Cattle and Buffaloes

(A) Burley Method

This method of casting cattle, devised by Dr. D. R. Burley of Georgia, has many advantages over the other casting methods.
While the cow is being held by a strong halter or by a nose lead a forty foot piece of rope is placed over her back with its centre at the withers. The ends are carried between the forelegs and crossed at the sternum. One end is carried up each side of the animal’s body and the two are crossed again over the back. Each end passes downward between the rear legs going between the inner surface of the legs and under the udder or scrotum, as the case may be.

When the ends of the rope are pulled, the cow will fall. The operator may control the direction of the fall by pulling the casting ropes so that the animal is forced to one side or the other.

To tie the rear leg the operator keeps both ropes tout and slides the uppermost one along the under surface of the rear leg to the fetlock. He flexes the leg and makes a half hitch around the fetlock.

The end is then carried around the leg above the hock, across the cannon bone, and back around the fetlock. The leg is secured by several such “figure 8’s”.

To tie the front leg a short heavy cord or rope about six feet long is needed. One end of it is fastened around the pastern with a clove hitch leaving a free end about eight inches long. The front leg is flexed and the long end of the cord carried forward and passed under the main casting rope descending from the withers.
Fig. 6.13 Fixing the hind leg with rope

The cord is passed around the flexed front leg several times and tied in a reefer’s knot to the short free end at the pastern.

Fig. 6.14 Tieing the hind leg with rope

The animal is rolled over and the rear leg of the other side is tied with the other end of the casting rope. With another six foot cord, the other front leg is tied, and the animal is then completely restrained.

(B) Rope squeeze method

- This is a standard method of casting a cow.
- The rope for this restraint may be arranged on a cow while she is in the stanchion.
- She may then be led to the place where it is desired that she lie down and tension applied to the end of the rope.
- Make a loop around the cow’s neck using a bowline knot placed as indicated in the drawing.

![Fig. 6.15 Application of loop at the neck](image)

- Throw the end of the rope over her back to the opposite side.

![Fig. 6.16 Application of loop on the body](image)

- Reaching under the cow, pick it up and bring it around her body and under the standing part of the rope near the bowline to form a half hitch just behind the shoulder.
6.3 Definition and Ageing in Dairy Animal

6.3.1 Teeth Eruption

A calf is born with 8 temporary milk incisors in the bottom jaw. These teeth grow in size and last until the animal is yearling, as in the teeth below.

- By tossing the end over the cow’s back again, make another half hitch just in front of the udder. Pulling the rope will force the cow to lie down.
Fig. 6.19 A calf with temporary teeth

**Age: Two years**

- The first permanent incisors (dots) come in from about the time a cow is 1 1/2 years old to two years.
- By approximately age two years they are typically fully developed. They often come in at an angle and then straighten.
- **NOTE:** Smaller teeth visible to the left and right of the first permanent incisors are “milk” or “baby” teeth.

Fig. 6.20  Age : Unknown
Estimated Age : 2 years

Fig. 6.21  24-26 months
Estimated Age : 2 years

**Age: Three years**

- The second pair of permanent incisors (dots) appear somewhere around age 2 1/2 years, and are typically fully developed by age three years.
Age: Four years

At approximately age 3 1/2 years the third pair of permanent incisors (dots) are cut and are typically fully developed by age four years.

Age: Five years

At approximately age 4 1/2 years the last of the cow’s permanent incisor teeth (the “corner” incisors; dots) are cut, and are typically fully developed by age five years. Therefore, at age five years, cows typically have all eight of their permanent incisors erupted and in use. At this age the incisors are tall, relatively flat across the front (when compared to older ages), sharp at the top, and close together.
Age: Six years

- From age six, estimating cattle age by their teeth is based on the degree of wear of the teeth. Estimating the age of cattle from this point forward becomes more difficult.

- At age six years the cow’s eight permanent incisor teeth will begin to show various degrees of wear.

- The tops of the teeth will still be comparatively sharp but will have begun to dull slightly, and the teeth will begin to take on a slightly rounded appearance from side-to-side (as opposed to appearing more flat from side-to-side as seen in younger ages).
Age: Seven years

- At age seven years the cow’s eight permanent incisor teeth will continue to show various degrees of wear. The tops of the teeth will show additional loss of sharpness, and the teeth will continue to appear slightly more rounded from side-to-side (as opposed to appearing more flat from side-to-side as seen in younger ages). At age seven there is commonly a separation, from subtle to definitely noticeable, between at least some of the teeth from top to bottom. The roots of the teeth may begin to be visible at the gum line.

- **NOTE:** In the photos below all eight incisors were present in the cow, but sometimes cannot be seen in the photos.

![Fig. 6.29 Actual Age: 7 Years](image1)
![Fig. 6.30 Actual Age: 7](image2)

Age: Broken Mouth

- A broken mouth cow is a cow that has lost one tooth due to age. In some areas, a cow is not a “broken mouth” until she has lost two teeth due to age.

**NOTE:** In the photo below the corner tooth on the left-hand side of the photo was present, but cannot be seen in the photo.
Age: Gummer

A “gummer” is often the oldest age description given to a cow. A gummer has lost several teeth due to age, or has worn them down until they are of little or no practical use.

6.4 Methods of Identification of Dairy Cattle

Animal identification is the basis for keeping accurate production records of the herd/flock. Individual animal identification allows producers to keep records on an animal’s parentage, birth date, production records, health history, and a host of other important management information.
Accurate records provide the producer with enough information to make individual or whole herd/flock management decisions.

Identification is also important to indicate ownership of a particular animal, or to indicate the herd/flock of origin. A successful identification system makes able to quickly identify an animal.

The identification systems of the animal classified in to two types

1. Temporary
2. Permanent

**Temporary Method:** Used to identify the animals for only short period of time. These include
- Putting neck straps with number,
- Painting the numbers on animal body,
- Painting the horns,
- Cutting off the brush of the tail.

**Permanent methods of Identification Includes**
- Tattooing
- Tagging
- Branding
- Electronic identification

**6.4.1 Tattooing**

Tattoo is a method of identification that is permanent if properly done. This method is mostly used for identification of young calves and labbs.

Required equipment
- Tattooing letters/symbols
- Tattooing ink/paste
- Tattooing forceps
- Sprit/alcohol
- Clean cloth

Procedure

Fig. 6.33 Step 1. Clean the inside of the ear with sprit

Fig. 6.34 Step 2. Apply tattooing Ink

Fig. 6.35 Step 3. Pressing the tattooing forceps after fixing the desired number/letter
6.4.2 Tagging: It is important method of identification of cattle in India. It is easy and quick to carry out. The equipment required are ear tags made of plastic/brass, tag applicator.
Steps of tagging

- Properly secure the animal to apply tag
- Identify the tagging site on the animal’s ear.
- Place each half of the tag onto the applicator.

![Fig. 6.39 Tags in Applicator](image)

Before tagging the animal, check alignment of the tagger by closing the jaw of the applicator to the point where the two halves meet; the stud should be centred with the hole.

![Fig. 6.40 Alignment of Tags](image)

Position the applicator in the identified tagging site on the animal’s ear firmly and close the applicator in a fast manner and release.
6.4.3 Branding: Branding is a process of searing a number, letters, designs or a combination of these on the skin of the animal using heat, chemical or cold which causes cauterisation of the skin, killing the hair follicles and leaving a scar. Branding allows identifying the animal from a distance without necessary restraining.

Branding is of 3 types

• Hot iron branding
• Chemical branding
• Freeze branding

6.4.3.1 Hot-Iron Branding: Good hot iron brands are permanent and legible from a distance. Sets of branding irons are available in the market. Same branding irons can be used for hot and chemical branding.
In hot iron branding, the desired iron is heated to bright red and applied to the skin on the sides of the thighs with light pressure for not more than three seconds. Apply a little mustard oil with zink over the burns for ready healing.

6.4.3.2 Chemical Branding: The iron should be dipped in the branding chemical. The extra chemical drained off the iron and the wet iron applied on the skin.

6.4.3.3 Freeze Branding can be a relatively painless and very effective form of permanent animal identification. Freeze branding is more comfortable to cattle than is hot iron branding. While hot iron branding makes a neat, legible scar on the surface of the hide, freeze branding changes hair colour to white. Freeze branding works by destroying the pigment-producing cells in hair follicles, resulting in white hair growth. Freeze brands typically become readable about 6 to 8 weeks after branding. Liquid nitrogen or a combination of denatured alcohol and dry ice are effective methods for cooling freeze branding irons. Irons suitable for freeze branding are often made of copper alloy. Copper irons tend to work better than stainless steel and aluminium irons because they transfer cold well.

Steps of Freeze branding

- The irons should cool for 20 minutes in liquid nitrogen before first use.

![Fig. 6.43 Iron Cooling in liquid Nitrogen](image)

- Properly restrain the animal.
- Clip the area to be branded.
- Brush or wipe the area clean.
- Spray a liberal coat of alcohol on the clipped surface.
Apply the branding iron for the predetermined amount of time. If the iron moves, reapply it to the depressed area and add a few seconds to the application period.

6.4.4 Electronic Identification

Electronic Identification (EID) is the latest method used to identify livestock and is based on electronic devices and readers. The device used is a micro-chip in either an ear tag or a ceramic bolus.
Fig. 6.46 Electronic Identification

The bolus is swallowed by the animal and remains in the animals’ stomach for its lifetime. The reader records the individual number on the device and this data is recorded and locked to the visual ear tag.

Fig. 6.47 Electronic Reader

Advantages

Animals can automatically be identified without handling the animal. Treatments, weights etc can be recorded against the individual animal with minimum human intervention, especially when using a race reader.

6.5 Records to be Maintained in a Dairy Farm

6.5.1 Maintenance of farm records is important for

- Effective monitoring of animal performance right from birth.
- Evaluation of management and feeding systems.
• Individual animal comparisons to assist in breeding, culling and other decisions.
• Milk recording of individual animals.
• Evaluation and comparison of different animal production systems.
• Production of action lists for management

6.5.2 List of Records to be maintained in Dairy Farms

Daily Income expenditure statement in dairy farms

<table>
<thead>
<tr>
<th>Date</th>
<th>Description of the item</th>
<th>Income</th>
<th>Total income</th>
<th>Expenditure</th>
<th>Total expenditure</th>
<th>Balance</th>
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<tbody>
<tr>
<td>01.01.2011</td>
<td>Milk</td>
<td>20,000</td>
<td>45,000</td>
<td></td>
<td></td>
<td>+25,000</td>
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<tr>
<td>01.01.2011</td>
<td>Culled cows</td>
<td>25,000</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>01.01.2011</td>
<td>Feed</td>
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<td>8,000</td>
<td>10,000</td>
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<td>01.01.2011</td>
<td>Medicines</td>
<td></td>
<td>2,000</td>
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<td></td>
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2. Individual Animal record

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<th>Animal number</th>
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<tr>
<td>Lactation order</td>
</tr>
<tr>
<td>Date of service</td>
</tr>
<tr>
<td>1st</td>
</tr>
<tr>
<td>2nd</td>
</tr>
<tr>
<td>3rd</td>
</tr>
<tr>
<td>Date of calving</td>
</tr>
<tr>
<td>Sex of the calf</td>
</tr>
<tr>
<td>Days in milk</td>
</tr>
<tr>
<td>Milk yield</td>
</tr>
<tr>
<td>Days dry</td>
</tr>
<tr>
<td>Remarks</td>
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</table>

3. Calving register

<table>
<thead>
<tr>
<th>Animal Number</th>
<th>Due date of calving</th>
<th>Date of Calving</th>
<th>Calf Number</th>
<th>Sex of the Calf</th>
<th>Birth weight of Calf</th>
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</table>
### 4. Calf Register

<table>
<thead>
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<th>Calf Number</th>
<th>Date of birth</th>
<th>Sex of the calf</th>
<th>Sire Number</th>
<th>Dam Number</th>
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</table>

### 5. Growth record of the young Stock

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<thead>
<tr>
<th>Calf Number</th>
<th>Birth weight</th>
<th>Fort nightly weight</th>
<th>Weight of 1st service</th>
<th>Weight of 1st calving</th>
<th>Remarks</th>
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<tbody>
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### 6. Breeding Records

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<thead>
<tr>
<th>Animal Number</th>
<th>Date of Calving</th>
<th>Service</th>
<th>PD Date</th>
<th>Result of PD</th>
<th>Expected date of calving</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Date time bull number</td>
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<td></td>
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### 7. Daily Feeding Register

<table>
<thead>
<tr>
<th>Date</th>
<th>No. of Animals</th>
<th>Concentrate</th>
<th>Green Folder</th>
<th>others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Received</td>
<td>issued</td>
<td>Balance R I B</td>
<td>R I B</td>
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</table>
8. Daily milk record

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<thead>
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<th>Date of calving</th>
<th>01</th>
<th>02</th>
<th>03</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
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</table>

9. Health Register

<table>
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<th>History and Symptoms</th>
<th>Diagnosis</th>
<th>Treatment</th>
<th>Remarks</th>
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<tr>
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<td></td>
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</table>

10. Deworming and Vaccination Register

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<thead>
<tr>
<th>Animal Number</th>
<th>Deworming date</th>
<th>Next due date</th>
<th>Vaccination for</th>
<th>Date of Vaccination</th>
<th>Next due date</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. Daily Livestock Register

<table>
<thead>
<tr>
<th>Date</th>
<th>Cows</th>
<th>Calves</th>
<th>Heifers</th>
<th>Breeding bulls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.6 Common Vices of Dairy Animals

Certain bad habits are prevalent among the cattle which leads to economic loss to the dairy farmer. These habits are

- Suckling another cow or herself
- Licking other animal
- Kicking during milking
- Fence and rope breaking
- Buller steer syndrome
- Tongue rolling/playing
- Eye rolling
- Head shaking/nodding
- Feed related vices
- Rubbing
- Barbiting
- Butting other animals and men
- Chewing objects etc.

Unless they are properly treated from the first observation, it becomes a difficult problem to get rid of such practices in later stages. Some of the common bad habits are discussed below:

### 6.6.1 Suckling

- Some cows that suck themselves or other cows, thus causing losses of milk, contamination of the udder and sometimes indigestion of the animal concerned.
  - The reason for this vice is not clearly known
  - To prevent this, the cow should be separated from the rest of the herd.
  - A cradle or a bull ring is put in the cow’s nose and then two or three other rings are attached to it. A special ring that has some sharp prongs soldered on to it, is very effective. This system does not interfere with the animal’s normal eating.

### 6.6.2 Licking

- Some animals, especially calves, get into the habit of licking other calves during the milk feeding period.
  - This ultimately leads to the indigestion of hair which gets entangled with the curdled milk in the stomach and forms hair balls. On further accumulation of such hairs, balls continue to grow in size and lead to serious disorders which may be transmitted to other calves.
  - One of the precautionary methods is to rub a pinch of salt or mineral mixture on the tongue of the calf after each feeding.
· Repetition of this system will enable the calf to forget this habit. Some use rope-net or wire gauze muzzle to control this vice.

· Young calves of this nature can best be kept in individual pens or tied so that they cannot reach others.

6.6.3 Kicking

· Many heifers or cows kick when they are milked.

· It may be due to handling by an unskilled milker or may be by nature vicious.

· Before applying any remedial measure, it will be wise to search for the reasons of such habit.

· It may be possible that the cow is suffering from some disease of the udder or teats.

· Sometimes bad milking method may compel the animal to do so. In such cases proper treatment will bring the cow in order.

· But when the cow by nature is vicious, in that case one method is to tie the head high. Another is to tie a rope around the body of the cow just in front of the udder. In severe cases, anti-linking chains can be used. A clamp fits over each hock and a chain fastens them together. Sometimes a piece of rope is used to tie the hocks by making a loop like the figure “8”. Unless crossed between the two hocks, the strap will slip down when the cow struggles.

6.6.4 Fence Breaking

· Some animals have the habit breaking their fence of the enclosure in which they are grazed on jumping over the fences.

· The habit is formed due to the feeling that on the other side of the fence the grasses are more green or plenty.

· There is little that will stop a roughish cow except proper hitching arrangement and good fences.

6.6.5 Buller Steer Syndrome

· In this type of vice the young male calves (Rider) mount their herd mates willing to be mounted (Buller).

· There is no intromission attempt made by rider, although sometimes there may be partial penile erection.
Young male calves weaned early in life as well as kept in intensive housing system are prone to development of this type of behavioural problem.

Addition of new steer to a well-established group of male calves result in an increased incidence of buller steer syndrome.

In order to reduce the incidence of buller steer syndrome close watch should be kept over the steers at least once a day, for identification of buller.

The bullers are separated from the lot and kept with fewer animal groups.

Newborn male calves should be kept with their mother for some time, which will inhibit the confined indoors.

6.6.6 Tongue Rolling or Playing

The animals extrude their tongue from the mouth and moved by curling and uncurling outside or inside of the mouth. After that partial swallowing of the tongue and gulping of the air take place.

It is perform by cows and buffaloes to satisfy their instinct of prehension of forage plants during grazing.

Tongue rolling is seen most frequently immediately before and after feeding.

It has been observed that hereditable factor and early weaning of calves can increase the incidence of this behaviour.

Animal should be left for grazing or they should be given the freedom of movement by keeping them untied for few hours. Visual separation of affected animal is required to prevent the spread of this behavioural abnormality to other animals and they should be given some unchaffed fodder for chewing. Animals having the habit of tongue playing should not be kept as breeding stock.

6.6.7 Eye Rolling

This is condition in which eyes are moved in orbit at a time when there are no visible objects present in surroundings of the animal.

Affected calves stand immobile for extended period of time, head is held motion less along with rolling of the eyes and it is repeated frequently.

This behaviour has been found to be more in those calves that are kept in confinement in individual calf box and lack the access to loafing area.

Calves should be given some loafing area for walking and exercise and if this is not possible then they should be kept loose for some period of time.
6.6.8 Head Shaking or Nodding

- Head shaking has been observed mostly in the adult animals that are being kept in confined housing environment for all the time.

- Animal while shaking the head they hit their head with manger, wall of the house, peg etc. and they keep it up for a long time if not being interrupted.

- They start doing this activity at any time whenever they become free after taking their feed, but the maximum incidence has been observed during night hours. Such animals create nuisance to their owner if they are being kept adjacent to the residing room of the owner.

- As the problem of head shaking arises as a consequence of confined housing environment so it will be better if the animals are allowed for grazing or they should be kept untied for few hours so that may involve in social interaction with each other.

6.6.9 Feed Related Vices

- In order to satisfy their natural grazing and exploratory instincts some dairy animals are found to be indulge in some feed related vices such as – Feed tossing, Dropping of feed and Water lapping. In feed tossing behaviour the animal starts rooting, sorting and finally tossing the feeds along the sides of manger.

- In feed dropping behaviour the animal drops feeds from an elevated feed manger to the ground and then eats that feed which may be the cow’s solution of fulfilling her natural grazing instinct. Such behaviour by the dairy animals may result in to 5 per cent feed loss of the feed offered to them.

- In water lapping behaviour the animal starts licking at water instead of drinking. It is commonly seen in animals that are not allowed for grazing and are deprived of any exercise.

- Problems associated with feeding of animals can be overcome by allowing grazing to the animals that are kept tied on their feeding stall round the clock. In case grazing facilities are not available then they may be kept loose for at least one hour daily so that they can overcome the frustration of being confined at one place. The fodder should be chaffed finely so that all part of the fodder plants get properly mixed which will preclude any preferential feeding by the animal. The mangers should be properly designed and the bottoms of the mangers should be close to the ground level so that the animals may satisfy their grazing behavior to some extent.
6.6.10 Rubbing

- Some parts of body is moved back and forward by the animal against a solid object.
- The movement is repeated so many times that it could not function only to alleviate a local irritation.
- It is more common in animals kept in confinement and comparatively more noticeable in horned breed and more common in bull than the other stock.

6.6.11 Bar Biting

- In this condition animal clamps his jaws around a bar and moving the head forth and back for a minute or more.
- Incidence of this behavioural problem has been found to be more in calves weaned in early age as well in those calves that are being kept in individual calf box and not having access to loafing area.
- This behaviour develops due to confinement for long duration at one place and weaning of calve in very early age life.
- This problem can be managed by feeding the calves by using artificial nurser/teat if weaning of calve in early age can’t be avoided and use bedding material such as wheat or paddy straw which will provide oral occupation to calves.

Some considerations to prevent the development of abnormal behaviour in cattle and buffaloes

- If possible one should follow loose housing system and house the animals as per their age, body wt., physiological status and social hierarchy in the herd.
- In case the farmers are bound to opt for conventional housing system then they should provide ample space to animal for walking and exercise. If calves are weaned immediately after birth or at very early age then milk feeding to the calves should be done by artificial teats or a bottle with a screw nipple and immediately after milk feeding they should be fed ground grain mixture/wheat bran so as to distract them from indulging in inter-sucking.

6.7 Weaning of Calf

- Weaning means separation of the calf from the mother and rising separately. Calf can be separated from the mother immediately after calving/after colostral period.
6.7.1 Teaching the calf to take milk

- Teaching a calf to suck from a nipple bottle is much easier than teaching one to drink from a bucket.
- A nipple bottle is convenient for measuring the correct amount milk.
- A bucket is convenient for encouraging calves to consume calf starter (a dry feed, which can be put in the bucket as a calf finishes the milk replacer).
- Since calves will instinctively nurse, insert one or two fingers in its mouth and let the calf start suckling. Then insert the nipple of the bottle in its mouth and let it continue to suck.
- If bucket feeding is used, force the calf’s mouth into the bucket of milk while it is sucking on your fingers.
- A good milk replacer will contain at least 22 percent protein and 15 percent fat. Because of the fat level, it is easier to mix when warm water is added.
- Milk replacer may be fed warm, but not above 100 °F.
- Each calf should be fed from a separate nipple bottle or bucket to avoid spreading diseases from one calf to another.
- Separate pens will reduce disease transmission and make it easier to feed.
- Water should be made available for the calf even though it is being fed milk or milk replacer. It is best to offer water at least 20 minutes after feeding the liquid feed because water helps maintain the clotting enzyme (rennet), which is needed in the calf’s stomach.

6.7.2 Advantages of weaning

- Early weaning reduces the amount of milk consumed by the calves and spares more milk for human consumption
- Reduces the cost of rearing the calves during their nursing period.
- Facilitates early rumen development in buffalo calves
- It also facilitates the raising of male calves to a live weight of about 400 kg, for slaughter at 16 to 18 months
- Female calves come to breeding at the early age.
6.8 Castration and Dehorning

To castrate a male animal means that the functioning of the testicles is stopped by preventing production of male hormones so that the animal is unable to reproduce. Castration may be accomplished by physical, chemical or hormonal techniques. Physical methods are most common. Testicles may be removed surgically or killed by obstructing the blood supply. Young calves may be castrated with rubber rings, Burdizzo or by surgery. Surgical castration may be more appropriate for calves that are not handled until weaning.

6.8.1 Reasons for castration

- Stop the production of male hormones and semen in unwanted bulls
- Helps in taming the oxen for draught purposes
- Prevent mating and reproduction of scrub bulls after the age of puberty
- Produce docile cattle that are easier to handle compared to bulls
- Decrease aggressiveness, mounting activity, injuries, frequency of dark-cutting carcasses
- Enhance on-farm safety for animals, producers and employees
- Improves fattening in beef cattle
- Provide meat products of the quality consumers demand

6.8.2 Time of castration

- Castration can be done at any age up to 12 months.
- It is, however, better to do it when the animals are very young (before 2 months of age).
- Although the animals grow better when they have not been castrated, the shock of castration is greater the older they are.
- It is also easier to handle the animals when they are very young.

6.8.3 Methods of castration

6.8.3.1 Burdizzo method of castration: Common method of castration in cattle

Technique

- Use this technique when the spermatic cord can be palpated - one month and older.
Find the spermatic cord on one side of the scrotum. Reach between the hind legs and grasp the scrotum above the testicles. The spermatic cord runs from the testicle into the calf’s body. It is about the size of a pencil and moves easily from side to side in its half of the scrotum. Pinch the cord to the outside edge of the scrotum between your thumb and forefinger. If right handed, use your left hand to hold the cord and your right to operate the Burdizzo.

Position the Burdizzo correctly for crushing. One jaw of the Burdizzo has projections at each end to keep the spermatic cord from slipping out of the Burdizzo. Place the jaw with the projections on the front side of the scrotum. Point the projections toward you.

Include only the part of the scrotum that contains the spermatic cord between the jaws of the Burdizzo. Do not crush more of the scrotum than necessary. The jaws should be placed just above (1-1.5 cm) the top of the testicle.

Close the Burdizzo, count out 10 seconds and check to be sure the spermatic cord has been held between the jaws of the Burdizzo. You can also rock the spermatic cord back and forth in the jaws.

Release the Burdizzo, move it to a new site 1 cm below your first site, and repeat steps four and five. Choose a site below the first crush to minimize acute pain from a second crush.

Repeat the procedure on the opposite side. Stagger the pinched areas on the left and right side of the scrotum. Do not pinch a part of the scrotum that
lines up with a pinch on the opposite side. The crush lines must not overlap the centre-line of the scrotum

- Check calves four to six weeks later to be sure the testicles have shriveled. The testicles swell initially and then degenerate and shrink in size.

![Fig. 6.49 Burdizzo Castration Sites](image)

**Advantages and Disadvantages**

- Bloodless
- Slow to perform and requires expertise
- Unreliable when done incorrectly, leads to stags
- Equipment becomes ineffective after long-term use and must be replaced

**6.8.3.2 Elastrator Method**

Elastic band castration cuts off blood supply to the testicles. A lack of blood supply kills the testicles. The equipment for banding calves less than three weeks of age is called an elastrator. An elastrator (Figure 6.49) is the tool used to apply an elastic band to the neck of the scrotum. The elastic band obstructs blood flow to the testicles and the scrotum. In time, the scrotum and testicles fall from the body. The elastrator band is most reliable for calves less than three weeks of age.
Fig. 6.50 Elastrator Method

**Technique**

- Use the elastrator technique for calves from birth to three weeks of age.
- Use elastic rings purchased within the last 12 months to avoid breakage and assure a tight fit. The rings must be strong enough to cut off blood flow in the arteries as well as the veins. If not, the scrotum will swell.
- Pull both testicles into the scrotum. A muscle attached to each testicle will be pulling against you.
- Place the rubber band on the elastrator. Hold the elastrator with the prongs facing up. Close the handles to open the band.
- With the calf standing and both testicles in the scrotum, stretch the ring open and slip the open band up over the scrotum. Release the band just above the top of the testicles (~0.5 cm), not at the base of the scrotum.
- Check to be sure both testicles are still in the tip of the scrotum and that the ring is placed properly. If not, cut the ring with scissors and start again.
- Remove the elastrator from under the band.

Fig. 6.51 Elastic Band at Top of Testicles
Advantages

- Calves are handled easily and little labour is involved.
- It is a bloodless method.
- Preferred for castrating at a wet, muddy areas

6.8.3.3 Open wound castration (emasculator or knife)

![Fig. 6.52 Emasculator](image)

![Fig. 6.53 Scalpel](image)

Technique

- Before the operation, the person doing the operation must wash his hands well, the instruments must be boiled and the scrotum disinfected thoroughly with iodine or another suitable disinfectant.
- Apply antibiotic powder to prevent infection, and a fly repellent.
- A sharp knife is used to remove the lower third of the scrotum, and each testicle is removed from its supporting membranes. Do not remove too little of the scrotum otherwise it will not drain well.
- The emasculator has a cutting and a crushing surface. The instrument is placed on the spermatic cord and the vascular supply closed so that the testes are removed while excessive bleeding is prevented by the action on the vascular tissue.
- If the knife is used, the cords should not be cut cleanly. The instrument is held at an angle, and scraped over a distance of about 30 mm, until the cord breaks. This prevents too much blood flow.
- It is better to use the emasculator rather than the knife.
Advantage

- Castration is irreversible because the testicles are removed.

6.8.4 Disbudding and Dehorning

Dehorning of horned cattle is the process of removal of their horns or the process of preventing their growth. A polled animal is one that grew no horns or one that was dehorned. Disbudding by chemical or hot-iron destroys the horn-producing cells of the horn bud. Surgical disbudding removes the horn bud and the horn-producing cells of the horn bud. Dehorning removes the horn and horn-producing tissue after horns have formed from the bud.

Advantages

- Reduce the risk of injury and bruising to herd mates
- Require less space at the feed bunk and in transit
- Decrease risk of injury to farm workers, horses and dogs
- Decrease risk of death, illness due to horn cancers
- Produce docile cattle that are easier to handle
- Enhance on-farm safety for animals, producers and employees
- Facilitate easier use of handling facilities

6.8.4.1 Age of Dehorning

- Calves can be dehorned at the early age preferably at below 10 days age

6.8.4.2 Methods of dehorning

1. Chemical method
2. Electrical method

Chemical Dehorning

Caustic chemicals will prevent the growth of horns when properly applied to the horn buds of new-born (less than 10 dasys age) calves. The chemical destroys the horn-producing cells around the horn bud. The chemicals are available as sticks or pastes

Technique

1. Administer sedation, analgesia and local anaesthetic.
2. Expose the horn bud (about the size of a 5-cent piece) by pushing the hair back (Figure 3).

3. Apply the caustic to the horn button. Use a wooden applicator and rub the horn bud till bleeding comes.

4. Protect the calf from accidental caustic burns by applying Vaseline around the eyes.

Fig. 6.54 Horn bud in young Calf

The circle at the base of the ear shows the location of the horn bud in a young calf. The horn bud is readily visible after pushing back the hair. Reposition the hair over the paste and bud after applying the dehorning paste.

6.8.4.3 Hot Iron Dehorning

Hot iron dehorners are available in versions heated by a furnace or fire, 12-volt battery, 120-volt electricity, power packs. The head of the iron is a hollow circle and it fits over the horn bud. Proper application of the hot iron will destroy the horn-producing skin at the base of the horn. This technique works well for calves up to 12 weeks old. There are several sizes of dehorning irons. The proper size is one where the burner makes a complete ring around the base of the horn.

Technique

- Administer sedation, analgesia and local anaesthetic.
Preheat the dehorning iron to a red colour. Both electric and gas irons work best when they are “red” hot.

Hold the calf’s ear out of the way to keep it from being burned.

Place the tip of the burner over the horn and apply slight pressure. When the burning hair begins to smoke, slowly rotate the dehorner by twisting your wrist.

Continue the application of heat for 10-15 seconds. Do not leave the dehorner in place for much longer, especially in young calves. Heat can be transferred through the thin bones of the skull and damage the calf’s brain.

Dehorning is complete when there is a copper-coloured ring all the way around the base of the horn.

The horn bud or button will slough off in 4 to 6 weeks.

![Fig. 6.55 Electronic Hot Iron Dehorner](image)

An electric hot-iron dehorner will destroy the horn-producing skin at the base of the horn bud.

### Advantages and Disadvantages

- Bloodless
- Can be used at any time of the year
- Young calves up to 12 weeks of age
- Unreliable when done incorrectly, leads to scurs (partial horn growth)
- Requires expertise - pain control and technique

#### 6.8.4.4 Dehorning Spoon or Tube

Dehorning spoons or tubes provide a quick and efficient technique for removing horn buds in calves less than eight weeks of age. With this method, a
sharpened metal tube cuts through and removes the horn-producing skin at the base of the horn bud. Use the proper size tube to remove the horn plus about 1/8 inch of skin around the entire horn bud.

**Technique**

1. Administer sedation, analgesia and local anaesthetic.
2. Select the correct size tube (4 sizes available) to fit over the horn bud, and cover about 1/8 inch of skin around the horn base.
3. Place the cutting edge straight down over the horn.
4. Apply pressure to the tube; push and twist the tube until the skin has been cut through.
5. Cut under the horn bud and remove it, using a scooping motion.
6. Apply an antiseptic to the wound. Some bleeding may occur.
7. Clean and disinfect the cutting edge of the tube between calves.

![Fig. 6.56 A Dehorning Spoon or Tube](image)

A dehorning spoon or tube is used to remove the horn bud plus the horn-producing skin at the base of the bud.

**Advantages and Disadvantages**

- Not bloodless
- Useful for young calves
- Risk of infection because of open wounds
- Avoid use during fly season
- Unreliable when done incorrectly, leads to scurs
- Requires expertise - pain control, technique, control of bleeding
6.9 Deworming and vaccination Program

Elimination of internal parasites is called deworming. The following is the deworming schedule in calves.

<table>
<thead>
<tr>
<th>Age of the calf</th>
<th>Deworming drug</th>
<th>Dose/kg body weight</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 days</td>
<td>Piperazine adepate</td>
<td>200-400 mg</td>
<td>Ascarias</td>
</tr>
<tr>
<td>30 days</td>
<td>Piperazine adepate</td>
<td>200-400 mg</td>
<td>Ascarias</td>
</tr>
<tr>
<td>60 days</td>
<td>Albendazole</td>
<td>7.5-15mg</td>
<td>Round worms</td>
</tr>
<tr>
<td>90 days</td>
<td>Fenbendazole</td>
<td>5-10mg</td>
<td>Round worms</td>
</tr>
<tr>
<td>120 days</td>
<td>Oxyclozanide</td>
<td>5.10mg</td>
<td>Liverflukes</td>
</tr>
<tr>
<td>150 days</td>
<td>Albendazole</td>
<td>7.5 – 15mg</td>
<td>Round worms</td>
</tr>
<tr>
<td>180 days</td>
<td>Fenbendazole</td>
<td>5-10mg</td>
<td>Round worms</td>
</tr>
</tbody>
</table>

After 6 months deworming should be carried out for every 3 months up to 1 year and for every 6 months thereafter.

Advantages of deworming

• Improves feed efficiency and body weight in calves
• Prevents death in calves due to Ascarias
• Improves resistance in calves for other infectious diseases
• Prevents anaemia in calves
• Boost vaccination titres.

6.9.1 Precautions During Deworming

• Dose should be appropriate
• Deworming should not be carried out in sick calves
• Care should be taken while drenching the deworming drug to the calves. Faulty drenching leads to aspiration pneumonia
6.9.2 Vaccination Schedule in Cattle and Buffalo

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Disease</th>
<th>Vaccine</th>
<th>Dose (ml)</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Foot and Mouth disease</td>
<td>FMD vaccine, Raksha FMD vaccine</td>
<td>5 ml</td>
<td>Twice in a year, September &amp; March</td>
</tr>
<tr>
<td>2</td>
<td>Haemorrhagic Septicaemia</td>
<td>Alum ppt. H.S. Vaccine, H.S. vaccine</td>
<td>5 ml, 3 ml</td>
<td>Annually before monsoon (twice a year in endemic areas)</td>
</tr>
<tr>
<td>3</td>
<td>Black quarter</td>
<td>Alum ppt. B.Q. vaccine</td>
<td>5 ml</td>
<td>Annually before monsoon</td>
</tr>
<tr>
<td>4</td>
<td>Brucellosis</td>
<td>Brucella cotton-19 strain vaccine</td>
<td>5 ml</td>
<td>Only once i.e. at 4-6 months of age in females in problem herds.</td>
</tr>
<tr>
<td>5</td>
<td>Theileriosis</td>
<td>Rakshavac-T vaccine</td>
<td>3 ml</td>
<td>Annually.</td>
</tr>
</tbody>
</table>

Summary

Scheduling and carryout of the routine and periodical operations are important for proper functioning of the dairy farm. Different methods of restraining of dairy animals were discussed. The suitable method of restraining can be used depending up on the purpose. Determination of age of the age of the animal was explained in detail. Various methods of identification of the animal was discussed. The appropriate method can be chosen depending on the age of the animal and purpose of identification. The record maintenance in dairy farm is important for efficient management and analysis of dairy business. Common vices of the dairy animals and their prevention were discussed. Weaning of the calf was explained. Different methods of castration and dehorning of the cattle was explained. The schedule of deworming and vaccination was discussed.

Short Answer Type Questions

1. Explain about casting of the dairy animal
2. How do you differentiate temporary teeth from the permanent teeth?
3. What is tattooing? Explain the procedure of tattooing.
4. What are the production records to be maintained in a dairy farm?
5. List out common vices of the dairy animals.
6. What is weaning?
8. What is the importance of deworming and vaccination in dairy animals.
**Long Answer Type Questions**

1. Explain daily routine and periodical farm operations in dairy farm.
2. How do you determine the age of the cattle?
3. Explain different methods of identification of livestock.
4. Write about various records to be maintained in dairy farm.
5. Explain different methods of castration in dairy animals.
6. How do you dehorn the horned animals? Explain.
7. Explain the methods of weaning in dairy animals.
8. Explain about deworming and vaccination schedule in cattle, sheep and goat.
7.1 Reproductive Organs of Cow and Bull

The re-productive organs or genital organs of a cow consist of ovary, fallopian tubes, uterus, cervix, vagina and Vulva. Each of these plays a vital role in the reproductive phenomena.
The ovaries are two in numbers and almond shaped situated at a distance of 40 - 45 cm from the opening of the vulva. 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 look like pimples on the ovarian surface known as graffian follicles.

Graffian follicle also produces female sex hormone known as oestrogen which is responsible for oestuus symptoms in the female cattle.

Matured follicles bursts and release ova and the process is known as ovulation.
At the site of rupture, new cells grow as corpus lutum which secrets progesterone hormone, which helps in preparing the uterus to receive fertilized ovum and maintain the pregnancy. When the heifer attains puberty, the functioning of the ovaries and the ova commences. The activity of the ovary is associated with the appearance of heat.

**Fallonpian 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.

**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 are lodged in cotyledons for nourishment of the foetus.

**Cervix**

Cervix is about 10 - 12 cm in length and located between uterus and vagina and also known as neck of the womb. The wall of cervix is firm and cervical 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.
Vagina

The vagina is a muscular passage, which accommodates the penis of the bull during coitus and also acts as a passage for the expulsion of foetus from the uterus during delivery. It is extending from the posterior of the cervix to 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.

Vulva

Vulva or labia is the terminal portion of the female genital tract. It has two lips. When the 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 a bull consists of Testicles, Epididymis, vasdeferens, siminal vesicles, prostate glands, cowpers glands, urethra and penis.
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 contain long coiled tubes known as semineferous tubes which produces ‘sperms’. Between these tubes interstitial or leydig cells which produces male hormone as testosterone.

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 is to store the spermatozoa and to provide nourishment to the sperm during the process of their maturing.

Vasdeferens

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

**Fig. 7.4 Arrangement of tubules and-ducts in the testis**

Seminal Vesicles

Seminal vesicles has lobulated surface. Seminal vesicles secrets alkaline thick viscous fluid which is the largest portion of the seminal plasma.
Prostate Gland

It is an accessory gland situated at the neck of the bladder surrounding the urethra. It is compound gland having many lobules. It secrets a substance which absorb Co2 given off by the sperm.

Cowpers 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 facilitates smooth movement of the sperms in the passage.

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.

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 tip of the penis is about 5 cm long and it is known as glans penis. The penis has sigmoid flexure just behind scrotum. It is made up of muscular and erectile tissue which becomes engorged with blood when the animal is sexually stimulated. During copulation whole sigmoid 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 takes place starting with oestrous and ending with the next oestrous is termed as oestrous cycle.
- The length of oestrous cycle on an average in cattle and buffalo is 21 days.
- The oestrous cycle is divided into 4 phases i.e. prooestrus, oestrus, metoestrus and dioestrus.

The stages of the bovine cycle are
- Day 0 is considered to be estrus.
- Days 1-5 are metestrus.
- Days 6-17 are diestrus.
- Days 18-20 are prooestrus.
Fig 7.5 Oestrus cycle

- Proestrous makes the animal coming to heat. During this phase the graffian follicle will grow and produce oestrogen. This hormone is absorbed in blood and passed to oviduct and causes the growth of cells lining the oviduct, which facilitates transport of ova. This hormone is also responsible for the oestrus symptoms in the cattle.

- The 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 heat symptoms.

- At the end of oestrous period ovulation will occur.

- Metoestrus is the period just after the ovulation during which period level of oestrogen and leutinizing hormones fall and corpusluteum begins to functions.

- Diaoestrus 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.
SYMPTOMS OF HEAT

The various symptoms of heat are

- The animal will be excited, restlessness and nervousness.
- Frequent bellowing and reduced feed intake can be observed.
- Peculiar movement of lumbosacral region is present.
- The animals which are in heat will lick and smell other animals.
- The animals will try to mount other animals
- The animals will standstill when other animal try to mount. This period is known as Standing heat. This extends 14-16 hours.
- Frequent micturition (urination) will be observed.
- Clear mucous discharge will be seen from the vulva, sometimes it will be string like. The Mucous also stick to the near the pasts of vulva.
- Swelling of the vulva will be seen.
- Congestion and hyperemia of the vaginal mucus membrane present.
- The tail will be in raised position.
- Milk production will be slightly decreased.
- On Palpation uterus will be turgid and the cervix will be opened.

Artificial insemination Advantages - Disadvantages

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

Advantages of A.I

- There is no need of maintenance of breeding bull for a herd; hence the cost of maintenance of breeding bull is saved.
- It prevents the spread of certain diseases and sterility due to genital diseases. E.g. contagious abortion, vibriosis.
- By regular examination of semen after collection and frequent checking on fertility make early detection of interior males and better breeding efficiency is ensured.
- The progeny testing can be done at an early age.
The semen of a desired sire can be used even after the death of that particular sire.

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

It makes possible the mating of animals with different body sizes without injury to either of the animal.

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

It helps in maintaining the accurate breeding and calving records

It increases the rate of conception as insemination carried on animals free from reproductive disorders.

It helps in better record keeping.

Old, heavy and injured sires can be used.

Disadvantages of A.I

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

7.4 Collection of Semen 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.

- Use of Artificial vagina
- By Electro-stimulation method.
· 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:

· A heavy hard rubber hose 2” diameter open at both ends with a nozzle for air and water in and outlet.

· Inner sleeve of rubber or rubber liner.

· The semen receiving cone or rubber cone.

· Semen collection tube made of glass or plastic graduate in cc and its fraction correct to 0.1 CC

· Insulating bag

![Artificial Vagina of Cattle](image)

Before using for semen collection all the parts of A.V are washed thoroughly, sterilized properly and assembled into artificial vagina.

The rubber liner is inserted into the rubber hose inverting both ends back by folding back from both sides opening and fastening with rubber bands. Now the space between the hard rubber hose and inner rubber liner forms a water tight compartment.

The nozzle at one end of the hose can be fixed or removed by 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 nozzle.

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 nozzle into the water jacket to create pressure in it 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 bull 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.

**Procedure**

- The cow or dummy is secured in a service create. It is important that the collection area have non-slip flooring to avoid injuries and because ejaculation may be inhibited if the bull is nervous about his footing.

- The assembled A.V is held with the left hand by a right handed person at 45° angle from the direction of penis.

- When the bull mounts on the cow, the sheath of the bull will be grabbed 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 air vent is opened to release the pressure from the jacket. The water from the jacket is also drained by opening the nozzle. 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, heat or air by covering with an insulation bag with zip.
7.5 Insemination Methods

There are different methods for insemination in different species of animals.

- Speculum method
- Vaginal method
- Recto vaginal method.

Out of the above three methods, the recto vaginal method is popular in dairy animals.

7.5.1 Recto Vaginal Method

The recto-vaginal technique is the most commonly used method of artificially inseminating (AI) cattle. Regardless of whether the inseminator is left or right handed, it is recommended that the left hand be used in the rectum to manipulate the reproductive tract and the right hand be used to manipulate the insemination gun. This is because the rumen or stomach of the cow lays on the left side of the abdominal cavity, displacing the reproductive tract slightly to the right. Thus it may be easier to locate and manipulate the tract with the left hand.
Steps in performing successful AI

Step 1: Restrain the animal to be inseminated. A gentle pat on the animal’s rump or a soft spoken word as the inseminator approaches will help to avoid startling or surprising the cow.

Step 2: Raise the tail with the right hand and gently massage the rectum with the lubricated glove on the left hand. Cup the fingers together in a pointed fashion and insert the left hand in the rectum, up to the wrist.

Step 3: Gently wipe the vulva with a paper towel to remove excess manure and debris.

Step 4: Insert the gun at a 30° upward angle to avoid entering the urethral opening and bladder located on the floor of the vagina.

The cervix can be located, grasp it and gently push it forward. This will straighten the vagina and the gun should pass freely up to the cervix. The inseminator will note a distinct gristly sensation on the gun when it contacts the cervix.
The cervix (Figure 10) consists of dense connective tissue and muscle and is the primary landmark for inseminating cattle. The cervix usually has three or four annular rings or folds. The opening into the cervix protrudes back into the vagina.

Step 5: Once the gun is in contact with the external surface of the cervix, grasp the external opening to the cervix with the thumb on top and forefingers underneath (Figure 7.11). Use the palm and these two fingers to guide the gun tip to the cervical opening located between the thumb and forefingers. With gentle probing, the opening of the cervix should be located. The inseminator will feel the gun slide forward until it contacts the second cervical ring.

Step 6: Maintain gentle but steady forward pressure on the gun and slide the thumb and forefingers just in front of the gun tip and re-grasp the cervix. Using the flexibility of the wrist, gently twist and bend the cervix until the second ring of the cervix slides over the gun tip (Figure 7.12). Repeat the process until
all the rings have been passed over the gun tip. When all rings of the cervix have been cleared, the gun should slide forward freely with little resistance. Since the uterine wall is very thin, the inseminator will once again be able to feel the tip of the gun.

**Figure 7.12** Moving the cervix over the tip of the insemination gun.

**Step 7:** It is now time to check the gun placement and deposit the semen. Rotate the gloved hand until it lies on top of the cervix. With the index finger of that hand, locate the far end of the cervix (Figure 7.13). Pull back on the gun until the tip of it is directly underneath the index finger near the internal opening of the cervix. Raise the finger and slowly deposit the semen (Figure 7.14). Push the plunger slowly so that drops of semen fall directly into the uterine body.

**Figure 7.13** Locating the end of the insemination gun.
Fig. 7.14 Depositing the semen in the body of the uterus.

With proper AI technique and gun placement, semen will be deposited in the uterine body. Uterine contractions will then transport spermatozoa forward to the horns and oviducts with a good distribution of both sides (Figure 7.15). When the insemination gun is more than 1 inch through the cervix, all the semen will be deposited in only one horn (Figure 7.16).

Fig. 7.15. Good distribution of the semen to both uterine horns

Figure 7.16 Improper distribution of the semen into one horn because the insemination gun is pushed too far forward.
Step 8: After properly depositing semen, slowly pull the gun from the reproductive tract. Remove the gloved hand from the rectum. Check the gun tip for signs of blood, infection or semen leakage inside the sheath. Wipe the gun clean and dry and return it to the proper storage location.

7.5.2 Speculum Method

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

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 to the female genitalia.

7.6 Embrayo Transfer Technology - Advantages and Disadvantages

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

- It is used for rapid multiplication of genetically superior females.
- It is used for rapid determination of genotype of an animal, especially when the characters being investigated are dependent on dominant genes.
- Using genetically unreliable mothers as foster mothers for embryo of superior genetic makeup.
- For economic and safe transfer of exotic germplasm from one country to another.
- For increasing the litter size in sheep and pigs
- For production of twin calves in cattle.
- For production of identical offsprings which are useful as research material.
- For production of young ones with a sex of choice.
- To study the maternal influence on the foetus.
· Rapid multiplication of endangered, rare and commercially desirable breed

· Production of transgenic livestock.

Disadvantages

· Availability of progeny tested bull frozen semen is important.

· 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.

· Embryo transfer technology is very expensive due to low survival rate of embryos. The hormones are very costly and they have to be imported.

· Embry Transfer Technology reduces highly technical skills.

7.6.1 Stages in Embryo transfer Technology

· Super ovulation of donor cow with follicular stimulating hormone at 32 mg.

· Inseminating superovulated cow twice on the day of oestrous.

· Embryo collection

There are two methods commonly used for embryo collection

(a) Surgical method Flush 2 to 20 ml of flushing medium (Dulbecco’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.

(b) Non surgical method

Dilate the cervix with cervical dilator and 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.

7.6.2 Preparation of donor

· Donor cow is placed in a travis

· The perineum of the donor cow is cleaned and scrubbed with antiseptic solution. Epidural anaesthesia is given.
• Foley’s catheter is introduced in to the uterine horn.

• The plastic balloon is inflated to seal off the horn of the Uterus. Embryos are flushed out with culture media and collected in Petri dish.

7.6.3 Selection of Embryo for transfer:

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

7.6.4 Selection and preparation of recipients:

Recipients should be a regular (good breeder). It should have infection free genital tract. It should have calved 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.

7.6.5 Synchronization of estrous between donor and recipient:

For successful of embryo transfer, synchronization of the stage of oestrus cycle between the donor and between the stage of embryo and recipient is necessary. For good results, the recipient should be in estrous within 12 hours of the donor. This can be achieved by using synchronizing agents (PG F2α)

7.6.6 Transfer of Embryos

Transfer of embryos can be done by two methods

(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 E.T. gun loaded with straw which contains embryo, 6 days after oestrus. The embryos at the time of examination and selection can be manipulated for invitroculture of embryos for preservation

7.6.7 Success Rate

The average number of calves produced per super ovulation is 3-4. It is possible to induce super ovulation in a cow for 4-5 times per year. 10 calves can be obtained cow per year on an average.
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 sizes 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 day a farmer can get semen of an outstanding sire for inheritance of high milk yield at his door step. 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.

- NaCitrate 1.856 gm
- Fructose 1.0 gm
- Water Fill to 66 ml
- Glycerol 14 ml
- Egg Yolk 20 ml
- pH to 7.0 with HCl
- Dihydro-streptomycin 50.0 mg

- 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 improves sperm resistance to glycerol and also provides nutrition.
- Frozen semen is packed in single plastic straws at 5°C Centigrade.
- 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 pathogen 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 to 20, hours period in refrigerator at 5°C.

Liquid nitrogen plays a vital role for storing the frozen semen straws, at a temperature of -196°C for longer periods.

7.8 **Pregnancy Diagnosis**

Pregnancy can be diagnosed by

1. **By observing the signs of pregnancy.**
   - The animal will not come to heat again
   - The animal tends to become sluggish in temperament and tractable
   - The animal has tendency to grow
   - Increase in the volume of abdomen
   - Increase in body weight
   - The mammary gland become firm, enlarged and teats takes waxy appearance.

2. **Examination of Uterus per rectum**
   - Ovaries contain corpusluteum throughout the gestation period. C.L. is firm, rounded at the top and slightly elevated from the surface of the ovary.
   - From the beginning to middle of the 2nd month, one horn of the uterus is enlarged. If 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 foetal membranes can be felt.
   - By third month uterus detention can be seen. If distended horn is tapped with fingers, it reveals like a piece of wood floating in fluid beneath.
Early in 4th month cotyledons can be felt. By the end of 4th month uterine artery starts enlarging. If the artery is slightly compressed between the fingers and thumb, continuous vibrating fremitus (uterine thrill) can detected which latter changes to pulsation.

From 5th month onwards uterus sinks below the pelvic cavity until middle of 6th month. After wards presence of calf can be easily detected.

3. Laboratory tests

1. Serum of pregnant cows contains globulins.

2. 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.

3. Specific gravity test: 0.25ml of cervical mucosa is placed in copper sulphate with 1.008 specific gravity. If it sinks it is pregnant and if floats it is non pregnant.

4. 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.

5. 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 the animal is positive for pregnancy, where as with non pregnant green colour returns to original colour.

7.9 Parturition - Assistance and Other 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 which should be laxative nd easily digestible.
The calved animal is kept warm. The cow should be given plenty of lukewarm 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 sometimes prolapse of uterus or vagina is seen. In such cases it should be immediately referred to a qualified veterinarian. Sometimes heavy milking cows will show the symptoms of “Milk fever” which has to be attended by a veterinarian to give 300-500ml of calcium borogluconate intravenously. After parturition or delivery the placenta is not expelled (Retained placenta), in such cases it is removed manually after 24 hours.

7.10 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 explained. The artificial vagina method is superior and described in detail. Physical, chemical and bacterial examination of semen and semen dilutions, preparation of frozen semen and its storage and methods of insemination and cleaning and sterilization of AI equipment, fertilization, embryogenesis, pregnancy diagnosis and precautions to be taken before and after parturition is described in detailed

Short Answer Type Questions

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 Answer Type Questions

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?
Structure

8.1 Mammary Gland, Structure and Development
8.2 Lactogenesis and Galactopoiesis
8.3 Milk letdown
8.4 Milking methods
8.5 Sources of Milk contamination - steps in clean milk production.
8.6 Summary

8.1 Mammary Gland, Structure and Development

The udder is a skin gland and is located entirely outside the abdominal cavity. It is supplied with blood vessels i.e. mammary artery or mammary vein. It is composed of two halves, the right and left, divided by 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 secretary tissue and some supporting connective tissue.

The secretary tissue consists of numerous “Alveoli” or tiny chambers lined with many secretary cells.

Each Alveolus is supplied with tiny capillaries which lie outside the secretary cells.

Small muscle fibres, called myoepithelial cells also surrounding each alveolus, which causes contraction of the alveolus and produce “Let - down” of milk. Each alveolus is drained by a small duct called alveolar duct.

A cluster of alveoli and their ducts resembling a bunch of grapes constitute a lobule.

These ducts units successively to larger ducts called intralobar (within lobe) and inter lobular (between lobules)

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 in 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 a 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.

Fig. 8.2 The mammary gland of a cow

Fig. 8.3 Diagram of alveolus showing the lumen, epithelial cells and capillaries
8.2 Lactogenesis and Galactopoiesis

Lactogenesis

- Synthesis of milk is called lactogenesis.
- 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 it 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.
- At the time of parturition a rise of prolactin adrenal corticoids occurs with concomitant decline in oestrogen 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 4 to 6 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.

8.3 Milk Let Down

- 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 pituitary gland located at its base.

Mechanisms are activated in the pituitary gland which causes 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 The neurohormonal reflex of milk ejection.
(A) that a cow associates with milking causes a nerve impulse (B) to travel via the inguinal nerve(1) to the spinal cord(2) and the brain(3). The brain causes the release of oxytocin (D) from the posterior pituitary (C). Oxytoxin is released into a branch of the jugular vein(4) and travels to the heart(5) and is then transported to all parts of the body by the arterial blood. The oxytocin reaching the udder leaves the heart by the aorta(6) and enters the udder through the external pudic arteries (7). Un the udder it causes the myoepithelial cells to contract, resulting in milk ejection from the alveoli.

8.4 Milking Methods

Hand milking and machine milking are the two methods being used to remove the milk from the udder

8.4.1 Hand milking

· 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 strip cup 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.

Methods of hand milking

Stripping and full-hand milking are the two commonly used methods of milking.

8.4.1.1 Stripping method

· Stripping 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
8.4.1.2 Full hand milking

- The base of the teat is closed in the ring formed by the thumb and forefinger 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. This practice should be avoided as it injures the teat tissues.

![Fig. 8.5 Full hand milking](image)

**Advantages of full hand milking**

- 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.

- Full-hand method is superior to stripping as it simulates the natural sucking process of calf.
Stripping causes more irritation to teats due to repeated sliding of fingers on teats and so discomfort to cows, but stripping has to be adopted for cows with smaller teats for obvious reasons. 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.

8.4.2 Machine Milking

Machine milking is more efficient method of milking compared to hand milking. Modern milking machines are capable of milking cows quickly and efficiently, without injuring the udder, if they are properly installed, maintained in excellent operating conditions, and used properly.

**Parts of the milking machine**

- The machine includes teat cups that contact the cow’s teats and remove the milk, a claw where milk pools as it is removed from the four teats, vacuum tubes that provide vacuum to the teat cups and a milk tube that removes milk away from the claw, a source of vacuum for the machine, and a pulsator that regulates the on-off cycle of the vacuum.

- Many milking machines today have an automatic take-off (ATO or detacher) device that removes the machine from the cow when milking is completed.

8.6. Milking machine on a cow indicating machine parts.
8.6 (A) one inside of the liner and (B) one between the metal shell and the outside of the liner. A vacuum is pulled in both chambers; the vacuum in chamber A is continuous, while the vacuum in chamber B alternates between atmospheric pressure and the vacuum.

When the teat cup is applied to the teat, the end of the inside chamber is filled by the teat.

- During the milk phase the vacuum applied inside the liner is constant and keeps a constant negative pressure at the end of the teat, drawing milk (in yellow) from the gland.

- The vacuum applied to chamber B, between the shell and the thinner walled part of the liner, keeps the liner from collapsing under the vacuum. During the rest phase, the vacuum inside chamber B is momentarily off. Air (in green) enters chamber B instantly reaches atmospheric pressure, collapsing the rubber liner around the teat end, massaging the teat and maintaining blood flow.

- The lower part of chamber A maintains its vacuum (lower part of right diagram), while the upper part around the teat momentarily loses vacuum. This alternating vacuum-atmospheric pressure in chamber B is controlled by a pulsator.

- However, if the constant vacuum were left onto the teat end for an extended period, blood and lymph would accumulate in the end of the teat, causing trauma to the teat. This would be like attaching a vacuum hose to the end of your finger. A proper pulsation rate, that is the number of cycles of vacuum on - vacuum off (in Chamber B above), or milk phase – rest phase cycles, usually is about 45-
60 per minute. The ratio of time that the machine is in milk phase vs rest phase should be between 50/50 to 60/40 (pulsation ratio). Pulsation is important for maintaining teat end health.

- The area exposed to the hose would turn red with accumulated blood. To prevent teat-end trauma, this alternating vacuum-atmospheric pressure, referred to as

**Advantages of milking machines**

- Saving of labour expenses.
- Reduction of dependency on skilled farm workers.
- Enables rearing of larger herd strength.
- 3-4 times faster than hand milking.
- Increase in the milk yield.
- Increase in the quality of milk.
- Reduces stress throughout the lactation by creating good milking routines.

**Limitations**

- Some of the older cows which are accustomed to hand milking may not adjust to machine milking.
- Standby power supply is essential.
- High initial investment and training of staff.
- Negligence in following the strict cleaning procedures would lead to severe contamination and higher incidence of mastitis.
- Greater water requirement for cleaning of equipment.
- Prompt service and availability of spares is essential

8.5 Sources of Milk Contamination - Steps in Clean Milk Production

Milk containing dirt, dust, foreign materials have high bacterial count and with off flavour is called contaminated milk. Milk is contaminated by various sources like udder, exterior of cow’s 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

Un Sanitary conditions of milking barns and bedding of the animal causes bacterial growth. Such bactecia may enter in to the udder through teet canal, which causes infection in 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 in the animal body may enter in to 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 avoids 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 have their entry in to milk. So that care should be taken to avoid these parasites from the barn by spraying, fly proofs 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, diphthiria 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 fisting causes contamination of milk. Milkers generally moisten their fingers with milk, water or even saliva, while milking. This 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 that dry hand milking may be
practiced to avoid contamination of milk. Major contamination of milk is caused by bacterial entry. So that steps are to be taken to monitor such bacterial entry like avoiding insanitary conditions of the barn, cleanliness of the milker, utensils and avoiding unfair milking practices.

**8.5.8 Steps in Clean Milk Production**

- The animal should be washed before milking.
- Washing of cows is best practice to minimise the bacterial entry.
- 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.
- Hands of the milker should be clean and dry. Wet hand milking may result in high bacterial count in the milk.
- Nails of hands of the milker should be well trimmed.
- Milker should be free from all diseases.
- Dusty feed like Rice polish should not be fed to the animal at the time of milking.
- Milking barns should be well ventilated free from flies.
- Utensils used for milking should be clean, sanitized, smooth and copper free.
- Flavour producing feeds should be fed only after milking So that flavours will not appear in milk.
- The hind legs and the switch of the animal will be tightened with the help of a milk man’s rope at the time of milking.
- Milk is kept in cool place to maintain the flavour and keeping quality.
- Milk should be covered with lids to avoid dust, dirt, entry hot, or cold, day light or strong artificial light, all at which tend to decrease milk quality.

**8.5.9 Bacteriological Standards of Raw Milk SPC/ml Grade**

- Raw milk with not exceeding 2,00,000 specific count in one ml of milk can be graded as very good raw milk.
- Between 2,00,000 and 10,00,000 Good
- Between 10,00,000 and 50,00,000 Fair
8.6 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 galactopoiesis is maintenance of lactation. The secretion of milk is depending on hormonal function of prolactin, 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, and stage of lactation, season of calving, milking intervals, and frequency of milking, level of feeding, heat period and exercise.

Short Answer Type 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?

Long Answer Type Questions

1. Describe in detail about 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.
9.1.1 Sheep Breeds

India has about 40 breeds of sheep out of which 24 are distinct. They vary from the non-woolly breeds of sheep in the Southern Peninsular region mainly kept for mutton and manure to the reasonably fair apparel wool breeds of the Northern temperate region.

Based on utility, Indian breeds of sheep can be classified into the following:

a) Apparel wool breeds: Hissasrdale, Nigiri, Kashmir Merino, Avivastra, Bharat Merino. These are crossbreds of native sheep with exotic fine wool/dual-purpose/mutton breeds.
(b) Superior carpet wool breeds: Chokla, Nali, Magra, Jaisalmeri, Pugal, Patanwadi, Tibetan, Bonpala, Gaddi, Rampur Bushair, Poonchi, Karnah, Gurez, Changthangi, Avikalin.

(c) Coarse carpet wool breeds: Malpura, Sonadi, Muzaffaranagari, Jalauni, Deccani, Bellary, Coimbatore, Chhotanagpuri, Balangiri, Ganjam, Bhakarwal, Shahabadi

(d) Hairy meat breeds: Nellore, Hassan, Mecheri, Kilakarsal, Vembur, Ramnad White, Madras Red, Tiruchi Black, Kenguri. These sheep are maintained primarily for meat almost in the whole of Southern Peninsular region. The wool produced is very coarse, hairy and coloured; below 36s quality; and suitable only for extremely rough carpets, barrack blankets and kamblies.

Based on various Agro-climatic conditions and type of sheep found in them, the following four different regions over the country:

**A. Sheep Breeds in the Northwestern Arid and Semi-Arid region**

**Chokla/ Chapper/ Shekhawathi**

- Adjoining areas of Bikaner, Jodhpur, Jaisalmer District of Rajasthan
- Medium size compact body, head is small.
- Face with broad forehead free of wool and dark brown/reddish brown and extend up to middle of neck

![Fig. 9.1 Chokla](image-url)
· Skin is pink, prominent roman nose, free of wool
· Legs short with small hard black hoof.
· The hair coat is dense relatively fine covering entire body including belly quarter part of legs
· Males: 40-45 kg FM; 27-35Kg
· Avg wool: 1.5-2.5 kg
· Produces fine carpet wool among Rajasthan breeds.

NALI

· Rajasthan, Haryana, Punjab
· Medium sized animals, compact head. Face color is light brown. skin is pink
· Ears large and leafy, forehead covered with wool

Fig. 9.2 Nali

· Face is full of light brown hair
· Short legs with amber hoofs.
· Both sexes horned
· Male: 35-40kg
· Female: 30-35 kg
· Yellow colored coarse carpet
· Wool yield 1.5-3.0 kg/year

**Marwari**
· Marwad, Jodhpur, Pali, Nagaur dists of Rajasthan
· Medium sized, resistant to hardy conditions.
· Black faced and the color extends up to lower part of Neck,
· Head covered with black hair
· Ears small, twisted, legs long thin, short tail.
· Both sexes are polled.
· Male: 30-40 kg Fe: 25-35 kg
· Coarse carpet wool avg Yield 1.5-2.5 kg/Y

![Fig. 9.3 Marwari](image)

**Magra**
· Bikaner, Nagaur, Jaisalmer and Churu districts of Rajasthan.
· Medium to large animals
· White face with light brown patches around the eyes
· Skin colour is pink. Ears are small to medium and tubular. Both sexes are polled
Pugal

- Bikaner and Jaisalmer districts of Rajasthan
- Fairly well-built animals
- Black face, with small light brown stripes on either side above the eyes
- Both sexes are polled
Malpura

- Jaipur, Tonk, and adjacent areas of Amjer
- Fairly well-built animals, with long legs. Face light brown
- Ears are short and tubular
- Both sexes are polled
- White fleece, extremely coarse and hairy. Belly and legs are devoid of wool.

![Fig. 9.6 Malpura](image)

**B. Sheep Breeds in the Northwestern Arid and Semi-Arid region**

**Deccani**

- Maharashtra, AP, Karnataka
- Medium sized animals
- Predominantly black or black with white markings
- Rams horned, ewes polled
- Ears are medium long, flat, drooping. Tail is short thin
- Fleece is extremely coarse and hairy
- Belly and legs devoid of wool
Fleece yield is 450gm. Used for blanket manufacture

- Male 38 kg, female 28kg

Fig. 9.7 Deccani

**Nellore**

- Three varieties are distinguished, primarily on the basis of colour: “Palla”, completely white or white with light brown spots on head, neck, back and legs; “Jodip” - white with black spots, particularly around the lips, eyes and lower jaw, but also on belly and legs; and “Dora”, completely brown.

Fig. 9.8 Nellore
• Nellore district and neighboring areas of Prakasham and Ongole districts of Andhra Pradesh
  • Relatively tall animals with little hair & the rams are horned; the ewes are polled
  • The mature ewes average 30-35 kg and a height of 30-34 inches. Mature males average 40-45 kg with a height of 36-40 inches. Lamb birth weight is 2.5 - 3 kg.

**Bellary**
  • Sheep found to the north of the Tungabhadra River are called “Deccani” Bellary district of Karnataka.
  • Medium-sized animals, with body colour ranging from white through various combinations of white and black to black
  • Males are horned; females are generally polled. Ears are medium long, flat and drooping
  • Male – 35kg; female; 27kg

![Fig. 9.9 Bellary](image)

**Mandya/ Bannur/ Bandur**
  • Mandya and Mysore district of karnataka
  • Relatively smaller animals
• Color is white but sometimes face is light brown this may extend up to neck.
• Compact body with typical reversed U shape conformation from rear
• Ears are long, leafy and drooping, often wattles present
• Slightly roman nose. Both sexes polled.
• Coat is extremely coarse & hairy
• Male – 34 kg, female – 27 kg

Fig. 9.10 Mandya / Bannur / Bandur

C. Sheep Breeds in the Northern Temperate Region

Gaddi
  • Kistwar and Bhadarwah Tehsils in Jammu province of Jammu & Kashmir State
  • Medium-sized animals, usually white, although tan, brown and black and mixtures of these are also seen.
  • Males are horned
**Rampur Bushair**

- Simla, Kinnaur, Bilaspur, and Spiti districts of Himachal Pradesh and Dehradun, Rishikesh, Chakrota and Nainital districts of Uttar Pradesh
- Medium-sized animals.
- The fleece colour is predominantly white, with brown, black and tan also seen on the fleece in varying proportions.
- The ears are long and drooping.
- The face line is convex, giving a typical Roman nose.
- The males are horned; females are polled
- Fleece is of medium quality and dense
Kashmir Merino

- This breed originated from crosses of different Merino types (at first Delaine Merinos, and subsequently Rambouillet and Soviet Merinos) with predominantly migratory native sheep breeds, such as Gaddi, Bhakarwal and Poonchi.

![Kashmir Merino](image)

**Fig. 9.13 Kashmir Merino**

D. Exotic Breeds of Sheep

**Merino**

Developed in Spain—Merino (officer named merino). Imported in America in 1801 used to dev American merino. Through selection many strains developed. Medium sized breed. Short head. Body color: white faced sheep white feet. Smaller in size, thin tailed. Wrinkles in the skin is peculiarity. Skin is pink. Head and legs covered with wool

- Ewes generally polled, Rams spiral horns
- Ram-75kg, Ewes-65kg. Fleece yield: 4-5kg per year
- Staple length-5-10cm
- Soviet merino: More grease in fleece,
- Larger skin folds, large quantity of wool on face
- Australian merino: Small skin folds, small quantity wool on face
Rambouillet

Originated from merino in France (Descendent of Spanish merino), larger in size than merino.

- Color: face and leg white, skin is pink.
- Free from skin folds.

Excellent fine wool producer of long staple.

Rams: horned spiral/polled. Ewes polled.
- White hair around eyes and nose
- Ram: 100-125kg, Ewes: 60-90kg
- Fleece yield: 4.5-5.5 kg per year.
- Prolific breeders
- Ewes show good mothering ability.

**Dorset**
- Native of England (Somerset, Dorset countries)
- Medium size, medium size head, polled and horned strains available
- Face, ear, legs white in color free of wool
- Nostril, lip and skin are pink, white hooves
- Superior meat quality. Cross breeding to improve meat quality of Nellore, mandya
- Ram-80-110kg, Ewe-50-80kg

![Fig. 9.15 Dorset](image)

**Suffolk**
- Native to Suffolk in great Britain.
- First and foremost mutton breed
- Cross of Norfolk x Southdown
- Black face, ears and legs black
- Legs short and straight
- Wool absent below knees & hock both Rams Ewes polled.
Carcass is full of lean meat with no waste fat.
- Prolific and best milkers
- Rams: 100-135 Kg, F-70-100
- Staple length: 5-6 Cm
- Wool is white or black

**Corridale**

- Only important dual breed imported to India.
- Native to New Zealand and Australia
- Cross developed from Lincoln & Leicester rams X Merino ewes through interbreeding and selection
- Broad head, large thick ears
- Rugged and heavily fleshed body Short legs white color body with black spots. Generally polled. Prolific and hardy.
- Produces high quality mutton and long wool
- Ram-80-110Kg, Ewes-55-85 kg.
- Annual yield: 4.5-5.5Kg wool,
- Staple length-8-12 cm
Karakul

- Oldest breed. Native of central Asia,
- Named after village Karakul
- Seen in (Afghanistan) Bokkoro(USSR), Iran. Baghdad-Iraq
- Fat tailed. prized for pelt. pelts are taken from young lambs  and have tight curly pattern hair. Relatively coarse fiber used for outer garments and used to make carpets, hand woven rugs, dark colors more prefered.It is a desert animal  that stores fat in the tail for use in lean season. Pelts of karakul are referred as  Persian lamb. males 80-100kg  Fe-45-70kg
- Stand tall with long narrow body, top line highest at lion with sloping towards tail. legs medium .head is long narrow
- Rams horned/polled Ewes-polled .wattles seen at some times
9.1.2 Goat Breeds

A. Goat Breeds in the North Western Arid and Semi - Arid Region

Jamnapari

- Agra, Mathura and Etawa districts in Uttar Pradesh
- Large animals. The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrotmouth appearance. The udder is well developed, round, with large conical teats.
- Average lactation yield (30): 201.96 ± 6.65 kg
- Average lactation length: 255 ± 6.7 days

Barbari

Etah, Agra and Aligarh districts of Uttar Pradesh, and Bharatpur district of Rajasthan.

- Small animals, with compact body
- White with small light brown patches is the most typical
- Both sexes have twisted horns, medium in length and directed upward and backward
- Average lactation yield: 107.120 ± 3.2789 kg
- Lactation length: 150.13 ± 5.247 days
Beetal

- Throughout the States of Punjab and Haryana

- Large animals. Variable coat colour, predominantly black or brown with white spots of differing sizes

- Both sexes have thick, medium-sized horns, carried horizontally with a slight twist directed backward and upward

- Average lactation yield: 177.38 ± 1.46 kg Average lactation length (6, 17): 187.0 ± 3.02 days
Jhakarna

- Jhakrama and a few surrounding villages of Rajasthan
- Large animals. The coat, predominantly black with white spots on ears.

In farmers’ flocks, average daily milk yield: $3.18 \pm 0.17$ kg; lactation length: $114.7 \pm 18.5$ days.

![Fig. 9.22 Jhakrama](image)

Marwari

- Marwar region of Rajasthan
- Medium-sized animals. Predominantly black with long shaggy hair coat
- Beard is present in both sexes. Ears are flat, medium in length and drooping
- Milk. Under farmers’ flock conditions: average daily milk yield: $0.530 \pm 0.32$ kg; lactation length: $196.3 \pm 14.2$ days. Under farm conditions (7): average lactation yield: $91.39 \pm 6.8$ kg; length: $105.80 \pm 14$ days; daily milk yield: $0.713 \pm 0.047$ kg.

![Fig. 9.23 Marwari](image)
Sirohi

- **Distribution.** Sirohi district of Rajasthan
- Compact, medium-sized animals
- Coat colour predominantly brown, with light or dark brown patches
- Both sexes have small horns, curved upward and backward
- **Milk.** Average lactation yield: \( 71.18 \pm 1.55 \text{ kg} \). Length: \( 174.8 \pm 2.75 \text{ days} \) (219).

![Fig. 9.24 Sirohi](image)

Malabari

- Calicut, Cannannore and Malapuram districts of Kerala.
- Medium-sized animals. Coat colour varies widely from completely white to completely black. Both sexes have small, slightly twisted, horns, directed outward and upward. Ears are medium-sized. Udder is small and round, with medium-sized teats.

![Fig. 9.25 Malabari](image)
Osmanabadi

- Latur, Tuljapur and Udgir taluks of Osmanabad district of Maharashtra.
- Tall animals Most males (89.5%) are horned; females may be horned or polled, in almost equal proportions
- The udder is small and round with small teats placed laterally.

![Osmanabadi Goat](image)

Fig. 9.26 Osmanabadi goat

B. Goats Breed in Eastern Region

Bengal

Distributed throughout all eastern and northeastern India, from Bihar through northern Orissa to all West Bengal, Assam, Manipur, Tripura, Arunachal Pradesh and Meghalaya

Colour is Black. Small animals. The hair coat is short and lustrous. The nose line is slightly depressed. Both sexes have small to medium horns. Skins are of excellent quality and are highly prized.

![Bengal Goat](image)

Fig. 9.27 Bengal Goat
C. Goats Breeds in North Temperate Region

**Gaddi**

- Chamba, Kangra of Himachal Pradesh and Dehradun, Nainital and Chamoli hill districts in Uttar Pradesh

- Medium-sized animals. Coat colour is mostly white, but black and brown and combinations of these are also seen. Both sexes have large horns, directed upward and backward and occasionally twisted. Ears are medium long and drooping. The nose line is convex. The udder is small and rounded, with small teats placed laterally. The hair is white, lustrous and long.

![Fig. 9.28 Gaddi goat](image)

**Changthangi**

- Changthang region of Ladakh, at altitudes above 4000 m

- Medium-sized animals. Half of the animals are white, the remainder black, grey or brown. Both sexes have horns, generally large turning outward, upward and inward to form a semi-circle, but a wide variation exists in both shape and size.

![Fig. 9.29 Changthangi](image)
• The pashmina is harvested once a year, generally in June/July, either by shearing or by combing. Average production is 214 g.

Chigu

• Lahaul and Spiti valleys of Himachal Pradesh, and Uttar Kashi, Chamoli, Pithoragarh districts of Uttar Pradesh, bordering Tibet.

• Medium-sized animals. The coat is usually white, mixed with greyish red. Both sexes have horns, directed upward, backward and outward, with one or more twists.

D. Exotic Goat Breeds

Saanen

• Origin. Saanen valley of Switzerland

• Body color white to light cream. Pendulous udder

• Hair short & fine. straight Face, slightly dished with erect ears pointing forward upwards. Generally horn less but occasionally horned.
• Buck wt: 95 kg, Doe: 65 kg Milk yield is 2-5kg/day
• Known as milk queen of goats
• Breed is sensitive to sunlight and performs better in cool climate

Toggen Burg

• Origin: Toggenburg valley in Switzerland
• Oldest known dairy goat breed. Medium size
• Adaptable to the wide range of climates
• Slightly smaller than other breeds
• Color varies from light brown to dark chocolate with white stripes on each side of the face, ear, each side of the tail and front of
• Legs below knee and hock joint.
• Ears are erect carried forward.
• Face may be dished or straight
• Male: 80Kg Fe: 65 kg
• Males having longer hair than
• Female giving it rugged appearance
• AMY: 5.5Kg / day 3-4% fat

Fig. 9.32 Toggen Burg Goat
Alpine

- Originated in Alps France.
- 3 varieties French, British, American
- Usual color is white / black.
- There is no established color. Multicolored
- French alpines are excellent milkers. Horns present
- Other types no horns. British alpine is black in color
- Body weight: 80-85kg Doe: 60kg
- AMY: 3-5lit

Nubian

- Origin: Nubia in NE Africa, also found in Egypt, Ethiopia
- No fixed color, long legged hardy goat with long hairs.
- Gradually disappeared as the dev of Anglo Nubian breed (Nubian of Egypt X Jamunapari). Heaviest & largest breed of Europe
- Robust body, long pendulous ears Roman nose
- Horns if present lie flat over the head
- Legs are long giving better space to udder
- M: 65-80 Doe: 50-60kg AMY: -6-5 lit 4% fat
- Known as Jersey of goat world
Angora

- Angora dist in Asia Minor - Turkey
- White in color, small animals with short legs
- Horns greyish twisted. Tail short erect
- Ears 2” in length, pointed
- Straight back with shoulders and hip are equal height
- Produces a valuable textile fibre – Mohair - white soft silky hair which covers the body and most part of the legs with close matted ringlets.
- Mohair compared to wool is smoother, thin, smooth scaled
- Mohair grows up to 4-10”, shorn twice a year yield - 3kg/year. Used for sweater.
9.2 Housing of Sheep and Goat

The type of housing varies with the production system, the objective of raising sheep and goats and perhaps tradition. Housing can range from very simple structures made of a roof and partial walls to complex structures fitted with automatic feeders and waterers. Animals may be kept either in an area within the family home or in a separate animal shed.

Functions of good housing

- It should buffer the extremes of climatic conditions and provide comfortable micro environment inside the shed to reduce stress on the animals housed.
- It should permit a dry and comfortable surface for the animals to rest and provide sustainable health.
- It should provide desirable working conditions for labour and supervisory staff on the farm.
- It should be integrated with feeding, watering, and manure handling systems.
- It should protect the animals from predators.
- It should be economical.

Location of Sheep Farm

- Located on dry, elevated and well drained place & not exposed to strong hot or cold winds.
- Having plenty of water
- Access to roads
- Electricity facility
- Facilities for marketing animals and meat
- Facilities for working staff

Floor Space Requirements for Different Classes of Sheep and Goats.

Space requirements vary depending on whether animals are kept in individual or group pens. The space requirement also varies with the size of animals, i.e., bigger animals require larger space than smaller ones.
### Space (m²/Animal)

<table>
<thead>
<tr>
<th>Type of housing</th>
<th>Breeding Female</th>
<th>Breeding Male</th>
<th>Young Stock</th>
<th>Additional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent confinement (zero grazing)</td>
<td>1.2</td>
<td>2.0</td>
<td>0.8</td>
<td>Exercise yard, feed trough, watering trough</td>
</tr>
<tr>
<td>Night housing and day time grazing.</td>
<td>0.8</td>
<td>1.5</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

### Floor of the House

- The floor should be sloped, porous or slatted for water drainage. A minimum floor slope of 5% is recommended; that is, for every 1 m there should be a fall of 5 cm.

- Ventilation is good and dung and urine drop through the floor, preventing build-up and reducing risk of disease spreading.

### Walls

In warm climates walls are partially open to allow movement of air through the house. Ventilation is important to remove heat, moisture and pollutants so that animals stay cool, dry and clean.

### Types of Sheds

- Flock shed
- Ram shed
- Lamb shed
- Lambing shed
- Sick animal shed
- Shearing Room:
- Wool storage Room
- Dipping tank
- Foot bath

**Flock Shed:** Housing of ewes kept for breeding purpose
- Measurements: 15 x 4 x 3 m
- Capacity: 60 animals

**Ram Shed:** Rams kept for breeding purpose
- Measurements: 4 x 2.5 x 3 m
- Capacity: 8 animals

**Lamb Shed:** Lambs are housed to keep un-weaned animals and weaned but un-matured animals
- Measurements: 7.5 x 4 x 3
  - un-weaned animals: 5 x 4 m
  - weaned but un-matured animals: 2.5 x 4 m
- Capacity: 75 animals

**Lambing Shed:** Measurements: 1.5 x 1.2 x 3 m
- Capacity: 1 animal

**Sick Animal Shed:** Segregating Sick and Disabled animals
- Measurements: 3 x 2 x 3 m

**Shearing Room:**
- The room should be well lit by having large glass windows all around
- Floor: Cement-paved with smooth surface

**Wool Storage Room:**
- Should have clean smooth floors & walls lined with glazed tiles up to 1.5 m height
- Should be made dust and damp-proof
- Three windows on three sides

**Foot Bath**
- A shallow tank made of cement concrete at the entrance of the farm
The tank is filled with germicidal solution to protect animals from diseases and pests.

**Sheep House Specifications**

- The shed should be located in an elevated and well drained place
- Roof is preferred either thatched or corrugated Asbestos sheet with sufficient slope to drain rain water
- The sheep shed should be constructed N – S length wise to enable the shed dry and clean by entry of sun rays during morning and evening
- Walls may be constructed completely on North and South. A 3’ height wall or a diamond mesh preferably with bamboos on the wall up to the roof level may be laid on East and West
- The height of the shed may be restricted up to 10 ft
- Covered area of the shed: 1600sft (length 80 ft X 20 ft width X 10 ft height) with 5 ft collapsible gate, centrally located
- Feed Troughs Movable RCC feed troughs in the paddock: 10 Nos. Size of each trough: 10 ft Length X 18 inches width X 18 inches depth).
- The feed trough should be located 6"- 9"above the ground level
- Water trough in the paddock: 50 ft length X 4 ft width X 2 ft dept (made up of brick & smooth finished with cement)

### 9.3 Breeding of Sheep and Goat

#### 9.3.1 Traits to consider when selecting breeding stock

**A. Growth**

- ✓ Birth weight
- ✓ Weaning weight (90 day weight)
- ✓ 6-month weight
- ✓ Yearling weight
- ✓ Pre-weaning average daily gain (ADG)
- ✓ Post-weaning ADG
- ✓ Feed efficiency
- ✓ Body conformation
B. Reproduction

✓ Conception rate
✓ Number of lambs born per ewe mated and lambing
✓ Number of lambs weaned per ewe
✓ Lambing percentage
✓ Weaning percentage
✓ Litter size and weight
✓ Fertility or birth problems
✓ Ewe weight at weaning

C. Carcass Yield and Quality

✓ Dressing percentage
✓ Rib-eye (loin-eye) area
✓ Fat thickness over the rib-eye
✓ Lean: bone: fat ratio or %
✓ Carcass conformation and muscling

D. Health

Mortality and morbidity rates
Tolerance or resistance to parasitism
Disease resistance

9.3.2 Selection of Breeding Rams

It is said that “The ram is half of the flock.” This is true because a ram could be mated to several ewes resulting in many offspring at a given time or mating season while a ewe could have at most twins or triplets at any given lambing. To have a successful meat sheep enterprise a producer must use above average rams for breeding. Breeding rams for meat sheep production should have good mutton characteristics. A further consideration in ram selection is that he will determine the quality and growth performance of progeny and the qualities of female lambs kept for replacement ewes.
General Conformation

Good conformation is vital for sheep to achieve maximum efficiency in meat production. A meat sheep with good conformation has:

- A wide, straight back;
- Smooth shoulders;
- Fullness through the heart area;
- A good spring of ribs; and
- A long, well balanced body, with adequate skeletal size.

Fig. 9.36

Check shoulder, back and loin area for covering width of loin area and fleshing over rump. See also if the ram to be selected has bold masculine head with bright eye and correct mouth.

Fig. 9.37

Check spring of rib for firm flesh for body.

Feet and legs

The legs of good looking sheep should be straight and set squarely under the corners of the body. The legs should not be very close at the hocks or very widely apart or bowed. Strong feet and pasterns are essential for proper mounting.

Testicles

There is a direct correlation between testicle size and semen quality. The scrotal circumference measured around the widest point of both testes is a good indicator of healthy scrotal size. Yearling rams should have a scrotal circumference
of at least 25cm. The testicles should also be firm when palpated and of equal size. There should not be any cryptorchidism condition.

### 9.3.3 Selection of Breeding Ewes

Selection of ewes for breeding is also very important. The following characters are important while selecting the ewes.

**Health**

Health in sheep and goats is shown by a general alertness and appearance.

The ewes to be selected must have bright eyes, smooth and shiny hair cover, sound udder and feet.

The sick animals are having dull appearance and paleness of skin and eyelids and separate themselves from the rest of the flock or stand under a tree/hedge. Sick animals may also be coughing, have discharges from the eyes and nose and diarrhea.

**Body Size**

- It is a well known fact that large breeds (mature live weight 70 kg and above) produce lambs that grow faster and consequently reach market weight earlier than the smaller breeds (mature live weight 30 - 45 kg).

**Udder**

- A ewe to be selected for breeding must have a good sized normal udder.
- There should not be abnormalities such as swellings and lumps in the udder. Such abnormalities indicate a previous history of mastitis or other infections.
  - The udder skin should be soft and pliable.
  - The two should be normal, free from injury and not blind.

**Temperament and mothering ability**

- This characteristic is particularly important during lambing time.
- Ewes with good mothering ability will suckle their lambs readily and try to defend their offspring if predators or strangers approach.
  - Poor mothers take little interest in their lambs and sometimes they even abandon them.
Conformation and milking ability

- There is a connection between body conformation, fleshing quality, ability to fatten and milking ability.

- Such analogy also exist in cattle where we have beef breeds that fatten faster, yet the cows produce very little milk compared to dairy breeds such as Holstein Friesian, Jersey or others. However, the mutton breeds such as the Dorper, Hampshire, etc produce enough milk to support their offspring.

9.3.4 Signs of Oestrus

- Bleating continuously
- Swollen – red colored vulva
- Flagging of the tail
- Frequent urination
- Cervical mucus discharge, which causes hairs to stick together
- Restlessness
- Mounting other goats and
- Seeking the buck

The best confirmation of oestrus is when the doe or ewe stands when being mounted. This is commonly called ‘standing heat.’ The duration of oestrus is variable in that it is shorter in younger ewes and does but longer in older animals.

- Normal duration will be 24 to 36 hours.

Oestrus Detection Techniques

- Oestrus in sheep and goats is relatively easy to detect compared to that in cattle as heat signs are well pronounced, particularly in goats. Still, where controlled mating or artificial insemination (AI) is used regular detection of oestrus is necessary through using a teaser ram or buck: Teasers are males that have been either vasectomized or epididymized. When a ram/buck with a marking paint at brisket region mounts a female in oestrus, some of the marking pigment will be transferred to the rump of the female.

- Tying an apron made of leather or canvas around the body of a ram/or buck to prevent the penis from entering the vagina of females.
9.3.5 Mating Systems

- The following types of mating could be practiced depending on the system of production.

**Flock-Mating**

- Fertile rams or bucks are allowed to remain continuously with a group of females. This mating system is commonly practiced in India by Sheppard.
  - This method avoids the need for heat detection but makes recording the mating date, the sire and calculation of the expected date of parturition difficult unless breeding males are identified with marks.
  - Flock mating provides the best result in terms of fertility and lamb/kid crop given an appropriate male-to-female ratio. However, inbreeding and subsequent declines in productivity could occur unless males are rotated or replaced on a predetermined period.
  - Maintaining the correct ratio of fertile rams/bucks and ewes/does i.e. one ram/buck to 20–25 ewes/does or 3 per 100 ewes/does in a year-round mating is important as it can affect the overall reproductive efficiency. The age of the breeding ram/buck, the length of the mating season and the environment in which the animals are kept may influence the ratio.

**Pen-Mating**

- This involves confining a sire with a group of females for mating during the service period.
  - Housing groups of females with a selected breeding ram/buck at night. Continuous supervision is important to make changes of sires if the assigned sire does not perform well.
  - Identification of the sires enables calculation of the estimated date of lambing/kidding.

**Hand-Mating**

- This involves detecting females in oestrus and bringing them to breeding males.
  - In this system, regular and efficient heat detection methods are essential.
  - The PM–AM method of breeding is used, where females detected in estrus in the afternoon are bred early the next morning and those detected in estrus in the morning are bred in the afternoon of the same day.
In terms of fertility, this method is the least efficient as the male is restricted in breeding the female.

This system is useful for small holders who have few female sheep or goats but no breeding male. One sire kept by an individual will serve sheep or goats of many surrounding owners who bring ewes/does in estrus to the male.

**Artificial Insemination (AI)**

- Artificial insemination is a technique in which semen is collected from a ram or buck and put into the reproductive tract of a ewe/ Doe.
- The standard procedure of inseminating does involves lifting up of their rear quarters with their front legs remaining on the ground. With the aid of speculum and pen light the cervical opening or ‘os’ is located and, under visual control, an insemination pipette is passed into or through the cervix for semen deposition.

### 9.4 Management of Different Classes of Sheep and Goat

#### 9.4.1 Management of Ewes

**Flushing**

- Flushing is the practice of providing a high energy/protein diet prior to and during mating. The duration most commonly used is 2 to 3 weeks before and after mating.
  - The impact of this practice is evident on thin ewes and does.
  - Flushed ewes/does respond to the increased level of nutrient intake by increased ovulation rate which leads to improved prolificacy.
  - This practice is particularly useful when pasture quality and availability limits nutrient intake and digestibility.
  - Daily feeding of 250g of concentrate/grains during breeding season take care of the flushing in ewes

**Other Practices**

- Screen the ewe/ Doe flock and cull ewes/does with bad udders and any other physical deformities.
  - Ewes/does with a history of poor mothering ability, low milk production or had lambing/kidding difficulties would be strong candidates for culling.
Lambing/kidding season is one of the factors that affect the survival of lambs/kids, it is advisable to consider adjusting the breeding/mating time so that lambing/kidding could occur at a favorable time for survival.

**Care and Management of Pregnant Ewes/Does**

- Ewes/does must have enough body reserves at lambing/kidding to produce lambs/kids with adequate birth weight and produce sufficient colostrum and maintain milk yield in early lactation.

- Most fetal growth, along with mammary gland development, occurs during the last third of gestation. Appropriate nutrition is very important during this time.

- Ewes/does should be consuming about 3% of their bodyweight daily in total dry matter feed intake of feedstuffs that contain 55 to 60% TDN. Sufficient protein intake (11 – 12% crude protein in the diet) is also necessary for proper fetal growth and udder development.

- Insufficient feed intake, particularly energy, will result in thin ewes/does that have weak lambs/kid and produce inadequate colostrum, have reduced milk production throughout lactation and thus increased lamb/kid mortality.

- Clean, fresh water should be available for *ad libitum* consumption.

- All ewes/does should be routinely vaccinated against endemic diseases like clostridiosis, pasteurellosis etc.

- Ewes/does should be dewormed 3 to 4 weeks before lambing/kidding so that lambs/kids are born into an environment with low parasite challenge.

**Lambing / Kidding management**

In lambs/kids, most deaths occur in the neonatal period. Causes include starvation, lambing injuries, infectious conditions and difficult birth, among others.

The dam should give birth in a clean environment either on a well-rotated pasture or stall bedded with straw or other absorbent material.

The first thing to check at the birth of a lamb is cleaning off excess mucus in the nasal passages.

Disinfect the navel by dipping the cord in a solution of 7% tincture of iodine to prevent entry of disease causing organisms.

Making sure that the lamb/kid consumes enough colostrum of about 10% of their body weight or 60 milliliter per kilogram of body weight within 24 hours.
One of the most important functions of colostrum (first milk) is to provide lambs/kids with immunoglobulins that provide immunity for the first couple of months of life. Colostrum is also a highly concentrated source of energy, acts as a laxative and is an essential feed within 6 hours of birth.

Colostrum enables the newborn to follow its mother and protects it from over cooling (chilling) which is the single most important cause of death. Moreover, allowing the lamb/kid to suckle colostrum is an important part of the maternal bonding process.

Care and Management of Nursing/Lactating Ewes and Does

- Ewes and does have a great capacity to mobilize energy reserves for milk production, especially in early lactation.
- The quality of feed offered and particularly that of roughage is important. Daily feeding of 800g of good quality hay/400g good quality concentrate is required apart from regular grazing.
- Ewes and does nursing twins or triplets need special attention. They need to be fed extra quantities of good quality hay and concentrate to meet the high requirements during early lactation.
- There is also a need to provide plenty of clean, fresh drinking water.

9.4.2 Management of Newborn Animals (Lambs and Kids)

Birth to Weaning

- Proper feeding and care of the dams during the last trimester of gestation is necessary to have healthy, vigorous offspring.
- Lambs/kids with birth weight within the normal range for the breed can be raised without much difficulty. Lambs/kids with low birth weight or are weak at birth need special attention. Very low or very high birth weights (related to dystocia or difficult births) are detrimental to lamb survival.
- Immediately after birth, the umbilical cord should be trimmed if needed using clean scissors and then dipped in tincture of iodine. The recommended concentration is 7% tincture of iodine. As much as possible, protect newborn lambs/kids from cold, rain and wind.
- In order to ensure the establishment of firm dam-offspring relationships, the dams and their offspring should be confined together soon after birth or stay around the homestead for at least 4 days.
• The lamb/kid may need to be warmed with a heat source or with a hot
water bath or warming box, particularly if body temperature is below 37.8°C.

• If lambs appear thin and weak, check the ewe to see if she is milking.
Check for a mastitis problem, whether the teats are open, and/or if she has
claimed the lamb.

• Hand-feed the lamb with colostrum or milk replacer (if available) if any
one of these problems is observed.

• Intake of colostrum, the “first milk”, is crucial for successful rearing of
lambs/kids.

• Colostrum contains a high level of nutrients important for lamb health
and performance.

• Colostrum also contains a high level of antibodies against a variety of
infectious agents. At birth, the lamb/kid does not carry any antibodies because
antibodies in the ewe’s bloodstream do not cross the placenta. Colostrum imparts
passive immunity. Colostrum has to be fed during the first 24 hours; feeding
colostrum later than this period confers little or no advantage. This is because
the intestinal wall of the newborn is only permeable to antibodies (large protein
molecules) during the first 24 to 36 hours and absorption is most efficient during
this period. If the ewe/doe has inadequate colostrum, cow colostrum can be
given.

• Newborn lambs/kids are pre-ruminant animals in the early stage of
development. It will take some time (usually 6–8 weeks) for the rumen to develop.
When concentrate feed or hay is offered, consumption starts at about 2–3 weeks
of age. Access to quality roughage feed or concentrate is essential as it stimulates
eye’s bloodstrea nt of the rumen. It is recommended that forage be chopped and
given to kids, and when possible concentrate feed should be offered but not in
a dry form.

• Growth of the young, particularly during the first weeks of life, is entirely
dependent on milk of their mothers. For this reason, it is important to ensure that
dams produce adequate milk. The health and structure of the udder should be
examined.

• If lambs/kids aren’t being cared for by their mother or are not receiving
an adequate amount of milk, they may become orphan lambs. The sooner this is
detected the higher the chance of survival. Grafting is defined as giving a lamb/
kid to another ewe/doe. Always graft the stronger lamb, as the problem ewe/
doe will normally take care of the smaller one.
Weaning

- Lambs/kids are weaned naturally without attendant/shepherd intervention. Where intervention is made, weight development of the young rather than age should be used as a guide to weaning.

- Weaning should ideally take place when lambs/kids are consuming adequate amounts of solid feed. Milk consumption by lambs and kids falls to a negligible level after 110 days. At the same time, consumption of herbage increases.

- Young could be weaned successfully once the birth weight has increased 2.5-fold. This would mean a lamb with birth weight of 3 kg can be weaned at 7.5 kg body weight, which is attained at 2 to 3 months of age. However, in most production systems in the tropics, weaning at 120 days is common.

9.4.3 Care of the Breeding Ram

- Proper nutrition of rams during this period is important to maintain proper body condition.

- They will need to consume 2 to 2.5% of their body weight daily in feedstuffs that are 55 to 58% TDN.

- Good quality forages either as pasture or hay along with 250g of concentrate feed will generally suffice.

- Rams should also have a mineral and vitamin mix manufactured specifically for sheep available.

- Water is very important in maintaining rams and should not be overlooked.

- For ram lambs that have poor the nutrient needs become higher. A good quality grain mix, that has adequate calcium and protein should be fed at a rate equal to 2 to 2.5% of their body weight daily plus free choice good quality hay or pasture

- Internal and external parasite control program, proper vaccinations, hoof maintenance, an annual shearing, and proper feed and water. Also, periodic evaluation of body condition, health and physical soundness exams should be done.

- Many factors influence the breeding capacity of rams, including age, breed, nutrition, management, and environment.

- Ram lambs are capable of breeding 15 to 25 ewes during their first breeding season.
• Ram lambs should be observed closely to monitor their breeding behavior and libido to ensure they are servicing and settling ewes.

• The use of a marking harness, rotating colors every 17 days, is an excellent management tool for this purpose. The breeding season should be kept to a maximum of 60 days for young rams. This will prevent over-use, severe weight loss and reduced libido.

• Severe weight loss may impair future growth and development of the young ram, and reduce his lifetime usefulness. Supplementing ram lambs with grain during the breeding season will reduce excessive weight loss.

9.4.4 Routine operations in sheep and goat farms

The study of farm routines enables proper scheduling of various farm activities on a sheep and goat farm. It also aids in the optimum utilization of labour and resources, and higher returns through efficient management practices.

Daily Schedule of Activities on a Sheep / Goat Farm

<table>
<thead>
<tr>
<th>Approx. time</th>
<th>Farm Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0700</td>
<td>1. Turning out the animals for grazing. This can be delayed during the winter months.</td>
</tr>
<tr>
<td></td>
<td>2. Observe and isolate sick animals.</td>
</tr>
<tr>
<td>0800</td>
<td>1. Feed half of the daily concentrate ration to nursing females and fattening lambs/kids</td>
</tr>
<tr>
<td></td>
<td>2. Watering of the animals on the grazing lands</td>
</tr>
<tr>
<td>0830</td>
<td>1. Feed chopped green and dry fodder to penned sheep/goats</td>
</tr>
<tr>
<td></td>
<td>2. Cleaning of all the sheds and disposal of manure.</td>
</tr>
<tr>
<td>0900-1500</td>
<td>Special activities like record keeping, weighing and marketing of lambs and kids, shearing, vaccination and preventive health care, disbudding, grading, sorting, storage and marketing of wool etc.</td>
</tr>
<tr>
<td>1600</td>
<td>1. Return of sheep and goats to their pens</td>
</tr>
<tr>
<td></td>
<td>2. Feeding the other half of the daily concentrate ration to nursing females and fattening lambs/ kids</td>
</tr>
<tr>
<td></td>
<td>3. Feeding chopped green and dry fodder to all the animals</td>
</tr>
</tbody>
</table>
Note: On a goat farm, the milch does should be milked twice a day at convenient timings.

**Monthly Schedule of Sheep Farm Operations**

The monthly schedule of various sheep farm operations with twice a year lambing or shearing pattern under semi-arid conditions on an organized farm is given below.

<table>
<thead>
<tr>
<th>Month</th>
<th>Farm Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>Stock verification, protection against cold weather; care, management and supplementary feeding of advanced pregnant ewes; preparation of lambing pens, care at lambing, docking, identification of newborn lambs; supplementary feeding of breeding rams for spring mating; vaccination against clostridial infections.</td>
</tr>
<tr>
<td>February</td>
<td>Lambing continues, care and supplementary feeding of lactating ewes; creep feeding, ear-tagging, tail docking and growth recording of lambs; flushing of breeding ewes for spring mating, tupping (in later part of February), vaccination against sheep pox.</td>
</tr>
<tr>
<td>March</td>
<td>Lambing continues, care and supplementary feeding of lactating ewes; creep feeding, ear-tagging, tail docking and growth recording of lambs; washing of sheep, wool sampling, shearing, dipping, vaccination against sheep pox.</td>
</tr>
<tr>
<td>April</td>
<td>Wool sampling, shearing and dipping continues, creep feeding, growth recording and weaning of lambs; culling of old, infertile and weak animals; deworming, vaccination against FMD.</td>
</tr>
<tr>
<td>May</td>
<td>Weaning and supplementary feeding of lambs, drenching of weaners, grazing during cooler hours, tree lopping, proper shelter and adequate drinking water.</td>
</tr>
<tr>
<td>June</td>
<td>Care, management and supplementary feeding of advanced pregnant ewes; supplementary feeding, culling of undesired ram lambs, preparation of lambing pens, vaccination against tetanus, ET &amp; HS.</td>
</tr>
</tbody>
</table>
### 9.5 Health Management of Sheep and Goat

#### 9.5.1 Spotting of sick animals

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameter</th>
<th>Healthy Animal</th>
<th>Sick Animal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Sheep</td>
<td>Goat</td>
</tr>
<tr>
<td>1.</td>
<td>Look for animal</td>
<td>Alert</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Head</td>
<td>Raised</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Eyes</td>
<td>Wide open, bright</td>
<td>Dull with white deposition at the corners.</td>
</tr>
<tr>
<td>4.</td>
<td>Conjunctival m.m</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Nose</td>
<td>No Discharge</td>
<td>Slimy discharge</td>
</tr>
<tr>
<td>6.</td>
<td>Movement</td>
<td>Active</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Response</td>
<td>Quick</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Feces</td>
<td>Normal</td>
<td></td>
</tr>
</tbody>
</table>
9.5.2 Non-Infectious Diseases

Approximately 80% of deaths in lambs have been estimated due to non-infectious causes. Starvation, primarily from mismothering and behaviour, nutritional and environmental stress, reproductive problems and predation are the major causes reported.

**Pneumonia**

It is one of the most common and important pathological conditions in sheep. It is characterized clinically by increased respiration, coughing and abdominal breathing. A toll of 20-40% of the mortality has been reported at organized sheep farms due to pneumonia of bacterial or viral origin. Another type of pneumonia is “aspiration” or “drenching” pneumonia caused to wrong and forceful drenching operations. If some fluid has erroneously entered the animal’s respiratory tract, its head should be lowered immediately and slapped a few times.

**Ruminal tympany (bloat)**

It is the over-distension of the left flank either due to free gas or froth. This is generally encountered in “greedy feeders” when lush green pasture is available. Tying a bitter (eg. neem) stick in the mouth as a bit to increase secretion of saliva is the most practical and can be done immediately. Oral administration of sweet oil with turpentine oil or at times with formalin is advised.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameter</th>
<th>Healthy Animal</th>
<th>Sick Animal</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>Pulse (/min)</td>
<td>70-90</td>
<td>70-90</td>
</tr>
<tr>
<td>10.</td>
<td>Body Temperature</td>
<td>102.4</td>
<td>103.8</td>
</tr>
<tr>
<td>11.</td>
<td>Respiration (/min)</td>
<td>12-30</td>
<td>12-30</td>
</tr>
<tr>
<td>12.</td>
<td>Grazing</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Rumination</td>
<td>Regular</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Feed and water intake</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Udder</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Skin</td>
<td>Healthy</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Deficiency Diseases

1. Copper and Cobalt: Characterized by anorexia and wasting. Growth and wool production are severely retarded. Wool may be tender or broken. Fine wool becomes limp and glossy and loses crimp, developing straight, steely appearance. Anemia, diarrhoea and unthriftiness occur in extreme cases. Copper or cobalt sulphate treatment causes rapid disappearance of the symptoms.

2. Calcium, Phosphorous & Vit. D: The daily requirement of Ca, P & Vit. D for an adult sheep is about 2.5 gm, 1.5 gm and 300-500 units, respectively. Deficiency may result in rickets in lambs and osteomalacia in adults. Mineral supplementation in diet is essential to prevent this deficiency.

3. Vitamin A: Vit. A deficiency occurs in sheep on dry countryside during periods of drought. Symptoms include night blindness, corneal keratinization, ptyriasis, hoof defects, loss of weight and infertility. Congenital defects are common in the offspring of deficient dams. Animals should have access to green pasture and should be supplied with Vit. A in feed to prevent deficiency.

Pregnancy Toxaemia (ketosis)

It is a highly fatal disease caused due to a decline in the plane of nutrition and short periods of starvation (40 hrs) during the last two months of pregnancy. Hypoglycaemia and hyperketonemia are the primary metabolic disturbances. It is primarily a disease of intensive farming systems. Symptoms include separation from the flock, apparent blindness, constipation, grinding of teeth, drowsiness, tremors of the head, twitching of lips, in-coordination, ketonic breath, leading to coma and death. Treatment comprises intravenous administration of 50% glucose. Supply of molasses in the ration and provision of additional concentrate in the last two months of pregnancy helps prevent the condition.

9.5.3 Infectious Diseases

Black Leg

It is an acute, infectious disease caused by *Clostridium chauvoei* and characterized by inflammation of muscles, severe toxaemia and high mortality (approaching 100%). All age groups are susceptible. Increased protein feeding of sheep increases their susceptibility. The spores are highly resistant to the environment and the portal of entry is through the alimentary mucosa. Infection in sheep generally takes place through skin wounds following shearing and docking. Symptoms include high fever, anorexia, discoloration of skin, crepitation and depression. Penicillin is the drug of choice for treatment.
Enterotoxaemia (pulpy Kidney)

It is an acute disease of sheep of all ages, but primarily of lambs. It affects animals in a high state of nutrition on a lush feed, grass or grain. Morbidity rates seldom exceed 10% but mortality rate approximates 100%. It is caused by *Clostridium perfringens* type D which normally inhabits the alimentary tract of sheep. Under certain conditions, the organism proliferated rapidly in the intestines and produces lethal quantity of toxin. In lambs, the course of illness is very short, often less than 2 hours and never more than 12 hours, and many are found dead without manifesting early signs. Symptoms include green, pasty diarrhea, staggering, recumbency, opisthotonus, and acute, clonic convulsions with frothing at the mouth. A history of sudden death of several big lambs justifies a tentative diagnosis of enterotoxaemia. Suphadimidine may be effective for treatment. Two major control measures include reduction in the feed intake and vaccination. Infection with *Cl. Perfringens* type B (lamb dysentery) and type C (struck, hemorrhagic enterotoxaemia) result in severe enteritis with diarrhea and dysentery in lambs.

Tetanus

It is an acute, infectious disease manifested by tonic convulsions of the voluntary muscles. In sheep, it commonly follows routine operations such as shearing, docking, castration and even vaccination. *Clostridium tetani* form spores which are capable of persisting in soil for a number of years. The portal of entry is usually through deep, puncture wounds. Symptoms include stiffness of limbs, lock jaw, opisthotonus, followed by death due to asphyxiation. Tetanus antitoxin is usually administered but is of little value when the signs have appeared.

Pasteurellosis

It is primarily caused by *Pasteurella haemolytica* in sheep and usually occurs in pneumonic form, although a septicaemic form is not uncommon in lambs. Morbidity and mortality rates may be as high as 40%. Transmission occurs by the inhalation or ingestion of the infected material. Symptoms include pyrexia, mucopurulent discharge from the eyes and nose, coughing, depression and anorexia. Preventive vaccination is recommended, after which the animals should not be sent out for grazing for 2–3 days.

Sheep Pox

It is a highly contagious viral disease characterized by development of vesicles and pustules on the skin and internal lesions. Spread may be by contact with infected animals and contaminated articles, or by inhalation. It often causes
death in 50% of affected animals. Infection of the pustules by secondary organisms may cause pyrexia and other complications. The course of the disease is 3-4 weeks, during which time the sheep becomes emaciated and may shed their wool. Vaccination is the best control.

Foot and Mouth Disease

It is an extremely contagious, acute viral disease characterized by development of vesicles in the oral cavity and in the interdigital space. Mortality is usually low (3%), but the economic loss is chiefly due to the loss in condition of the affected animal. Transmission is by contact with the diseased animal and incubation period is less than 24 hrs. Antibiotics are recommended to check secondary infections. Vaccination is the best control.

Blue Tongue

It is an infectious but non-contagious, exotic disease of sheep. Natural transmission takes place through insect vectors viz. Culicoides and Aedes species, and sheep ked Melephagus ovinus. Incubation period is less than a week. Pyrexia upto 106°F is the common initial symptom. The disease has three clinical forms: abortive, acute and sub-acute. The abortive form mostly goes unnoticed. In the acute form, there is fever lasting for 5-6 days with nasal discharge, frothing, marked salivation, highly congested and cyanotic nasal and oral mucosa, epithelial excoriation in the oral cavity and purplish discolouration of the interdigital space, paterns and coronets. Symptoms are less severe in the sub-acute form. Morbidity rate may be 50% or more whereas mortality rates vary widely. Antibiotics are recommended to check secondary infections.

9.5.4 Disease Control

Disease control is the reduction in the incidence of disease and the number of deaths in a flock.

- Disease control can be achieved by treating diseased animals and by preventing disease through proper herd management practices.

9.5.4.1 Strategies of Disease Control

Quarantine

- Isolation of animals that are either infected or suspected of being infected with a disease or diseases.
Non-infected animals that are at risk of getting a disease may also be quarantined.

A quarantine period is also used to isolate new animals before allowing them to mix with a flock. A quarantine period is a minimum of 3 weeks.

**Bio-Security**

Biosecurity is the prevention of disease-causing agents from entering or leaving any place where animals are present.

It involves a number of measures and protocols designed to safeguard producers, animals and the livestock industry from disease outbreaks.

Isolate new animals from the flock or stock returning from the market or other places.

Do not bring infection onto your farm, or spread it around your farm through clothes, footwear or hands.

Where possible, limit and control farm visitors.

Do not allow contact with neighboring animals, such as through fences.

Do not share injecting and dosing equipment with other producers.

If necessary, cleanse and disinfect all equipment thoroughly.

Dispose of dead animals properly.

Use separate equipment and personnel for isolated animals.

Keep the isolation barn as near as possible to the farm entrance and separate it from other pens or barns by at least 3 meters.

Dispose of bedding properly so that other livestock do not have access to it.

**Deworming**

Elimination of internal parasites is called deworming. The following is the deworming schedule in calves.

<table>
<thead>
<tr>
<th>Month</th>
<th>Deworming drug</th>
<th>Dose/kg body weight</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>Oxyclozanide</td>
<td>5 mg</td>
<td>Liverflukes</td>
</tr>
<tr>
<td>April</td>
<td>Albendazole</td>
<td>10 mg</td>
<td>Round worms</td>
</tr>
<tr>
<td>July</td>
<td>Fenbendazole</td>
<td>5 mg</td>
<td>Round worms</td>
</tr>
<tr>
<td>October</td>
<td>Albendazole</td>
<td>10 mg</td>
<td>Round worms</td>
</tr>
</tbody>
</table>
Vaccination

Vaccines are used routinely to prevent disease. A vaccine is a suspension prepared in a laboratory from the cause of the disease. When injected into an animal, the animal produces immunity to that disease, which protects the animal from that specific disease. Vaccines are of two types, dead and living vaccines. Always exactly follow the instructions given for the storage and use of vaccines. Most vaccines are injected under the skin. Always use sterile syringes and needles for vaccination. Always give the correct dose by the correct route.

Vaccination schedule for sheep

<table>
<thead>
<tr>
<th>Disease</th>
<th>Age and booster doses</th>
<th>Route</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot and mouth disease</td>
<td>6-8 weeks; repeat every 6-9 months</td>
<td>s/c or i/m depending on the vaccine</td>
<td></td>
</tr>
<tr>
<td>Hemorrhagic Septicaemia</td>
<td>3-4 months; repeat annually</td>
<td>1 ml s/c</td>
<td>May/ June</td>
</tr>
<tr>
<td>Sheep pox</td>
<td>3 months</td>
<td>s/c</td>
<td></td>
</tr>
<tr>
<td>Tetanus</td>
<td>Tetanus toxoid</td>
<td>0.5 - 1 ml s/c or i/m</td>
<td></td>
</tr>
<tr>
<td>Anthrax</td>
<td>4-6 months; repeat annually</td>
<td>0.5 ml s/c at tail fold</td>
<td>In endemic areas only</td>
</tr>
<tr>
<td>Enterotoxaemia</td>
<td>3-4 months, repeat after 15 days and then annually.</td>
<td>2.5 ml s/c</td>
<td>First two doses before august</td>
</tr>
</tbody>
</table>
Vaccination schedule for goats:

<table>
<thead>
<tr>
<th>Disease</th>
<th>Age and booster doses</th>
<th>Route</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot and mouth disease</td>
<td>6-8 weeks, repeat every 6-9 months</td>
<td>s/c or i/m depending on</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>the vaccine</td>
<td></td>
</tr>
<tr>
<td>Enterotoxaemia</td>
<td>3-4 months, repeat after 15 days and then</td>
<td>2.5 ml s/c</td>
<td>First two doses before August</td>
</tr>
<tr>
<td></td>
<td>annually</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>3-4 months, repeat annually</td>
<td>1 ml s/c</td>
<td>May/June</td>
</tr>
<tr>
<td>Anthrax</td>
<td>4-6 months, repeat annually</td>
<td>0.5 ml s/c at tail fold</td>
<td>In endemic areas only</td>
</tr>
<tr>
<td>Tetanus</td>
<td>3-4 months, repeat at 6 months and then</td>
<td>0.5 - 1 ml s/c or i/m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>annually</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**9.6 Summary**

India blessed with different breeds of sheep and goat which were discussed. Various important exotic breeds of sheep and goat also discussed. The importance of housing and various sheds required for different classes of sheep and goat were discussed. The breeding management of the sheep and goat was explained. The feeding and management of the different classes of sheep and goat was discussed. Health management and vaccination schedule of the sheep and goat was discussed.

**Short Answer Type Questions**

1. Explain about Nellore breed of sheep
2. List out important exotic breed of the sheep and goat
3. How do you detect oestrus in sheep and goat?
4. Explain various mating systems in sheep and goat
5. Explain about creep feeding of the lambs
6. List out the common infectious diseases of sheep and goat
Long Answer Type Questions

1. Explain various indigenous breeds of sheep
2. Explain various indigenous breeds of goat
3. Write about exotic dairy goats
4. Explain various exotic breeds of sheep
5. How do you plan the housing for sheep and goat?
6. Explain about the breeding management of the sheep and goat
7. Write about feeding management of the different classes of sheep and goat
8. Explain about various infectious diseases of sheep and goat.