Chapter 3

Milk Production

Objective: *To acquaint with important dairy breeds, body parts, breeding systems, and selection and judging of dairy animals.*

Introduction

Dairy cattle are cattle cows (adult females) bred for the ability to produce large quantities of milk, from which dairy products are made. According to National Livestock census 2007, there are 199 million cows in India. As per recent survey by National Bureau of Animal Genetic Resources, Karnal, there are 37 distinct breeds of cow in India which constitute 18% of Indian cow. Rest 82% are categorized as "Non descript" or Local deshi cow.

Dairy Breeds of Cattle

Most important dairy breeds of cow in India are Sahiwal, Red Sindhi, Gir and Tharparkar. Among crossbred, important dairy breeds are Karan Fries and Karan Swiss. Among exotic breeds, Holstein Friesen, Jersey and Brown Swiss are most important dairy breeds

The detailed description of some of the most important dairy breeds of cow is given below

Sahiwal

- Sahiwal is considered as one of the best dairy breed in India. It has been originated from Montgomery district of Pakistan.
- This breed is mainly found in Haryana,Punjab,U.P.,Delhi,Bihar and M.P.
- Sahiwal is comparatively a heavy breed with symmetrical body and loose skin. It is having short legs, stumpy horns and broad head. It also possess voluminous dewlap and pendulous sheath. It closely resembles Red Sindhi.
- The distinguishing feature between Sahiwal and Red sindhi is the Muzzle which is dark coloured in Red Sindhi while light coloured in Sahiwal. Sahiwal has whitish ring along the eyes.
- Body colour of Sahiwal is reddish dunn or pale red.
- The milk yield ranges from 1500 to 2500 kg per lactation
- The age at first calving ranges from 37 to 48 months and the calving interval is from 430 to 580 days

Sahiwal

Red Sindhi

- Home tract of this breed is Karanchi district of Pakistan. It is mainly found in Pu njab,Haryana,Tamilnadu,Karnataka,Kerala and Orissa.
- They are medium sized compact animals having well proportioned body and thick horns along with heavy hump,dewlap, sheath and pendulous udder.
- Body colour of Red sindhi cow is Red with the sheds varying from Dark red to light red.
- The milk yield ranges from 1300 to 1800 kg per lactation
- The age at first calving ranges from 39 to 50 months and the calving interval is from 425 to 540 days

Red Sindhi
(Courtsey : agritech.tnau.ac.in)

Tharparkar

- The home tract of this breed is in the Tharparkar district of southeast Sindh in Pakistan.
- Tharparkar cow is mainly found in Jodhpur, Cutch and Jaisalmer district of Rajasthan and also in some parts of Gujarat
- Animals are white or grey in colour.
- Forehead is broad and flat and slightly convex above eyes. Ears are long, broad and pendulous. Body size is medium. Udders are well developed.

- The milk yield ranges from 1800 to 2500 kg per lactation.
- The age at first calving ranges from 38 to 42 months and the calving interval is from 430 to 460 days

Tharparkar

Gir

- This breed has probably originated in Gir forest of south Kathiawar.
- They are mainly found in Junagarh (Gujarat) and also in Maharastra and Rajasthan.
- It is a moderate to large size breed. Animals have convex forehead and long face.
- Their ears are very long and pendulous, resembling a curled up leaf.
- The body colour is shining red to spotted white. Skin is soft, thin, and glossy.
- The milk yield ranges from 1200 to 1800 kg per lactation
- The age at first calving ranges from 45 to 60 months and the calving interval is from 430 to 490 days

Gir

(Courtsey : mgdas.com)

Exotic Dairy Breed

Holstein Friesen

- Holstein-Friesians breed is known as the world's highest milk producing dairy cattle breed.
- This breed has been originated from Holland
- They are large, black-and-white marked animals.
- The average milk yield is about 6150 kg per lactation.

Holstein Friesens

(Courtsey : www.britannica.com)

Jersey

- This breed has been originated from Island of Jersey in English channel.
- This breed is fawn coloured with or without white marking.
- The average milk yield is about 4000 kg per lactation.

Jersey

(Courtsey : www.megamedianews.in)

Brown Swiss

- This breed has been originated from Switzerland
- They are distinctly brown in colour.
- The average milk yield is about 5000 kg per lactation

Brown Swiss

(Courtsey : britannica.com)

Crossbred Dairy Cows

Karan Fries

- This breed has been evolved by crossing Tharparkar cow with Holstein Friesian bull semen at National dairy Research Institute, Karnal, Haryana
- This breed carries black and white patches and sometimes is completely dark with white patches on the forehead.
- The average milk yield is about 3700 kg per lactation.
- The age at first calving ranges from 30 to 32 months and the calving interval is from 400 to 430 days

Karan Fries cow

Karan Swiss

- This breed has been evolved by crossing Sahiwal cow with Brown swiss bull semen at National dairy Research Institute, Karnal, Haryana

Karan swiss

- The colour of this breed varies from light grey to deep brown.
- The average milk yield is about 3615 kg per lactation.
- The age at first calving ranges from 30 to 34 months and the calving interval is from 400 to 420 days

Dairy Breeds of Buffalo

Buffalo is one of the most important domestic ruminants centered mostly in tropical and subtropical regions of the world. The buffalo species originated in India.There are two types of buffaloes in world, Riverine buffalo and Swamp buffalo. Both are called as *Bubalus bubalis*. Riverine buffaloes are mainly present in Indian subcontinents and mediterranean region of Europe, and they are maintained primarily for milk. Buffaloes in south east asia and china are swamp type and well known for draught power. India is home tract for some of the best breeds of buffalo. The buffalo is the main milk producing animal in India contributing about 57% of total milk production of country.

According to a recent survey by National Bureau of Animal Genetic Resources, Karnal, There are 13 recognized breeds of buffalo in India. Important dairy breeds of buffaloes are Murrah, Niliravi, Jaffrabadi, Surti, Bhadawari, Mehsana etc.

Some of the most important dairy breeds of buffaloes are described below

Murrah

- Murrah is considered as best milch breed of buffalo.
- Breeding tract of Murrah buffalo is Hisar, Jind & Rohtak in Haryana and, Patiala and Nabha districts of Punjab. This breed is also called as 'Pride of Haryana' and 'Black gold'.
- Murrah has a massive body and comparatively long head and neck. It has short and typically tightly curved horns. It has well developed udder, broad hips, drooping fore and hindquarters and long tail reaching up to fetlock. The colour is usually jet black.
- The bullocks are good draught animals.
- The average milk yield per lactation is 1500 to 2500 kg with a milk fat content of 7 percent.

- The age at first calving ranges from 40—50 months. The inter-calving period is 450—500 days

Murrah

Nili Ravi

- Home tract of Nili Ravi is Sutlej valley in Ferozpur district of Punjab and Montgomery district of Pakistan.
- This breed is having elongated head, bulging at top and depressed between eyes. The horns are small and tightly coiled. The neck is coiled and thin. The udder is well developed.
- The colour of this breed is black with white markings on forehead, face and legs

Nili Ravi

(Courtsey : agtr.ilri.cgiar.org)

- The average milk yield per lactation is 1500 to 1900 kg.
- The age at first calving ranges from 45—50 months. The inter-calving period is 500—550 days.

Surti

- Home tract of this breed is Kaira and Baroda districts of Gujarat.
- The body is medium sized with elongated head and prominent eyes. The horns are sickle shaped, long and flat. The back is straight and tail is fairly long.
- The colour of breed is black or brown. Surti is typically having two white collar, one around the jaw and other at the brisket.
- The average milk yield per lactation is 900 to 1300 kg with a very high milk fat content (8—12%).
- The age at first calving ranges from 40—50 months. The inter-calving period is 400 to 500 days.

Surti

(Courtsey : dahd.nic.in)

Jaffarabadi

- Home tract of this breed is Kutch and Jamnagar districts of Gujarat
- This breed has long body, massive head and neck, prominent forehead, loose dewlap and well developed udder. The horns are heavy, inclined to droop at each side of the neck and then turns up.
- The colour is usually black.
- The average milk yield per lactation is 900 to 1300 kg.

Jaffarabadi

Bhadawari

- This breed is found in Bhadawari tehsil of Agra district and Etawah district of Uttar Pradesh and Gwalior district of Madhya Pradesh.
- This breed is having medium sized body, comparatively small head and short legs. The tail is long with black and white marking. Body is typically light or copper coloured.
- The average milk yield per lactation is 800 to 1000 kg.

Mehsana

- Home tract of this breed is Mehsana, Sabarkanda and Banaskanda district of Gujarat.
- This breed has long body and head. The horns are long and less curved. Udder is well developed.
- The colour is usually black to grey with white marking on face, legs and tail tips.
- The average milk yield per lactation is 1200 to 1500 kg.
- The inter-calving period is 450 to 550 days.

Mehsana

Dairy Breeds of Goat

Goats are versatile animals and known as 'Poor man's cow'. They are multipurpose animals, producing milk, meat, skin and hair. Goat was first ruminant to be domesticated sometime before 7000 BC at Zagros mountains on the boarders of Iran and Iraq. There are as many as 23 well defined breeds of Goats in India. According to 2007 livestock census, there are 145 million goats in India.

Most important dairy breeds of goat are Jamunapari, Beetle, Jhakhrana and Osmanabadi. Other important breeds of goats used for milk include Barbari,Malabari,Sirohi,Surti etc

Jamunapari

- This breed is found in Agra, Mathura and Etawah districts in Uttar Pradesh and Bhind and Morena districts in Madhya Pradesh.
- Jamunapari is a large sized animal. Average body length and height of Jamunapari is 75 and 82 cm respectively.
- Coat colour of this breed is predominantly white with brown patches on the ears and head.
- Typically this breed has got convex face with Roman nose. It is also having very long and pendulous ears.
- Horns are short, flat and twisted horizontally backward.
- In most of the animals, lower jaw is longer giving a parrot mouth appearance.
- This breed is known for its outstanding ability for milk production. Udder and teats are large and well developed.
- Average milk yield is 280 kg in a lactation period of 274 days

Jamunapari

(Courtesy: surendranagar.olx.in)

Beetle

- This breed is mainly found in Punjab and Haryana.
- Body of Beetle resembles Jamunapari but comparatively smaller. Average body length and height is 70 and 77 cm respectively.

- Breed has got Long pendulous ears and outwardly twisted horns
- Average milk yield is 157 kg in a lactation period of 186 days

Beetle

(Courtesy: lahore.olx.com.pk)

Jakhrana

- This breed is found near Behror in Alwar district of Rajasthan.
- Breed is large and predominantly black with white spots on ears and muzzle. Horns are outwardly twisted. Udder is well developed.
- Average daily milk yield varies from 2—3 kg for a lactation length of about 180—200 days.
- Lactation yield is 122 kg and lactation length is 115 days.

Jakhrana

(Courtesy: agtr.ilri.cgiar.org)

Osmanabadi

- This breed is mainly found in Maharastra.
- This breed is medium sized and mostly black in colour. The body length and height is 66 and 75 cm respectively. Ears are long and pendulous.
- Good yielders produce up to 3.5 kg per day and milk yield is 170—180 kg per lactation.

Osmanabadi

(Courtesy: zplatur.gov.in)

Body Parts of Dairy Animals

Knowledge of body parts of dairy animals is very important because it enables one to describe animals more clearly in judging and selecting animals and to properly apply husbandry and veterinary practices. Various external body parts of dairy animals are listed below.

Cattle

Body of cattle is mainly divided into 3 major areas -head, neck and trunk. Various parts present in these three areas are described below

Head

1) **Poll:** The part immediately between and behind the horns.
2) **Horns:** Paired bony processes that emerge from either side of the poll.
3) **Ears:** The organ of hearing, situated just behind and below the horns.

4) **Fore head**: From the poll down to the level of the eyes.

5) **Face:** From the level of the eyes downward to the nostrils.

6) **Nostrils:** Two natural openings for breathing.

7) **Temporal fossa:** Depression between the base of the horn and outer angle of the eye.

8) **Muzzle:** The lower part including nostrils, mouth and a chin.

9) **Eyes:** Organ of sight. It includes eyeball, upper eyelid, lower eyelid, and third eyelid (less developed), inner canthus and outer canthus. (Canthus is an angle formed by both lids on either end of the eye).

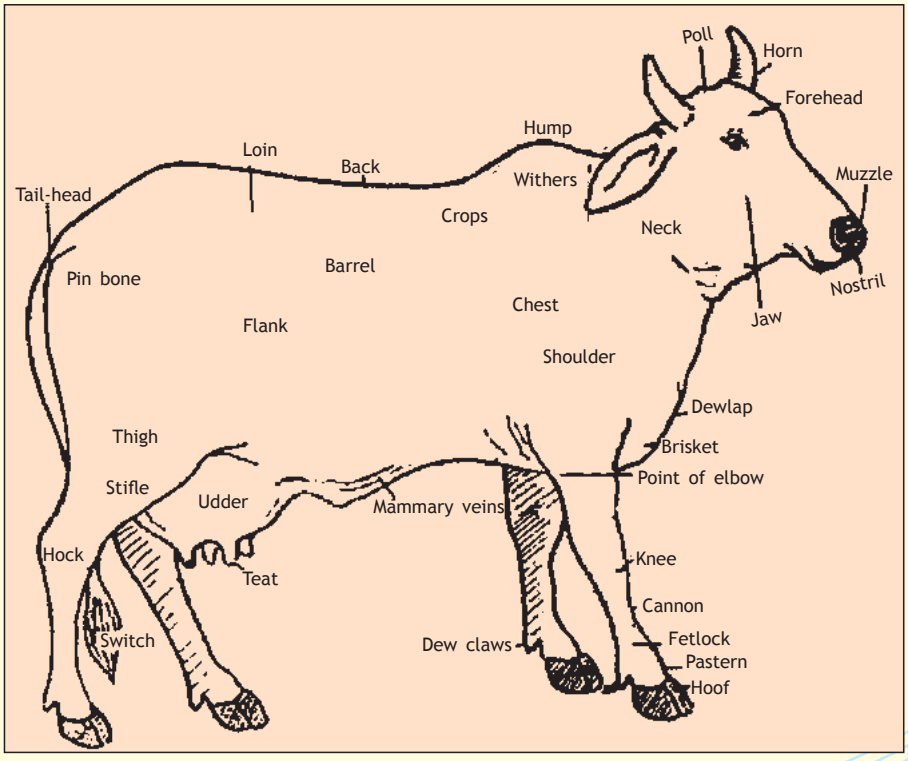
10) **Jaw:** Upper jaw is formed by maxilla and premaxilla bone and lower jaw by mandible bone.

Neck

11. **Crest:** Upper ridge of the neck, starting from poll.

12. **Base of the neck**: The place where neck joins the body.

13. **Dewlap:** A pendulous fold of the skin hanging down the lower part of the neck.



External body parts of cow

Trunk

14. **Hump:** Fleshy protuberance behind neck of indigenous cow.
15. **Withers**: Just behind the hump.
16. **Back:** Just behind the withers to the head of the last rib. Ribs are long curved bones which surround chest. There are 13 ribs in cow.
17. **Loin:** The part of the body lying on each side of the spinal column between the hip bone and last rib.
18. **Rump:** Region of sacrum, point of rump is the highest point formed by the sacral tuber.
19. **Tail:** The posterior extremity of an animal.
20. **Switch of tail:** Tuft of hair at the end of the tail.
21. **Brisket:** The part of the lower chest of the animal between the two fore legs.
22. **Chest:** Ribs springing from the backbone above and attached to the breastbone below.
23. **Belly (Abdomen):** The area behind chest carrying alimentary canal and other organs.
24. **Flank:** Hollow area between the ribs and hip or hook bone.
25. **Barrel:** Comprises belly and flank.
26. **Anus:** The posterior opening of alimentary canal under the root of the tail.

Points Present Only in Males

27. **Sheath (Prepuce):** Flap of skin in the abdominal region covering penis.
28. **Penis:** The male organ of copulation.
29. **Scrotum:** Pouch of skin in which the testicles are lodged.
30. **Testicles:** Male generative glands, which lie in the scrotum.

Points Present Only in Females

31. **Udder:** Mammary gland, the anterior part is called the fore udder and posterior as rear udder.
32. **Teats:** Through which the milk is drawn.
33. **Mammary vein:** Veins on the udder.
34. **Vulva:** External opening of the female genital organs situated below the anus.

Fore Limb - Consist of various bones like scapula, Humerus, Radio ulna, carpal and metacarpal bone

35. **Shoulder joint:** The joint formed between the scapula and upper end of the humerus.
36. **Elbow joint:** Formed by the distal end of humerus and proximal end of radius and ulna.
37. **Knee-joint:** Formed by radius, carpal bones and metacarpal bones.
38. **Fetlock joint:** Joint formed by the lower end of the metacarpal bone and the first phalanx with its sessamoides.
39. **Dew claws:** Two horny callosities behind the fetlock joint.
40. **Pastern:** The region below fetlock and above coronet.
41. **Coronet:** Region round the top of the hoof.
42. **Hoof:** The outer horny covering of the foot, which is divided into two parts called claws.

Hind Limb - Consist of various bones like Pelvic girdle (Ilium, Ischium and Pubis), Femur, Tibio-fibula, Tarsal and Metatarsal

43. **Hook bones:** Bony prominence formed by the external angle of ileum.
44. **Pin bones:** The projection of the quarter just below the root of the tail.
45. **Thurl (Hip joint):** Midway between hook bones and pin bones
46. **Thigh:** Region of femur bone, which runs from the hip joint to the stifle joint.

47. **Stifle joint:** The joint formed by femur, patella and tibia.

48. **Hock:** Joint formed between the tibia, tarsal bones and metatarsal bones.

Buffalo

1. Hump and dewlap are not present in buffaloes.

2. Brisket is more developed in buffaloes as compared to cattle.

3. Rest points are same as in cattle.

Breeding Systems

Breeding of farm animals involves evaluation of their production potential, selection of suitable individuals that excel in production, and mating them together in a planned manner to obtain better offspring. Breeding systems are generally classified into *inbreeding* and *out-breeding* depending on relationship of the individuals mated to produce the next generation.

Inbreeding

Inbreeding is a system of mating in which offspring are produced from parents that are more closely related than the average of population from which they come. The main advantages of inbreeding is that it can be used to form distinct lines or families within a breed and it makes more pairs of genes in the population homozygous. So good inbred animals have a better capacity to stamp their characteristics on the offspring. The major disadvantage due to which it is generally avoided that it is usually associated with the appearance of genetic defects and overall decline in vigor & performance

Out Breeding

Out breeding is mating of individual which are not closely related and does not have common ancestor for previous 4 to 5 generation.This system of breeding can involve mating of unrelated animals within a breed (outcrossing), crossing animals of different breeds (crossbreeding) grading up etc. The genetic effects of outbreeding are opposite to that of inbreeding. Whereas inbreeding increases homozygosity, outbreeding tends to make more pairs of genes heterozygous.

There are different forms of out breeding :

- **Cross-breeding**

Cross breeding is mating of animals of two different defined breeds.

eg. Holstein Friesens x Tharparkar = Karan Fries.

Brown Swiss x Sahiwal= Karan Swiss

Crossbreeding usually result in improved traits in the offspring. Superior traits that result from crossbreeding are called hybrid vigour, or heterosis. Heterosis is measured by average superiority of hybrid offspring over average of parents. Main objective of crossbreeding is to produce progeny superior to the parents. By cross-breeding, we can take advantage of good qualities of two breeds of distinct types by combining these qualities in progeny. By crossbreeding, we can take advantage of heterosis in promoting individual merit. Crossbreeding of local breeds with improved exotic breeds has brought considerable improvement in milk production with enough capacity to withstand direct and indirect effects of hot climate. In our country, introduction of exotic inheritance between 50 to 62.5 percent is optimum. The only disadvantage of crossbreeding is that offspring lack uniformity of coat colour and type.

- **Out crossing**

Mating of unrelated animals within the same pure breed is termed as outcrossing It is widely used because by mating females in a herd to unrelated males usually from outside the herd, the deleterious effects of inbreeding are avoided. Out crossing combined with selection has been responsible for most of the changes and improvements in most of the pure breeds in dairy cattle.

- **Up-grading**

Grading up is mating purebred males of a given breed to nondescript scrub females and their female offspring successively through generations with the objective of making progeny resembles and perform similar to the pure breed. The offspring come closer to possess 100% of phenotype of purebred used as we go on grading up and by 5th generation, it will have 96.87 percent of genes from purebred. The main advantage of grading up is that one can start a dairy farming business with relatively cheap non descript cows and grade them to obtain cows equal in every respect to more expensive purebreds.

Artificial Insemination

Artificial insemination (AI) is defined as deposition of semen (male gamete) into female reproductive tract with help of an instrument. It is most popular breeding technique employed in farm animals. In this method, semen with live sperms are collected from male, processed and preserved, is introduced into female reproductive tract at proper time with help of an instrument known as AI Gun, so as to achieve conception.

First scientific Artificial insemination was performed by Lazzaro Spallanzani, an Italian physiologist, in 1780 in dog which gave birth to 3 pupps. In India, First AI was done by Sampath Kumaran in 1939 at Palace Dairy farm, Mysore.

Artificial insemination has got so many advantages. It facilitates intensive selection of male animals for breeding, enables extensive utilization of superior sires and effectively eliminates diseases which are transmitted through natural service (coitus). It is an economic technique. Animals of unequal size can be bred and semen of superior sires can be used for many years, even after death etc. However it has got few disadvantages also. It requires considerable infrastructure and facilities to establish an enterprise and well trained personnel's are required for carrying out the process.

Procedure of Artificial Insemination

Artificial insemination technique essentially has following steps :

1) Collection of semen from male

2) Examination of semen/semen evaluation

3) Semen processing and dilution

4) Semen preservation

5) Insemination or deposition of semen in female reproductive tract.

Common Terminologies in Animal Production

- **Abattoir**: A slaughter house.
- ***Ad libitum:*** Free choice.
- **Artificial insemination:** It is the technique through which semen (male gametes)

are deposited into female reproductive tract by mechanical means with help of an instrument.

- **Balanced ration:** It is that feed or feed mixture which contains all the essential nutrients in appropriate quality and quantity as needed by animals for their maintenance, growth and production.
- **Bovine:** Term for species of cattle and buffalo.
- **Breed:** A breed is a group of inter-breeding animals of a species having similar morphological (colour, shape and size of body parts) characteristics.
- **Browse:** Feed taken from trees and shrubs including leaves, twigs and bark.
- **Bull:** Adult male cattle.
- **Breeding:** The mating of animals to produce young ones under controlled circumstances.
- **Buck:** Adult male goat.
- **Boar:** Adult male pig.
- **Bullock:** Castrated male cattle.
- **Buffalo bullock:** Castrated male buffalo.
- **Cow:** Adult female cattle.
- **Calving:** Act of parturition or giving birth in cattle and buffalo.
- **Culling:** The process of eliminating non productive or undesirable animals.
- **Colostrum:** The first milk produced by the mother immediately after giving birth to young one. It is highly nutritious and a rich source of antibodies.
- **Calving interval**: The number of days between 2 successive calving in cow/ buffalo.
- **Castration:** The process of removing male reproductive organ testes by mechanical means.
- **Caprine:** Term used for species of goat.

- **Conception rate:** The number of animals becoming pregnant as a proportion of total number of animal mated/inseminated.
- **Dam:** Female parent, the mother of an animal.
- **Dewlap:** A fold of loose skin hanging from throat of animal.
- **Doe:** Adult female goat.
- **Drove:** Group of pigs.
- **Dry cow:** A cow that is not producing milk.
- **Ewe:** Adult female sheep.
- **Estrus:** The period of heat or sexual excitement in female animals. It is the period in which female allow a male to mate with her.
- **Flock:** Group of sheep/goat.
- **Foal:** New born horse.
- **Farrowing:** Act of parturition or giving birth in pig.
- **Foaling:** Act of parturition or giving birth to foal in horse is known as foaling.
- **Gelding/Geld:** Castrated male horse.
- **Hog/stag/barrow:** Castrated male pig.
- **Herd:** A group of cows/buffaloes.
- **Kidding:** Act of parturition or giving birth to a kid in goat is known as kidding.
- **Kid:** New born goat.
- **Kidding interval:** The number of days between two successive kidding.
- **Lamb:** New born sheep.
- **Lambing:** Act of parturition or giving birth to a lamb in sheep is known as lambing.
- **Mare:** Adult female horse.

- **Maiden**: An unbred animal.
- **Non descript:** An animal usually of inferior quality that cannot be distinguished as belonging to a specific well defined breed.
- **Ovine:** Term for species of sheep.
- **Placenta:** A temporary organ that attaches fetus to the wall of uterus of mother.
- **Progeny:** Offspring of given individual.
- **Pasture**: Area of cultivated forages for grazing.
- **Pedigree**: The record of an individual's ancestory.
- **Pens**: Small enclosed areas inside a building which are used for keeping animals separately.
- **Pork:** The meat that comes from swine.
- **Piglet:** New born pig.
- **Puberty:** It is the period or age when a male or female animal is able to release gametes. In case of females, first estrus/heat is visible sign for attainment of puberty.
- **Ram/Tup:** Adult male sheep.
- **Swine:** Term used for species of pig.
- **Stallion:** Adult male horse.
- **Sow:** Adult female pig.
- **Skim milk:** The milk from which fat has been separated.
- **Shearing**: It is the process of removing wool from sheep quickly, completely, easily and with minimum discomfort to sheep.
- **Trait**: Trait is observable or measurable characteristic of an individual. Coat colour, body weight, milk yield etc are traits of individual animal.
- **Teaser bull:** A vasectomized bull used for heat detection.

- **Umbilical cord:** A band of tissues connecting fetus with its placenta.
- **Wether:** Castrated male sheep.
- **Weaning:** Process of separating the calves from their mother at birth or later and rearing them artificially.
- **X-chromosome**: A sex chromosome found in mammals. All the eggs produced by female contain X chromosome.
- **Y-chromosome**: A sex chromosome found only in male mammals.
- **Zebu cattle***:* The humped cattle breeds of Indian origin.

Selection and Judging of Dairy Animals

Selection of Dairy Animals

Principal criterias for selection of dairy animals are breed characteristics, fertility and milk production.

Following points should be taken care for selection of desirable dairy animals.

- Animal should be of recognized breed possessing all breed characters.
- Animal should have attractive individuality with feminity and vigour.
- Animal should have wedge shaped appearance of the body.
- It should have well proportionate head and neck consisting of wide nostrils, prominent facial veins, wide forehead, large and bright eyes.
- Chest of animal should be big.
- The udder should be big with smooth, soft and spongy texture. It should be well attached to the abdomen. The skin of the udder should have a good network of blood vessels. All four quarters of the udder should be well demarcated with well placed teats. Milk veins should be big, bulged, zigzag in shape, tortuous and prominent in front of udder on each side of belly.
- Body of animal should be angular when viewed from front, sides and over the withers. This angularity or sharpness of points is known as wedges.

- Animal should be young. Maximum yield by dairy cows are noticed during 2nd—5th lactation. Generally selection should be carried out during 1st or 2nd lactation
- Ancestor performance and fertility records of animal should be essentially checked. Animal having good ancestor performance and fertility record should only be selected.
- General health of animal should be good.

Judging of Dairy Animals

When information on the productive performance of the animal is not available or difficult to obtain, then selection of animal on type and body conformation is very useful. This can be accomplished by learning the judging techniques of dairy animals. Judging is also employed at animal fairs in beauty or breed characteristics competitions. It is cheap and convenient when an expert is trained to judge dairy types.

Requirements for effective Judging of dairy animal are given below:

- Score card for dairy animal
- An ideal type of dairy animal
- 3—4 dairy animals of same species, breed, age and lactation

Primary pre-requisite for judging and selection of dairy animal is proper knowledge of external body parts and ability to correlate the type of part with physiological functions of body.

The procedure for judging of dairy animals is as follows:

1) Study the score card and marks fixed for each parameter.
2) Form a picture of an ideal animal in mind.
3) Mark the animals as A,B,C,D or 1,2,3,4
4) Secure the animals in a row to study different parameters and make a relative examination among all the four animals in a ring and decide the score for each parameter.

   While using score card for judging dairy animals, following points should be considered

A) General appearance (30 points)

A good dairy temperament, docility, attractive individuality, feminine look, proportionate head and neck, balanced body parts, broad forehead, possessing greater vitality and vigour. Thin skin.

B) Breed characteristics (5 points)

C) Dairy characteristics (30 points)

Quality as revealed by angularity of body known as wedge and general openness without weakness, freedom from coarseness and evidence of milking ability with regard to stage of lactation

D) Body capacity (5 point)

As exhibited by chest girth and, length and depth of barrel with an ample digestive capacity

E) Mammary (udder) development (30 points)

The composite structure of milk glands is called udder. In cows & buffaloes, it is composed of four mammary glands with four teats between hind limbs. Large sized, strongly attached with abdomen, free from fat and fibrous tissues, symmetrically well balanced soft, smooth, pliable with long prominent tortuous milk vein. Teats of convenient size and squarely placed.

5) Tell your attendant to untie animals one behind the other for a short walk for 5 minutes

6) Watch the animal from 3—4 meters distance for the points mentioned above

7) Bring the animals again and arrange in the ring for making close inspection for age by dentition, quality of skin and udder.

8) Sum up the marks and place the animals according to merit based on marks obtained as 1st, 2nd, 3rd and 4th.

9) Classify the animals based on dairy type as follows

Grade	score point
Excellent	91 and above
Very good	86–90
Good	81–85
Acceptable	71–80
Fair	60–70
Poor	below 60

Animals scoring below 75 should be discarded.

Factors Affecting Hygienic Milk Production

Milk is most nutritious and complete food for neonates as well as for adult human being. In view of immense dietary importance of milk, the need to produce safe and clean milk is of profound significance.

'Clean Milk' is defined as Milk drawn from the udder of healthy animals, which is collected in clean, dry milking pail and free from extraneous materials like dirt, dust, flies, hay, manure etc. Clean milk has normal flavor with low bacterial count and is safe for human consumption.

The various factors which affect production of clean milk are as follows:

Hygiene of Animals

It is the most important factor affecting production of clean milk. Therefore utmost attention should be given on health and cleanliness of animals.

Health of animals

- There should be a periodical examination of animals for udder & other infections.
- Animals suffering from infectious diseases should be properly isolated and treated by a qualified veterinarian.

- Milk of infected animal should never be pooled with bulk milk until the animal fully recovers from infection.
- The most common disease which occurs in high milk producing animals is mastitis, which denotes inflammation of udder. Most common symptom of mastitis are changes in milk quality, swollen and painful udder and other signs exhibited by lactating animals. A prompt and proper diagnosis, treatment and control measures should always be undertaken.

Cleanliness of animal body

- Body coat of animals should be regularly washed, brushed and clipped. This practice is very necessary in case of buffaloes because they are used to wallow in dirty ponds and carry mud and filth on their body.
- Grooming of animals should be done well before milking so that dirt particles do not fall in milk
- Udder and teat should be properly washed and cleaned. All dirt particles from udder should be removed by washing with water. Addition of hypochlorite (500 ppm) helps to disinfect the udder. After washing, they should be dried with wash cloth or clean towel.

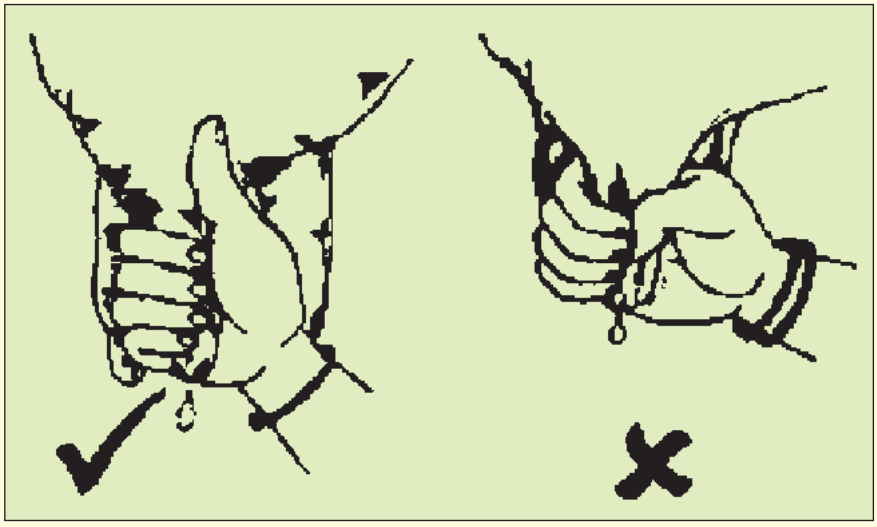
Hygienic Practices in Milking

Before milking

- Place of milking should be very clean, quiet and comfortable for animals. It should be properly cleaned before each milking.
- The person involved in milking should take all hygienic measures. He should cut his nails and wash his hand thoroughly with soap and water before milking.
- Udder along with teats should be washed with 1% acriflavin or $KMnO_4$ solution

During milking

- Milking should be done with full hands. It should be quick and complete. Knuckling method should be always avoided as it leads to more chances of injury.



Right and wrong method of milking

- First few ml of milk should be discarded because this contains a large number of micro-organisms.
- Milking should be complete and no milk should be left in udder after milking
- Milking operation should be completed in 6—8 minutes

Hand milking

- Unhygienic practices like dipping the fingers in milk and wetting the teats to soften them should be strictly avoided.
- Sick cows should be milked at the end to prevent any infection.

After milking

- After milking, teats should be dipped in antiseptic lotion
- Animal should not be allowed to sit at least for ½ to 1 hour as infection could spread via open teats.

Hygiene of Milking Utensils

- All milking utensils should be of uniform size and should have small mouth to avoid external contamination.
- They should be made up of non rusting and non absorbent materials such as aluminium or galvanized iron.
- The utensils should be scrubbed and cleaned before and after each milking.
- The detergent and chemicals used should be non-injurious to health, and non abrasive to hands. At farm level, use of washing soda coupled with exposure to sunlight or use of detergent cum disinfectants such as iodofore is recommended.
- The cleaned vessels should be kept inverted for complete drainage of water after milking, so as to avoid microbial contamination.
- The milking machine, wherever used, may be cleaned and sterilized after each milking with cold water rinse followed by hot detergent wash (45°C) and finally hot water sterilization (85°C). Before every milking, the equipment may be subjected to chlorine rinse with 300 ppm hypochlorite solution.

Housing of Animal

- Animal house should be sited such that it has access to maximum light and air.
- Housing should be located on a high ground compared to surrounding so as to facilitate proper drainage.
- Milking barn may be designed either single or double row in the shed depending upon number of animal.

- The wall on all sides should be made up of such materials that can be thoroughly cleaned.
- The floor should be constructed with either concrete or hard bricks.
- Adequate supply of clean water must be available on the dairy farm for cleaning
- Good ventilation is essential for continuous circulation of fresh air.
- All animal houses should have adequate lighting by both natural and artificial sources

Activity

Visit to a nearby dairy farm and note down the important breed characteristics of dairy animals.

REVIEW QUESTIONS

1. Which is the most important factor effecting clean milk production? Discuss.
2. Enumerate various factors effecting clean milk production.
3. Write the home tract of Sahiwal,Tharparkar,Gir and Red Sindhi breed of cattle.
4. Write the productive performance of Murrah, Niliravi and Surti breed of buffalo.
5. List the names of cross bred cattle strain developed in India.
6. Discuss the general characteristic of Karan Fries cattle.
7. Describe the general characteristics of Jamunapari breed of goat.
8. What are the different criteria for selection of a dairy cow?
9. Discuss the various parameters for judging a dairy cows.