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UNIT II:

DAIRY CATTLE MANAGEMENT

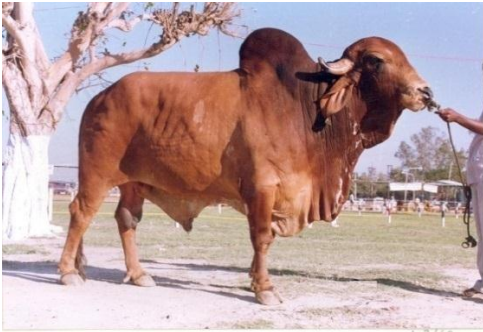
CATTLE AND BUFFALO BREEDS

The Indian breeds of cattle are classified as milch breeds, draught breeds and general utility breeds. They are as follows:

S.No	Type of Breed	Breeds	Salient characters
I	Milch breeds	1.Gir	Ponderous in build, pendulous dewlap and sheath have lateral or curved horns, predominantly red with varying colour pattern
		2.Red Sindhi	
		3.Sahiwal	
		4.Deoni	
II	Draught breeds	5.Nagori	Short horned white or light grey colour, with long coffin shaped skull and slightly convex profile
		6.Bachur	
		7.Kenketha	Lyre horned grey with wide forehead, prominent orbital arches, flat dish profile
		8.Malvi	
		9.Kerigarth	
		10.Hallikar	Mysore type – prominent fore head with long pointed horn raises closer at poll, coffin shaped skull. Grey colour
		11.Amirthamahar	
		12.Khillari	
		13.Kangeyam	
		14.Bargur	
		15.Ponwar	Short horned or slightly lyre horned small black, red, dun colour
16.Siri			
III	General utility breeds	17.Gaolao	Short horned white or light grey colour, with long coffin shaped skull, convex profile
		18.Krishna valley	
		19.Tharparkar	

		20.Kankrej	Lyre horned grey with wide forehead prominent orbital arches, flat or dished profile
IV	Exotic breeds	21.Shorthorn, 22.Ayrshires, 23.Jersey, 24.Brown Swiss 25.Red Dane, 26.Guernsey 27.Holstein– Friesian	
V	Buffalo Breeds	28. Murrah, 29.Bhadawari, 30.Jaffarabadi, 31. Surti, 32.Mehsana, 33. Nagpuri or Ellichpuri 34. Nili – Ravi 35. Toda	

CHARACTERISTIC FEATURES OF DIFFERENT BREEDS



MILCH BREEDS

GIR

Origin : Gir Forests of south Kathiawar
in Gujarat

Basic colours of skin are white with dark red or chocolate-brown patches or sometimes black. Most of the Gir animals seen today are purely

red.

The typical characteristics of Gir breed are:

- i. A broad convex forehead like a bony shield.
- ii. Long and pendulous ears are folded like a leaf with a notch at the tip. Their inside faces forward and always remains hanging from the base.
- iii. Horns are peculiarly curved, it take a downward and backward curve and again incline a little upward ad forward taking a spiral inward sweep giving a *'half moon'* appearance.
- iv. Tail is long and whip like.

Performance parameters

- i. Milk yield ranges from 1200-1800 kg
- ii. Age at first calving 45-54 months and inter calving period from 515 to 600 days **RED**

SINDHI:



Origin : Mostly found in Karachi and Hyderabad district of Pakistan.

Colour is red with shades varying from dark red to light, strips of white colour also sometime seen on dewlap and on forehead.

The typical characteristics of the breed is

- i. Head is well proportioned with a occasional bulge on the forehead
- ii. Horns are thick at the base and emerge laterally and curve upward.
- iii. Hump is well developed in males. iv. Dewlap and sheath are pendulous
- v. Udder is capacious and pendulous.
- vi. Compact frame and dropping quarters.

Performance parameters

- i. Milk yield ranges from 1100-2600 kg
- ii. Age at first calving 39-50 months and inter calving period from 425-540 days



SAHIWAL

Origin : Montgomery district in present Pakistan.

The colour is reddish dun or pale red, sometimes flashed with white patches

The typical characteristics of the breed is

- i. The Sahiwal is a heavy bred with symmetrical body and loose skin. Animals are long, deep, fleshy and comparatively lethargic.

- ii. Horns are short and stumpy.
- iii. Dewlap is large and heavy.
- iv. Hump in males is massive and frequently falls on one side.
- v. Naval flap is loose and hanging. Sheath in males is also pendulous.
- vi. Tail is long and fine with a black switch reaching almost to the ground. Performance parameters

The average milk yield - 2,725 -3,175 kg.

KANGAYAM



Origin : Kangayam, Dharapuram, Perundurai, Erode, Bhavani and part of Gobichettipalayam taluk of Erode and Coimbatore district. The kangayam breed was developed by the efforts of the late Pattagar of Palayakottai, Sri N. Nallathambi Sarkarai Manradiar.

The typical characteristics of the breed is

- i. Colour : Coat is red at birth, but changes to great at about 6 months of age. Bulls are grey with dark colour in hump, fore and hind quarters. Bullocks are grey. Cows are grey or white or grey. However, animals with red, black, fawn and broken colours are also observed. Horns, muzzle, eyelids, tail switch and hooves are black.
- ii. They are short with stout legs and strong hooves.
- iii. The horns are spread apart, nearly straight with a slight curve backward.
- iv. The eyes are dark and prominent with black rings around them.
- v. The dewlap is thin. The sheath is well tucked up to the body.
- vi. The average milk yield 600 to 700 kg in a lactation.

BARGUR



The typical characteristics of the breed is

- i. Found around Bargur hills in Bhavani taluk of Erode district.
- ii. Bargur cattle are of brown colour with white markings. Some white or dark brown animal are also seen.
- iii. Animals are well built, compact and medium in size. iv. Muzzle is moderate and black in colour.
- v. Horns are of light brown colour, moderate length, closer at the roots inking backward, outward and upward with a forward curve and sharp at the tip.

UMBLACHERRY



Origin : Thanjavur, Thiruvarur and Nagappattinam districts of Tamil Nadu.

Synonyms : Jathi madu, Mottai madu, Molai madu, therkathi madu.

The typical characteristics of the breed is

- i. Umblacherry calves are generally red or brown at birth with all the characteristic white marking on the face, on limbs and tail.
- ii. The colour changes to grey at about 6 months of age. In adult females, the predominant coat colour is grey with white marking on the face and legs.
- iii. All the legs below hocks have white marks either socks or stockings.
- iv. Horns are very small, curving outward and inward and sometimes spreading laterally.
- v. The practice of dehorning bullocks is peculiar in Umblacherry cattle. Horn buds are removed at 6 months of age by singeing with red hot iron.
- vi. Ears are pruned and hot iron branding is done.

PULIKULAM / JELLCUT BREED



Pulikulam is a distinct cattle breed and the present population is about 45000. This breed is seen in Madurai and Theni districts. They are also raised in Cumbum valley and the Periyar river, where there are grazing grounds of vast extent. These animals depend extensively on forest grazing. This is a quick trotting (5-6 miles per hour) breed. They are comparatively small, but active and capable of much endurance. Selected bulls are utilized as Jellicut or bull baiting purposes. Farmers are benefited through penning, which provides rich organic manure for agricultural crops. This breed can only be conserved in the agro-eco system where forest grazing is available.

ALAMBADI

Alambadi bulls are dark grey, almost black and cows grey or white. They have the typical backward curving horns of Mysore type cattle. They are active, useful draught animals but not fast trotter. This breed is restricted to Salem and Coimbatore district of Tamil Nadu and part of Bangalore district in Karnataka and closely resembles Hallikar breed. **D. Exotic breeds of**

Cattle:



In order to improve the milk yielding capacity of the indigenous cows, exotic cattle breeds have been extensively used in India. Important foreign breeds are described below:

Jersey

- i. It is the smallest of the dairy types of cattle developed on island of Jersey, U.K.
- ii. In India this breed has acclimatized well and is widely used in cross breeding with indigenous cows.
- iii. Because of their small and compact size they are more suitable for cross-breeding with zebu cattle.
- iv. The typical colour of Jersey cattle is reddish fawn.
- v. Dished forehead and compact and angular body.
- vi. These are economical producers of milk with 5.3% fat and 7 % SNF.
- vii. The highest record of milk yield was 11381 kg and fat 544 kg in a lactation period of 365 days.
- viii. In India this breed has acclimatized well and has brought about increased production of milk (2.5 times or 50 in the first generation progeny).
- ix. The age of maturity and inter calving period in the progeny have been considerably reduced.



Holstein Friesian:

- i. This breed was developed in the northern parts of Netherlands, especially in the province of Friesland.
- ii. They are ruggedly built and they possess large udder.
- iii. They are the largest dairy breed and mature cows weigh as much as 700kg.
- iv. They have typical marking of black and white that make them easily distinguishable.
- v. This is by far the best dairy breed.
- vi. The average production of cow is 6000 to 7000 kg per lactation. However, the fat content in their milk is rather low (3.45 per cent).

Brown Swiss



- i. The mountainous region of Switzerland is the place of origin of Brown Swiss breed. It is rather less refined than other dairy breeds, but is famous in its home tract for its rugged nature and good milk production.
- ii. In India excellent crossbred cattle have been obtained by crossing this breed with recognized Indian breeds of cattle; the *Karanswiss* cattle of NDRI, Karnal.



E. Breeds of Buffaloes

The buffalo species originated in India. The buffaloes are normally classified into river and swamp types though both are called *Bubalus bubalis*. Most of the animals in India river type though swamp type are also found in eastern parts of India.

India is considered as the home tract of some of the best buffalo breeds. Because of preference of buffaloes for milk. Indian buffaloes are an important source of milk supply today and yield nearly three times as much milk as cows. More than half of the total milk produced (55%) in the country was contributed by the 47.22 million milch buffaloes, whereas the 57.0 million cows contribute only 45% of the total milk yield. There are about 10 indigenous standard breeds of buffaloes.

MURRAH



- i. It is the most important breed of buffaloes whose home is Rohtak, Hisar and Jind of Haryana and Nabha and Patiala districts of Punjab.
- ii. **Synonyms** : Delhi, iii. The colour is usually jet black with white markings on tail and face and extremities sometimes found.
- iv. The tightly curved horn is an important character of this breed.
- v. The body size is massive, neck and head are comparatively long. Head of females is short, fine and clear cut.
- vi. Hips are broad and fore and hind quarters are drooping.
- vii. The buffalo cows of this breed are one of the most efficient milk and butter fat producers in India. Butter fat content is 7% Average lactation yield is vary from 1500-2500 kg.

viii. Age at first calving is 45-50 months and inter calving period is 450-500 days.

SURTI



- i. The breeding tract of this breed is Kaira and Baroda district of Gujarat.
- ii. Coat colour varies from rusty brown to silver-grey. Skin is black or brown. iii.
The body is well shaped and medium sized; the barrel is wedge shaped. iv. The head is long with prominent eyes.
- v. The horns are sickle shaped, moderately long and flat.
- vi. The colour is black or brown
- vii. The peculiarity of the breed is two white collars, one round the jaw and the other at the brisket.
- viii. The milk yield ranges from 900 to 1300 kg.

TODA



- i. Toda breed of buffaloes is named after an ancient tribe, Toda of Nilgiris of south India.
- ii. Coat colour of the calf is generally fawn at birth. In adult the predominate coat colours are fawn and ash-grey.
- iii. These buffaloes are quite distinct from other breeds and are indigenous to Nilgiri hills. iv.
The animals have long body, deep and broad chest, and short and strong legs.
- v. The head is heavy with horns set well apart, curving inward outward and forward.
- vi. Thick hair coat is found all over the body. They are gregarious in nature.

NEW CROSSBRED CATTLE STRAINS

Sunandini: Under Indo-Swiss project in Kerala, local non-descript cows were crossed with Brown Swiss bulls. The crosses with 62.5% brown-Swiss inheritance were mated intense followed by selection to synthesize a new breed named Sunandini. Average lactation yield 4351 kg in 305 days.



Frieswal: Friesian x Sahiwal crossbreds with Friesian inheritance between 3/8 and 5/8 at military farms are being interbred with semen of 5/8 Friesian crossbred bulls into a breed formation programme. Average yield 2729 kg



BREEDING - CROSS BREEDING- UPGRADING

Selection and system of breeding constitute the only tools available to the breeder for improvement of animals since new cannot be created though they can recombine into more desirable groupings.

Systems of breeding have been broadly divided as

1. Inbreeding – Breeding of closely related animals
2. Out breeding – Breeding of unrelated animals **Inbreeding:**

a. Close breeding: This means the mating of full sister to full brother or sire to his daughter or dam to her son. These type of breeding is followed only when the both parents are outstanding.

This leads to more homozygosity. **b. Line breeding:**

This means the mating of animals of wider degrees of relationship than those selected for close breeding. It promotes uniformity in the character.

Out breeding:

It consists of outbreeding, cross breeding and Up grading. **a. Out Crossing:**

Mating of unrelated pure bred animals within the same breed.

b. Cross breeding: It is the mating of animals of different breeds. It is generally used where the crossed progeny is directly marketed and are needed for breeding and further multiplications. It has become quite common in pigs and in the production of hybrid chickens.

Methods of cross breeding:

1. **Criss-crossing:** When the two breeds are crossed alternatively, the method is known as criss-crossing. This method is proposed for utilizing heterosis in both dams and progeny.

2. **Triple crossing:** In this system three breeds are crossed in a rotational manner. It is also known as rotational crossing.
3. **Back crossing:** Back crossing is mating of a crossbred animal back to one of the pure parent races which were used to produce it. It is commonly used in genetic studies, but not widely used breeders.

Advantages of cross breeding:

1. It is valuable as a mean of introducing desirable characters into a breed in which they have not existed formerly.
2. It serves a good purpose in evolving a new breed owing to the fact that it disturbs the balance and brings about recombination in the germ to cause variations.
3. It is an extremely handy tool to study the behavior of characteristics in hereditary transmission.
4. The cross bred animals usually exhibit an accelerated growth and vigour or heterosis.

Disadvantages:

1. It has tendency to break up the established characters and destroy combinations of that characters.
2. Cross breeding requires maintenance of two or more pure breeds in order to produce the cross breeds.

C. Grading: Grading is a form of out crossing, where in bulls of a distinct breed are bred on non-descript cows from generation to generation, so that in course of time a population essentially resembling the breed from which the Bulls are used.

Non-descript cow x Jersey Bull

F₁ 50% ND + 50% Jersey x Jersey Bull

F₂ 25% ND + 75% Jersey x Jersey Bull

F₃ 12.5% ND + 87.5% Jersey x Jersey Bull

After 5-6 generations the offspring will have 96.9 & 98.3% of the hereditary characters of

'Pure Breed'. So grading is a process by which a few 'Pure Breed' sires can rather quickly transform local variety of animals into a 'Group' resembling the pure breed.

ECONOMIC TRAITS OF CATTLE AND BUFFALOES

Criteria

Economic traits

1. Age at 1st calving : Age in days of the cow or buffalo on the date of 1st calving.
2. Lactation Length : Days in milk from the date of calving to the final drying off or or cessation of milk (305 days)
3. Lactation Yield : Milk yield in Kgs from the date of calving to the date of drying (corrected to 305 days)
4. Dry period : Days from the date of drying to the date of calving
5. Inter calving period : Days from the date of one calving to the date of next calving
(1st, 2nd)
6. Peak yield : The highest daily yield in Kgs during lactation period
7. Average Fat% : Average Fat %
8. Service period : The interval between calving and subsequent service resulting in conception
9. Breeding efficiency : Measured as the No. Services/Conception

Comparison of Economic Traits between Local, Exotic and Crossbred cattle

Particulars	Local	Exotic	Cross breed
Birth weight	20Kg	Jersey – 25-30kg. Friesian – 30-35kg.	25-30 kg
Age at maturity	33 Months	15 months	18-24 months
Age at 1 st calving	42 months	24 months	30 months
Lactation yield	12000 Kg.	3000-6000Kg.	2100-2400
Lactation period	180-210 Days	305 days	240 – 270 days
Dry period	90-120 days	60 days	75 days
Inter calving period	18 months	12-13 months	13-14 months

CULLING OF DAIRY ANIMALS

Culling is elimination or weeding out of undesirable animals from the herd, for reasons of uneconomic,, poor production, or very poor reproductive ability, with sterility problems and breeding, irregularities, very poor conditions, stunted growth, suffering from incurable illness, or disease animals found to be positive for serious infections diseases like Tuberculosis, Johnes disease, Brucellosis, lost one or more quarters and teats of the under due to chronic mastitis resulting in marked reduction in milk production.

Undesirable breed characters present in young animal. When the herd is a pure bred herd leading to disqualifications family lines, exhibiting heritable characters like supernumerary teats, loose horns in cows of certain breeds.

Disable animals due to injury or loss of organ, extreme lameness leading to unmentionable conditions, un healed fractured animals etc. come under the animal proposed or culling.

The culled animals carry lower values and a separate list is made for such called animals and it is known as culling list.

CULLING METHODS

The Tandem Method

The Tandem Method is a form of selective breeding where a breeder addresses one characteristic of the animal at a time, thus selecting only animals that measure above a certain threshold for that particular trait while keeping other traits constant. Once that level of quality in the single trait is achieved, the breeder will focus on a second trait and cull based on that quality. With the tandem method, a minimum level of quality is set for important characteristics that the breeder wishes to remain constant. The breeder is focussing improvement in one particular trait without losing quality of the others. The breeder will raise the threshold for selection on this trait with each successive generation of progeny, thus ensuring improvement in this single characteristic of his breeding program.

For example, a breeder that is pleased with the muzzle length, muzzle shape, and eye placement in the breeding stock, but wishes to improve the eye shape of progeny produced may determine a minimum level of improvement in eye shape required for progeny to be returned into the breeding program. Progeny is first evaluated on the existing quality thresholds in place for muzzle length, muzzle shape, and eye placement with the additional criterion being improvement in eye shape. Any animal that does not meet this level of improvement in the eye shape while maintaining the other qualities is culled from the breeding program; i.e., that animal is not used for breeding, but is instead spayed/neutered and placed in a pet home.

Independent levels

Independent levels is a method where any animal who falls below a given standard in any single characteristic is not used in a breeding program. With each successive mating, the threshold culling criteria is raised thus improving the breed with each successive generation.

This method measures several characteristics at once. Should progeny fall below the desired quality in any one characteristic being measured, it will not be used in the breeding program regardless of the level of excellence of other traits. With each successive generation of progeny, the minimum quality of each characteristic is raised thus insuring improvement of these traits.

For example, a breeder has a view of what the minimum requirements for muzzle length, muzzle shape, eye placement, and eye shape she is breeding toward. The breeder will determine what the minimum acceptable quality for each of these traits will be for progeny to be folded back into her breeding program. Any animal that fails to meet the quality threshold for any one of these criteria is culled from the breeding program.

Total Score Method

The Total Score Method is a method where the breeder evaluates and selects breeding stock based on a weighted table of characteristics. The breeder selects qualities that are most important to them and assigns them a weight. The weights of all the traits should add up to 100. When evaluating an individual for selection, the breeder measures the traits on a scale of 1 to 10, with 10 being the most desirable expression and 1 being the lowest. The scores are then multiplied by their weights and then added together to give a total score. Individuals that fail to meet a threshold are culled (or removed) from the breeding program. The total score gives a breeder a way to evaluate multiple traits on an animal at the same time.

The total score method is the most flexible of the three. It allows for weighted improvement of multiple characteristics. It allows the breeder to make major gains in one aspect while moderate or lesser gains in others.

For example, a breeder is willing to make a smaller improvement in muzzle length and muzzle shape in order to have a moderate gain in improvement of eye placement and a more dramatic improvement in eye shape. Suppose the breeder determines that she would like to see 40% improvement in eye shape, 30% improvement in eye placement, and 15% improvement in both muzzle length and shape. The breeder would evaluate these characteristics on a scale of 1 to 10 and multiply by the weights. The formula would look something like: $15(\text{muzzle length}) + 15(\text{muzzle shape}) + 30(\text{eye placement}) + 40(\text{eye shape}) = \text{total score for that animal}$. The breeder determines the lowest acceptable total score for an animal to be folded back into their breeding program. Animals that do not meet this minimum total score are culled from the breeding program.

Culling in dairy animals 10 points

- Do not move non-ambulatory animals to market under any circumstances.
- Make the decision to treat, to cull, or to euthanize animals promptly. Sick and injured animals should be segregated from the herd
- Delay transport of an animal that appears to be exhausted or dehydrated until the animal is rested, fed, and rehydrated.
- Milk all cows that are still lactating just prior to transporting to a packing or processing facility.

- Use a transportation company that is knowledgeable about your animal care expectations and provides for the safety and comfort of the animals during transport.
- Do not transport animals to a packing or processing facility until all proper treatment withdrawal times have been followed.
- Do not transport animals with a poor body condition, generally a Body Condition Score of less than 2 (1-5 scale).
- Do not transport animals that require mechanical assistance to rise and are reluctant or unable to walk, except for veterinary treatment. When using any handling device, abuse must not be tolerated.
- Do not transport animals with bone fractures of the limbs or injuries to the spine. Animals with a recent fracture unrelated to mobility should be culled and transported directly to a packing or processing facility.
- Do not transport animals with conditions that will not pass pre-slaughter inspection at a packing or processing facility. If unsure, consult with your veterinarian before transporting an animal to a packing or processing facility.

ESTRUS CYCLE

Generally a heifer attains **puberty** (this is the stage at which animal becomes sexually mature and the secondary sexual characteristics become conspicuous) by 8-12 months period. Smaller cows attain puberty at an early date than larger one. The **estrous cycle** starts from puberty, it is regular cycle occurs once in 21 ± 3 days throughout the reproductive phase. During the cycle a mature ovum is liberated from the ovary, the cervix become receptive to the spermatozoa, the female exhibits behavioural adjustment and attraction to receive the male.

Oestrus cycle is divided into

Proestrus (2 days): Period of building up growth of Graffian Follicle (GF) which helps for the nourishment of ovum fluid contains hormone called ‘oestrogen’. It causes changes in uterus, blood supply. This marks the animal is coming in heat. Graffian follicle in the ovary is growing resulting in increased secretion of follicular fluid which have estradiol. This increase number of cilia and increased vascularity of uterus resulting in increase in thickness of epithelial wall of vagina. The vaginal wall adjustment is well filled to prevent possible damage to the wall when coitus occurs.

Oestrus (1day): This is the period of desire. During which the female is ready to receive male. ‘Graffian Follicle’ will ripe or very turgid. This period is brought to an end by the rupture of the follicle (or) ovulation. Vulva becomes swollen. Vulva and Vagina are congested

Metooestrus (4 days): Implantation of the embryo takes place and Corpus Luteum (CL) will be formed and prevents the growth of graffian follicle thereby arrests oestrus cycle. This is the period when the

organ returns to normal non congested condition. During this period the cavity of the GF from which ovum has been expelled becomes recognized and forms a new structure known as C.L.

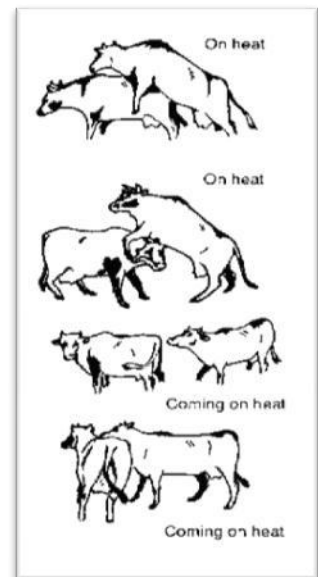
Diestrum (14 days): Further development of uterus takes place. If the animal has not conceived involution of uterus take place. Longest part of estrus cycle. Implantation of embryo and secretion of uterine milk takes place, which is used for the nourishment of the embryo prior to implantation. In case of absence of pregnancy, the animal returns to normal and thus the cycle continues.

Estrus is the period in which the animal exhibits sex desire. This period last for 12 to 18 hours. The estrus or heat is followed by ovulation which normally occurs 12-16 hours after the end of estrus.

Signs of estrus / heat in cattle

1. Off feed
 2. Sudden drop in milk production
 3. The cow may search for male, make deep bellow
 4. Restless and excited
 5. Bellowing
 6. Frequent urination
 7. Homosexuality character like mounting over other cow and accepting other cow to mount over
 8. During estrus the cow will accept the mounting by a bull or other cow. The behavior of standing quietly while being mounted by other cow/bull is called standing heat and this is the surest sign of heat.
 9. Oedema / swelling of genitalia. Mucous discharge from the vulva and it may stick on the tail head.
 10. Hair on the tail head may pushed forward
 11. There may be dirt on the side of the abdomen due to mounting by other animal
- The signs of heat that may be shown will be described for each stage. **a. Early heat period**

Signs of heat



A sexually mature, non-pregnant cow comes in heat every 18 to 24 days. It starts with the development of an ovum in the ovary. At this stage the cow shows early signs of heat. The length of this period varies from 6 to 24 hours. **b. Standing heat period**

Early heat changes into standing heat. The length of this phase of heat ranges from 6 to 18 hours. It is shorter under tropical conditions than under more temperate conditions. **c. Late heat period**

After the period of standing heat some cows continue to show behavioral signs of heat. This period is called the late heat period and can last for 12 to 24 hours.

About two days after the end of heat, cows may show a bloody mucous discharge from the vulva. This is called metoestral bleeding.

Right time for breeding a cow

Egg/ova from ovary is released about 12-18 hours after the onset of symptoms of heat. Ovum will survive upto 16 hours after the release. Sperm live for 12-14 hours. As a routine practice, if a cow is seen showing signs of early heat in the morning, it may be inseminated in the evening. If such signs are seen in the evening, the cow should be bred next day morning.

In buffaloes the expression of estrus sign is very poor. Particularly during summer period the buffalo show only **silent heat**. Silent heat means the animal could not show any visible sign of estrus. It occurs more frequently in first calver than in older cows, in early lactation than in later lactation. More pronounced in buffaloes during summer.

METHODS OF BREEDING IN CATTLE

1. **Artificial insemination (AI)** –Where bull semen is introduced in to the cow's uterus artificially using artificial insemination gun.
2. **Natural mating** –A healthy and proven bull is used to mate a cow.
3. **Multiple ovulation embryo transfer (MOET)** – A method of insemination where embryos (fertilised eggs) are transferred in to the cow's uterus.

Generally one ovum is released from each ovary at the time of ovulation. But by hormone injection, more ova can be produced from the ovary. After artificial insemination 4 to 10 embryos are collected at a time. Then each embryo is transplanted into a replacement mother —carrier cow . At very low temperature foetuses can be preserved for several days.

ARTIFICIAL INSEMINATION

Introduction

Artificial insemination is the technique in which semen with living sperms is collected from the male and introduced into female reproductive tract at proper time with the help of instruments.

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

The first scientific research in artificial insemination of domestic animals was performed on dogs in 1780 by the Italian scientist, Lazanno Spalbanzani.

TYPE OF ARTIFICIAL INSEMINATION (AI)

- Intra uterine insemination(IUI)
- Intra cervical insemination(ICI) OR Intra Vaginal insemination(IVI)

ADVANTAGES:

1. Increases usefulness of superior sires to extra ordinary degree.
2. Services of Superior Sires are greatly extended.
3. No need to maintain Breeding Bull. The frozen semen can be stored in the Liquid Nitrogen-196°C.
4. Semen can be quickly and easily transported by air to different continents.
5. Spreading of diseases is absolutely- NIL.
6. Overcomes the difficulty of size and weight between Dam and Sire.
7. Increase the rate of Conception because in the artificial insemination the semen is being deposited in the mid cervix.
8. Outstanding animals located apart can be mated.
9. Helps in better record keeping.
10. Old and heavy sizes bulls, injured / disabled sires can be used.
11. If the sires are used for Natural Service the animal can serve only 50-60 animals/year but under Artificial Insemination the amount of semen secreted by the animal can be used to satisfy the requirements of 1000 animals per year
12. Semen can be stored in the frozen state , so progeny can be obtained even after the transfer, WHY even after death of bull-15-20 years.(atomic, radioactive, X-ray unit)
13. Semen is expanded and no. of animal can be crossed.
14. Frozen semen can be transported to destination once in a month from the semen bank.

DISADVANTAGES.

1. Some bull's semen may not freeze well.
2. If inferior bull semen is frozen and used –Extensive damage is caused.
3. Maintenance of frozen semen bank is not economical for a small area of operation.

4. Requires well trained technical personnel's and special equipments and hygienic measures are to adapted in preparation.
5. Improper cleaning of instruments and unsanitary condition may lead to lower fertility and may be nucleus for the spreading of diseases.

EMBRYO TRANSFER TECHNOLOGY IN CATTLE

- Embryo transfer was first performed and recorded by Walter Heape in 1890.
- He transferred two Angora rabbit embryos into Belgian doe. She went on to produce a mixed litter of Belgian and Angora bunnies.
- Embryo transfer in food animals began in the 1930s with sheep and goats, but it was not until the 1950s that successful embryo transfers were reported in cattle and pigs by Jim Rowson at Cambridge, England.

COMPONENTS OF ET PROGRAM

▶ Donor (Animal that donates embryos)

- ❖ Have good reproductive performance and progeny performance.
- ❖ Have regular estrus cycles.
- ❖ Select 60-90 days of post calving.

○ Recipient (Animal that receives embryo from donor)

- ❖ Good healthy, body condition, vaccinated for all the reproductive diseases.
- ❖ Animal should have completed two estrous cycles.

PROCEDURE

- Selection of donor cow.
- Super ovulation of the donor cow
- Super ovulation is the release of multiple eggs at a single estrus.
- Hormone preparation, which is given intramuscularly or subcutaneously, with follicle stimulating hormone (FSH) activity.
- Insemination of the cow (12, 24, and 36 hours after the onset of standing heat)

FLUSHING OF EMBRYOS

- ❖ To collect the embryos non surgically, a small synthetic rubber Foley catheter is inserted through the cervix of the donor cow

- ❖ A special medium is flushed into and out of the uterus to harvest the embryos seven or eight days after estrus.
- ❖ This collection procedure is relatively simple and can be completed in 30 minutes or less without harm to the cow.

EVALUATION

- As the individual embryos are located using the microscope, they are evaluated for their quality for success if transferred to a recipient female.

The major criteria for evaluation include:

- ❖ Regularity of shape of the embryo
- ❖ Compactness of the blastomeres (the dividing cells within the boundaries of the embryo)
- ❖ Variation in cell size
- ❖ Color and texture of the cytoplasm (the fluid within the cell wall)
- ❖ Overall diameter of the embryo

EMBRYO TRANSFER-Types

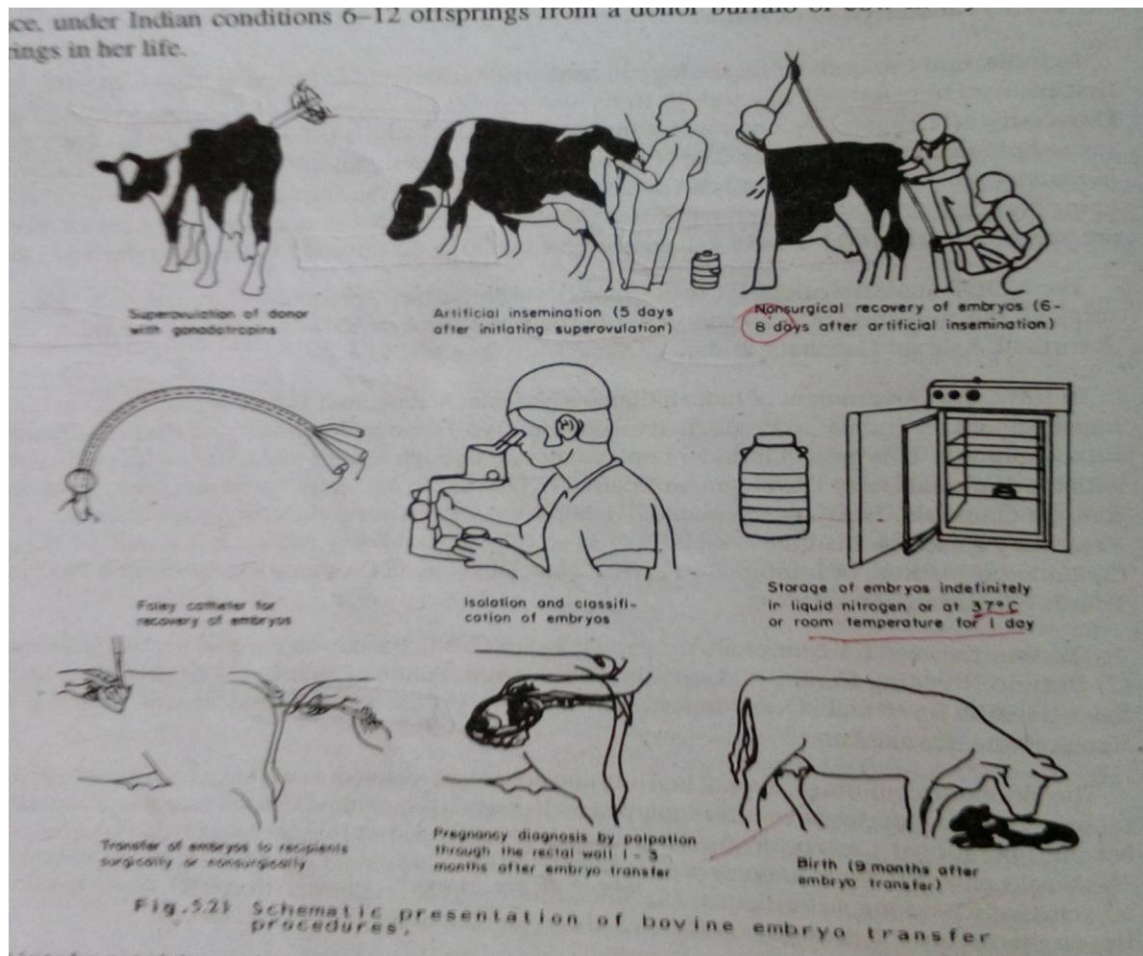
- Same day transfer of embryo (Success rate= 70-80%)
- Transfer of frozen embryo (Success rate= 50-60%) **Calf Birth at 280 days**

Advantages

- Increased number of off springs.
- Obtain offspring from old or injured animals.
- Increased farm income through embryo sales.
- Exportation and importation of embryos is easier than with live animals.

Disadvantages

- Cost and success rate high compare to AI.
- Cost and maintenance of recipient females-high.
- Best technician required.
- Possible spread of diseases from recipients.



HOUSING OF DAIRY CATTLE AND BUFFALOES

SELECTION OF SITE FOR FARM BUILDINGS

Proper housing which is conducive to good health, comfort and protection from inclement weather and which would enable the animals to utilize their genetic ability and feed for optimal production. For construction of farm buildings selection of site is most important.

Before selecting a site the following points are to be considered,

1. Type of soil
2. Availability of land
3. Electricity
4. Availability of water
5. Protection from wind and solar radiation
6. Away from noise and other pollution sources

7. Availability of market facility
8. Transport facilities
9. Drainage system
10. Miscellaneous like, telephone, school, post office and shopping centre etc.,

HOUSE LAYOUT

1. Orientation

In general animal sheds are located with long axis east to west the paddock side facing the north to get direct sunlight during winter and to prevent entry of direct sunlight into the shed during other seasons

2. Length of building

The standard length of building may be of any. It may vary depending upon the number of animals housed. ***3. Height of the building***

The standard height of the building may differ according to the roofing material and agro-climatic condition.

4. Width of buildings

- | | | |
|------------------------|---|---------------------|
| 1. Single row cow shed | - | 3. 80 to 4.25 metre |
| 2. Double row cow shed | - | 7. 90 to 8.70 metre |

5. Roof

It is designed to suit the local climatic conditions. Gable with roof ventilators are necessary for hot condition. Monitor roof is suitable for building with smaller width. Locally available materials like thatches, tiles, wood, agricultural byproducts are commonly used as roof materials. Improved materials like asbestos sheet or concrete are also used.

6. Floor

For any type of animal house flooring, the primary thing required is provision of good 'bottom'. It is as important as that of foundation wall. The bottom is called some times are hard core for the floor. Different materials are used for animal house flooring. The choice depends on availability, cost and other quality required for the animal houses. The floor may be cement concrete floor, vitrified paving bricks, stones, wood, building bricks, gravel and synthetic flooring like composition brick, rubber floor.

HOUSING

In India, a great diversity exists in the design of dairy animal shelters. Efficiently designed sheds can help lessen the thermal stress thereby increasing feed intake, milk production and reproductive efficiency. Under varied climatic, geographical and economical conditions prevailing

in India, designing an ideal set of building for dairy animals throughout the country is impossible. Hence, practically there are two systems of housing for dairy animals viz.,

- i) Loose housing and
- ii) Conventional barns

The former being widely followed in our country.

i. LOOSE HOUSING

It is a system of housing in which animals are kept loose in an open paddock throughout the day and night except at the time of milking and treatment. In this system, shelter is provided along one side of open paddock under which animals can rest when it is very hot or cold or during rains. Common feed manger and water tank is provided and concentrates are fed at the milking time which is done in a separate milking barn or parlour in which cows are secured at milking time and are milked. The open paddock is enclosed by means of half walls or plain wire fences of convenient height.

Advantages

1. Cost of construction is cheaper.
2. Future expansion is possible.
3. The animals will move freely so that it will get sufficient exercise.
4. The animal can be kept clean.
5. Common feeding and watering arrangement is possible.
6. Clean milk production is possible because the animals are milked in a separate milking barn.
7. Oestrus detection is easy.
8. At least 10-15 per cent more stock than standard can be accommodated for shorter period.

Disadvantages

1. It is not suitable for temperate Himalayan region and heavy rainfall areas.
2. It requires more floor space.
3. There is competition for feed.
4. Attention of individual animal is not possible.
5. A separate milking barn is needed for milking of animals.

ii. CONVENTIONAL BARNs OR STANCHION BARNs

In this system of housing, the animals are confined together on a platform and secured at neck by stanchions or neck chain. The animals are fed as well as milked in the same barn. These barns are completely covered with roofs and the sidewalls are closed with windows or ventilator located at suitable places to get more ventilation and lighting. It is applicable for temperate and heavy rainfall region. The same type of housing can be utilized for tropical region with slight modification.

Advantages

1. The animals and men caring for animals are less exposed to harsh environment.
2. The animals can be kept clean.
3. Diseases are better controlled.
4. Individual care can be given.
5. Separate milking barn is not required.

Disadvantages

1. Cost of construction is more.
2. Future expansion is difficult.
3. Not suitable for hot and humid climatic conditions.

Milking barn

This is a barn where milch animals are milked and is fully covered. It should be located at the centre of the farm with all other farm buildings arranged around it. Depending upon the number of milch animals, there are two types of milking barns, viz.,

- i) Single row system.
- ii) Double row system: head to head or face-in; tail to tail or face-out.

As per ICAR norms, in single row system, 12-16 numbers of animals can be kept. If it is greater than 16, then double row system is preferable. In double row system upto 50 animals can be maintained in a single shed. The distance between two sheds should be greater than 30 feet or it should be twice the height of the building.

There shall be an individual standing in the milking barns and the number of standings required should be 25% of total number of milch animals in the herd and the milking operation should be carried out in batches.

Advantages

Tail to tail system

1. Cleaning and milking of animals are easy.
2. Supervision of milking is also easy.
3. Less chance for transmission of diseases from animal to animal.
4. Animals can get more fresh air from outside.

Head to head system

1. Getting animals into the shed is easy.
2. Feeding of animals is also easy.

3. Disinfection of gutter will be more due to the direct fall of sunrays over the gutter.
4. Animals are better exhibited to visitors. **Disadvantages**
 1. Milking supervision is difficult.
 2. Possibilities of transmission of disease are more.

Floor space requirements

Type of animal	Floor space requirement (m ²)		Maximum number of animals/pen	Height of the shed (cm)
	Covered area	Open area		
Bulls	12.0	24.0	1	175 cm. in medium and heavy rain fall and 220 cm. in dry areas.
Cows	3.5	7.0	50	
Buffaloes	4.0	8.0	50	
Down calver –	12.0	12.0	1	
Young – calves	1.0	2.0	30	
Old – calves	2.0	4.0	30	

Feeding and watering space requirements

Type of animal	Space per animal (cm)	Total manger length in a pen for 100 animals(cm)	Total water tank length in a pen for 100 animals (cm)
Adult cattle & buffaloes	60 – 75	6000 – 7500	600 – 750
Calves	40 – 50	4000 – 5000	400 – 500

MANAGEMENT OF CALVES, HEIFER, PREGNANT, LACTATING AND DRY ANIMALS, AND BULLS AND WORK ANIMALS

Care and management of new born calf

Remove the mucus from the nose and mouth and clean it. If the calf does not start breathing, artificial respiration should be used by pressing and relaxing alternatively, the chest walls with hands. Another method is to hold the calf by the rear legs and lift from the floor with the head down. This may be repeated several times and helps in restoring respiration.

As soon as the calf starts breathing, observe as to whether the navel cord is still attached. The navel cord should be disinfected. The navel cord of the calf is tied about 2.5 cm away from

the body and cut about one centimetre below the ligature. Apply tincture of iodine to the cut end and repeat it 2-3 days. This will prevent infection. Then, if the cow does not lick the calf dry, or if the weather is cold, the herdsman should wipe the calf to clean and dry.

The next important step to follow is to feed the Colostrum **within 15 minutes** of calving, the calf should be fed with colostrum at the rate- $1/10^{\text{th}}$ of body weight and buffalo calves at the rate $-1/15^{\text{th}}$ of body weight. Colostrum containing low fat, high protein, vitamins and minerals forms a balanced feed for new-born calves. This helps to protect the calf against various diseases as it contains antibodies. Colostrum also helps to eliminate the material accumulated in the digestive tract before it was born.

If muconium (first faecal matter) is not voided out, mild enema by dissolving soap in a liter of warm water should be given.

Weaning: If weaning at birth is followed care should be taken to see that adequate colostrum is fed for the first 3-4 days. If weaning is practised 4 days after calving, then further ration has to be fed as per the schedule described.

Calf rearing system varies with the facilities available to farmers. They may be reared indoors or outdoors or partly indoors and partly outdoors. The important factors to be considered are:

1. Availability of quality fodder.
2. The humid tropical environment is ideal for the proliferation of internal parasites and it is very difficult to keep the calves free from massive infection if they are grazing.
3. Outside grazing may not provide sufficient nutrients from optimum growth.
4. Climatic stress affects growth and utilization of feed nutrients.

In humid tropics, it may be desirable to keep the calves indoor in day time and outdoor at night. This will reduce parasitic infection also. Thus, it is advantageous to keep new born calf in individual pen for the first 3-4 weeks of age. Calves that are running in batches often suckle or lick each other after feeding and it is a good practice to keep them in their ties for some time after milk feeding. Hair swallowed by the calves after suckling each other often form a hard ball in the abomasum and this is a constant cause of digestive disturbances. Cleaning the mouth of the calves after each milk feeding is a sanitary practice. The calf pens should provide comfort and easy cleaning.

Identification: This is essential for good management, especially in breeding farms. The best method of permanent identification is by tattooing the inside of the ear with indelible ink. Metal ear tags or button with letters and numbers may be inserted in the ear as a means of identification. Neck strap or neck-chain with a number plate attached, make an easy method of identification.

Body weight: of the calf is recorded on a balance along with length, breadth and height for the computation of milk allowance. Well fed cross bred calves on an average should gain 400 grams a day or 2.5 to 3 kilograms per week.

Removal of supernumerary teats is also important and this has to be carried out before development begins. This is usually done in the first month of age with the help of a short pair of

sterile scissors. If the extra teat is at the base of the normal teat, veterinary help may be resorted to remove it.

Dehorning or disbudding: Disbudding is carried out either by the use of hot iron, caustic sticks and electrical dehorning cone. Both the buds are destroyed at the early age (within 3 to 10 days).

Feeding Management: Utensils in which whole milk or milk replacer is fed to calves, must be clean and should be cleaned after each feeding. Severe digestive upsets can result from such contamination of the feeding parts. Either the nipple pail or the open type bucket are satisfactory for feeding milk or milk replacer. It may take less effort to teach a calf to nurse from a nipple pail than to drink from an open pail. Also, a rapid consumption of milk from an open pail may at times cause digestive upsets.

To teach a calf to drink from an open pail, place your fingers in its mouth and after it starts to nurse lower its head into a pail of warm milk or milk replacer. It may be necessary to repeat the process several times. A stubborn calf may need to be backed into a corner and restricted by standing aside its neck. Maintaining the temperature of the milk as removed from the cow is not necessary. However, it should be aimed to feed the milk at this temperature itself. However, cold milk at 35° to 40° F may cause calves to shiver and chill.

At any rate, calves should not be overfed.

CARE AND MANAGEMENT OF HEIFERS.

1. Heifers are either reared indoors or outdoors for 9-12 months.
2. In case of outdoors rearing protection must be given from the adverse climatic condition, rain, hot sun, snow, heavy winds biting flies, parasitic infestation etc.
3. Heifers of exotic breeds performance is slow in tropical areas in the out doors.
4. Small breeds attain age at first breeding in 15 months and large breeds in 18 months.
5. Adequate live weight would be 200-225 kg for smaller breeds and 275 kgs for the larger breeds for breeding.
6. Cross bred heifers show signs of heat as early as 10 months of age but none of them are mated until attain the body weight of 225/275 body weight or a minimum of 14 months age.
7. Age at first calving 25-28 months.
8. Feeding of Heifers.
 - A. Concentrate feed:
 - a. 3 months- 1 year : 1 kg.
 - b. Above one year : 2 kg.
 - c. Pregnant Heifers : 3-3.5 kg.
 - B. Green Fodder
 - a. Leguminous fodder : 10 kg.

b. Non Leguminous fodder : 25 kg.

C. Dry fodder : 3 kg.

9. Vaccination Schedule.

Brucell Strain 19 –to prevent abortion due to Brucellosis-Vaccinated at the age of 4-6 months of Calf.

Other Contagious Disease Vaccination are done accordingly prior to the prevalence of disease and prior to rainy season

Foot and Mouth disease : Once in 4 months.

Rinderpest : 1-3 years.

Haemorrhagic Septicaemia : 1 year.

Anthrax : 1 year.

Black Quarters : 1 year.

10. Housing :

a. Outdoor system / Grazing method

- Reared chiefly of grazing
- Care to be taken not to overstock on limited grazing land.
- Rotational grazing.
- Arrangement of shade and drinking water – pasture land
- Concentrate feed is to be provided – Centrally located feed trough.
- Protect from rain.

b. Indoors

- Management in covered area.
- Sufficient concentrate feed and fodder provided.
- Steaming up of heifers.

Feeding grains to pregnant heifers prior calving at 1.5 Kg. per day. It helps in their growth, bear the stress of foetus. It produces more milk after calving and increases lactation length.

Training of heifers

Heifers in early stage should be lead with halter to make them docile. Pregnant Heifers are to be housed along with milking cows at least a month prior to calving. The udder should be washed warm water and mopped with cloth to accustom her to feel the hands in this place. Just few days prior to calving pulling teats slightly may be practiced so that heifer would not excited.

Control of Parasites – Dewormed periodically at 3 –4 months intervals Grooming is to be practiced to avoid ecto- parasites.

CARE, MANAGEMENT OF PREGNANT ANIMALS

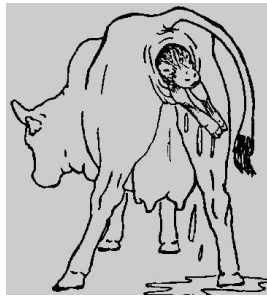
1. Identify pregnant animal after 90 days of artificial insemination if animal does comes to heat again.
2. Provide gentle treatment
3. First quarter of gestation period are critical
4. In early stages of pregnancy disturbances can cause abortion.
5. Provide concentrate feed 3.5 kg per day.
6. Provide 25 – 35 Kg. Greed fodder per day and 5 Kg. Paddy straw.
7. Minimum 45 – 60 days of dry period is essential.
8. Avoid long distance travel.
9. Avoid slippery condition in the shed.
10. Avoid chasing by dogs, bulls or children.
11. Avoid infighting between pregnant animals.
12. Separate pregnant animals from recently aborted animals or carriers of diseases like Brucellosis.
13. Provide adequate clean drinking water
14. Protect against extremes of climate.
15. A few days before the probable date of calving, cow should be transferred to individual calving pens. Pregnant cow may be transferred to calving pen 1 to 2 weeks before the expected calving date. The number of calving pens required on a farm depends on the number of breedable cows and heifer, generally 5 per cent of this number.
16. Ample amount of drinking water, laxative feed and generous supply of bedding may be provided.
17. The calving pen should be scrupulously cleaned and sterilized before bringing in the cow

Signs of approaching parturition

- i. Cow will leave the herd and seek isolation
- ii. Loss of appetite and distress
- iii. Distention of teat and udder, considerable milk appears in the udder and there may be dripping of milk

- iv. Relaxation of pelvic ligament one day before calving, the ligament on the sides of the tail head is loosened so that hollows appear on either side of the backbone and the tail head is raised and the quarters are dropped.
- v. The vulva become enlarged and flabby vi. Animal will be restless and will pace about often trying to kick or scratch the flank region.
- vii. The parturition process has three stages,
 - a. preparatory stage (uterine contraction and dilatation of cervix)
 - b. active expulsive stage
 - c. expulsion of foetal membrane.
- viii. Cow will deliver the calf within 12 hours after commencement of first stage.
- ix. Care must be taken to observe expulsion of placenta (after birth). It should be removed immediately so as to avoid cow eating it.

Normal calving



Management immediately after calving

1. Udder and hind quarter should be washed with lukewarm water containing an antiseptic solution of potassium permanganate lotion and dried with clean cloth.
2. Cows may be milked to relieve the pressure of the udder. If day old weaning is not practiced the calf can be allowed to remain with the mother in the calving pen for 7 to 10 days. Otherwise the calves can be removed immediately to calf pen. If the maternal instinct is more, cow's eyes can be blindfolded before the calf is removed.
3. The placenta should be expelled within 12 hours after parturition, if not it should be removed manually. Before manual removal the body temperature should be noted. In case of pyrexia, attempt should be made systemically to reduce fever. Otherwise systemic infection may establish.

- The cow should be monitored carefully for signs of any metabolic disorders like milk fever, grass tetany, ketosis, and acidosis and should be treated immediately.

CARE AND MANAGEMENT OF LACTATING ANIMALS.

The animals must be protected against inclement weather. Hygiene and sanitation of cattle shed and animals grooming, washing, disinfection etc must be carefully followed. Feeding must have: a) concentrate b) Roughages – Green fodder which include leguminous (1/3) and non-leguminous fodder (2/3) and dry fodder. Thumb rule for concentrate feeding is 450 –500 g Concentrate / Kg. milk production. The concentrate must contain DCP 15%: TDN 75%. The model feed formula may contain maize 33%, groundnut oil cake - 25%, Wheat Bran - 40%, Mineral Mixture- 1% and Salt 1%.

Feed alone constitute 60 per cent of the production cost of milk. Hence, feeding management plays a vital role in farm economy. The nutrient requirement should be determined for maintenance as well as for milk production and to meet the fat percentage in milk and gestation. In general the dry matter from roughage should not exceed 2 per cent of cow's live weight nor should it be less than 1 per cent.

Feeding of dairy cow at different stages of lactation

Quantity of green grass to be given (kg) for animal weighing			Concentrate (kg)
250 kg	300 kg	350 kg	
25	30	35	1.0 kg for every 2.5 kg of milk of average 4% fat percentage, in case of buffalo 1.0 kg for every 2.0 kg of milk produced.

Early lactation

The recently calved high producing cow is unable to eat enough feed to support her milk production. This means that the cow should have enough reserve to store nutrient to be drawn to tide over the period of heavy demand in early lactation, during which period the cow loses weight. This is the period of peak yield. Sometime during this period (usually 6 week),calcium deficiency may occur and in this case the animal must be supplemented with calcium in feed or injected through intravenous route.

Feeding during mid and late lactation

The cow can consume enough feed to meet the various demands for nutrients and the body weight of the cow remains more or less stable. During this period the cow may be fed a well balanced ration of good quality fodder and concentrate according to the milk yield and fat percentage of milk.

During the late lactation, intake ability of the cow exceeds nutrient needs. This is the time when the cow starts needing extra allowance for the growing foetus. This is also the period when the cow can readily replenish the already depleted body reserve and gain weight very fast. From 7 ½ month to 10

months of lactation, cow may be fed 1-2 kg concentrate feed in addition to their nutrient requirement for maintenance and milk production to replenish the condition lost in early lactation.

Frequency of feeding: Dividing the daily ration into 3 or 4 parts and feeding them in so many installments has been found to be useful in overcoming this problem. This also results in greater digestibility and better utilization of protein apart from preventing explosive release of acids.

Animals must be vaccinated periodically. For Rinderpest, Black quarter, Hemorrhagic septicemia, Anthrax-once in a year and for foot and mouth disease once in four months.

CARE AND MANAGEMENT OF DRY COWS

The day from the cow stops giving milk to the day it calves next, can be considered as dry period. Mostly dry cow does not give milk but it is pregnant. In some cases like infertility, the dry cow may be non-pregnant. **Purpose of dry period**

- The mammary gland functions incessantly during the entire lactation period, which results in considerable wear and tear in the secretory tissues of the udder. Dry period give rest to the cow's udder and helps the repair and regeneration of the secretory cells.
- During lactation the high yielders lose condition (body weight), to maintain high milk flow especially greater quantity of nutrient, calcium and phosphorous during lactation. Dry period gives an opportunity for the cow itself to recuperate condition lost during the lactation.
- On the other hand, uninterrupted lactation between calving is known to impair succeeding lactation production. Thus dairy cows need to be dried off before the ensuring calving and should be —steamed up for the next lactation.

Ideal dry period

The optimum length seems to be approximately six weeks for second lactation and older cows, and 60 days for first lactation cows.

Dry period and udder health

The dry period is an extremely important time for udder health for three reasons.

- First, the dry period is a good time for the long-term treatment of cows with a high cell count.
- Second, many of the cases of mastitis in the first month after calving are the result of infections during the last weeks of the dry period.
- Third, the first few weeks after calving are a time of greatly reduced disease resistance for the cow: during this period most clinical diseases (including clinical mastitis) occur. The

degree to which her resistance is lowered depends heavily on the cow's nutrition, hygiene and care during the dry period, transition period and fresh cow period.

Drying off

Principally, there are three methods of drying cows, viz., abrupt cessation of milking, intermittent milking and incomplete milking.

Abrupt/sudden cessation of milking: Sudden cessation of milking cause builds up of pressure in the udder which has no immediate permanent effect on the rate of secretion and so on drying off for a few days. After 4 or 5 days, involution or regression of the secretory cells commences suddenly which is completed in another few days. The fluid trapped within the udder is ultimately resorbed. This method is successful for the low milk yielding cows (less than 9 liters).

Intermittent milking: Milking once every second or third day or even less frequently, is not so effective a method and may even result in mastitis. But the method is preferred for cows already having mastitis; the udder is emptied and infused with antibiotic cream at each milking.

Incomplete milking: Emptying the udder gradually smaller and smaller quantities of milk from the udder spread over a week or so, can at best be preferred for very high yielding cow, in which sudden cessation of milk may cause swelling and pain in the udder.

More rational approach to drying high yielding cow is to reduce ration, especially protein, a couple of weeks prior to the proposed date of drying. In all cases, it is a beneficial precautionary step to wipe the teats with alcohol immediately after the last milking and then apply an antiseptic colloidal seal. This will go a long way in preventing mastitis, especially in cows with weak sphincters. This method is known as “*dry cow therapy*”

Feeding of dry cow

More than half of the calf's foetal growth takes place during the last quarter of pregnancy-the dry period. Feeding of cow during this period is often neglected because the cow is not giving any income. Due to this reason, good fodder and concentrates are generally withheld from the dry cow. This will have adverse consequences on her future production.

A dry cow should be fed adequate quantity of well balanced ration for

- i. Maintenance of the cow
- ii. Forming sufficient reserve for ensuing lactation
- iii. Growth of foetus
- iv. Production of colostrum with high nutritive value.

	Quantity of green grass to be give (kg) for animal weighing			Concentrate (kg)
	250 kg	300 kg	350 kg	

Dry cow	25	30	35	<ul style="list-style-type: none"> • For non-pregnant cows no concentrate is required. • Pregnant cows should be fed additional quantity of 1.5 kg of concentrate from 7th month of gestation • In case of dry cow, allowance up to 1 kg concentrate can be given if the condition of cow is poor or the fodder quality is inferior.
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CARE AND MANAGEMENT OF WORK BULLOCKS

- 60% - 70% of time – allotted to care and management of limbs and neck.
- Avoid over working the bullocks. The work should be evenly distributed.
- Protect the bullocks from rain and inclement weather exposure □ Lean type roof on the side of farmers house.
- Shoe the bullock properly before using them for work on hard ground.
- The hoof should be prepared first and shoe should made to fit the natural shape of hoof.
- Shoeing – road work – once in a month, field work – once in two months.
- Hooves should be hard, black and waxy the two halves should be even. The cleft of hoof should be narrow.
- Grooming is essential as it increases cutaneous respiration, spreads subcutaneous uniformly and parasitic infection is avoided.
- Feeding depends of type work
 1. Normal – 2-4 hours
 2. Heavy - 8 hours (Ploughing, pulling loaded cart)

Maintenance – 1.5Kg. Concentrate

Body weight	Normal work	Heavy work
300 Kg.	2 Kg.	2.5Kg.
400 Kg.	2.5 Kg.	3 Kg.
500	3	3.5

In addition 25 Kg of green and 3 to 5 Kg of dry fodder should be give.

NUTRITION

Nutrition involves various chemical reaction and physiological process which transforms food into body tissue (milk, meat, egg, wool) and activities (Work power). Nutrition involves ingestion, digestion, and absorption of the various nutrients and their transport to all the body cell and the removal of unusable elements and waste products of metabolism.

Nutrients are defined as the substances which can sustain or aids in the support of the life.

Lavoiser - French, a scientist is referred as father of Nutrition. There are two aspects in Animal Nutrition

1. Science of Nutrition – It is the work of Animal Nutritionist
2. Art of feeding of animals. - Good stockman ship.

Feed or feed ingredients that supplies higher-level of major nutrients but contains less than 18 % crude fibre are called as **concentrates** and those having more than 18% crude fibre are classified as **roughage**.

Concentrates containing higher than 18% protein are called **protein rich concentrates** while those containing less than 18% protein are called —**Energy rich concentrates** .

RATION: is the feed allowed for a given animal during a day of 24 Hours.

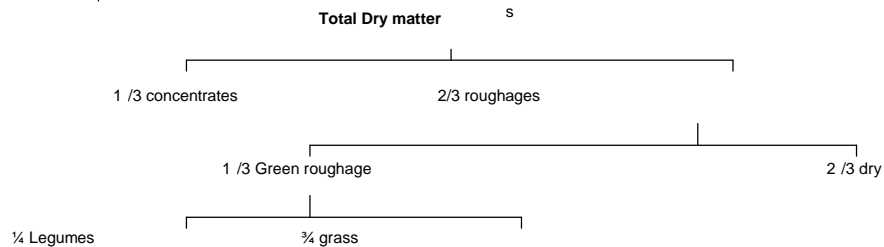
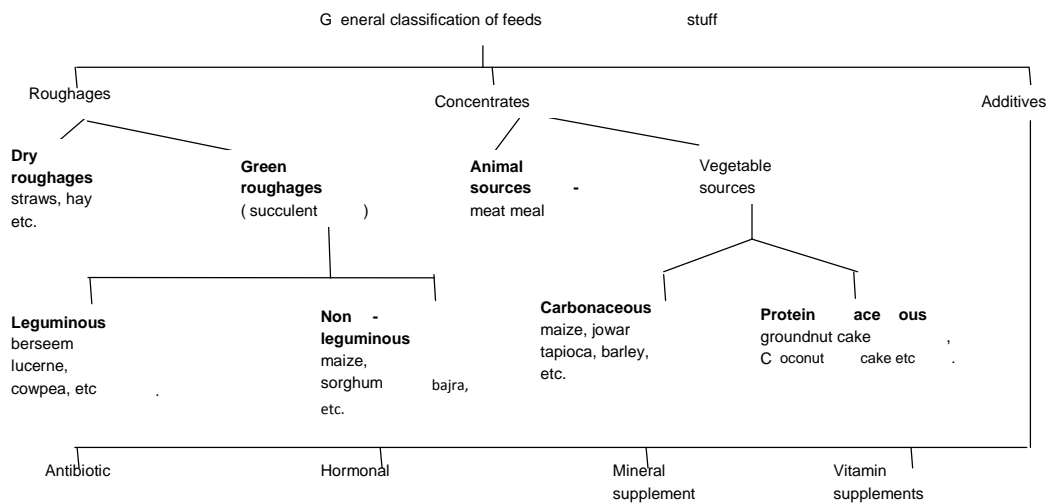
Balanced Ration: Balanced ration which provides essential nutrients to the animals in such proportion and amount that are required for the proper nourishment of the particular animal.

Desirable Characters of a ration.

1. Liberal feeding; Satisfy all the physiological status +waste in preparation + Feeding.
NOT over feeding-Doubly Wasteful.
2. Individual Feeding; Avoid Competition; adequate –individual feeding is always better.
3. Properly Balance: Concentrate; Roughage. A. green fodder (Leguminous and Non Leguminous fodder) B. Dry fodder.
4. Palatable & Variety: Better and balanced mixture of protein, vitamins and other nutrients.
5. Good and Sound: Low quality-unwholesome ingredients, may contain toxic components-poor quality –reduce feed value.
6. Mineral Mixture: Every Kg milk- 0.7%.-Deficit –depletion cause metabolic disease.
Milk contains eg. Ca 3 g and 2.7 g in milk and 3 grams in egg shell.
7. Laxative: otherwise food will be incompletely digested constipation-digestive disorder-utilization –nutrients affected-reduction in production.

8. Bulky: Capacious and satiety.
9. Green Fodder: Source of vitamin-A'-reproduction-Bulky- laxative-cost wise cheap-identified factors-easily digestible.
10. Avoid change in the diet: Bacterial digestion-Prevalence of specified species-sudden change – digestive disorder.
11. Maintain regularity: Glandular Secretion-essential for digestion.
12. Properly Prepared: Hard grain-Coarsely ground-Cottonseed soaked-coarse fodder – chaffed-sprinkled salt-molasses-increases consumption.
13. Labour and cost; ultimate –aim-profit; 70 % cost of production is attributed to feeding of animals.

Classification feed and fodder



Difference Between Concentrate & Roughage

Sl.No	Concentrate	Roughage
1.	10 % Moisture and 90% Dry matter	Dry fodder-10 % Moisture and 90% Dry matter

		Green Fodder-80-90 % Moisture and 10% Dry Matter
2.	Highly Digestible	Comparatively less digestible
3.	Crude fibre less than 18%	More than 18%
4.	Nutritive Value/unit mass is high	Low
5.	Compact in Nature	Bulky
6.	Keeping quality -High	Variable : Dry Fodder – High, Green fodder- Less/low

Common feed ingredients

Carbohydrate rich concentrates	Protein rich concentrates	Fibre rich concentrates
Maize or Corn	Groundnut cake	Wheat bran
Barley	Soyabean meal	Raw rice bran
Oats	Linseed meal	De-oiled rice bran
Sorghum	Mustard cake	
Bajra	Coconut cake	
Mill by-products like flour, polishings	Cottonseed cake	
Molasses	Sesame meal	
Roots and tubers	Pulse protein	
	Sunflower meal	
	Unconventional plant proteins	
	Meat meal	
	Meat and Bone meal	
	Fish meal	
	Blood meal	
	Feather meal	
	Hatchery by-product meal	

MODEL COMPOSITION OF CONCENTRATE MIXTURE OF YOUNG AND ADULT STOCK

IMPORTANCE OF GREEN FODDER PRODUCTION

India has about 15% of world livestock population with only 2% of world's geographical area. The current feed and fodder resources in India can meet only less than 50% of the requirement of its livestock population. The grazing intensity is very high viz., 2.6 cattle unit per ha as against 0.8 cattle unit per ha in developed countries. We are highly deficient in various livestock products, though we have about one-fourth of the total cattle population of the world. The analysis of this situation

reveals that one of the main reasons for the low productivity of our livestock is malnutrition, under-nutrition or both, besides the low genetic potential of the animals.

IMPORTANCE OF GREEN FODDER

- Green fodder is the primary only source of vitamin A for lactation and vitamin A is present in the form of precursor.
- Maintenance & function of the mucous membrane is directly related to vision.
- is essential reproduction a. conception, b. early embryonic mortality, c. maintenance of pregnancy, d. shedding of placenta.
- is essential for the respiratory tract
- is essential in the Gastro intestinal tract/ digestive tract-deficiency causes diarrhoea, mal absorption of nutrients etc.,
- is essential for the urinary tract –deficiency causes stones in the kidney , ureter , bladder.
- During lactation 2000 I.U. of Vitamin 'A' is eliminated in every litre of milk-It is to replenished
- laxative in action
- cheap source of Vitamin 'A'
- source of minerals ,Crude protein, Total digestible nutrients and dry matter is unidentified factors.
- Carotene Content of some fodder
 - a. Agathi 18.3 mg / 100 dry matter
 - b. Lucerne 15.6 mg / 100 dry matter
 - c. Guinea grass-14.2 mg / 100 dry matter
 - d. Desmodium 7.09 mg / 100 dry matter
- Feed should be available to cows at least 20 hours / day.
- Feed at least 60 % of ration during night in the hot weather (Summer)
- Cows will reduce feed intake by about 3.3% for every 2.2 rise in temperature over 24⁰c
- High producing cows will eat up to 12 meals / day each averaging 23 minutes.
- Water should be available *at libitum*.

NUTRITIVE VALUE OF FODDER CROPS

These are highly digestible (55 – 65%) mostly when harvested at a proper time. The crude protein may range from as little as 3% in very mature forages to over 30% in young heavily fertilized grass (on DM basis). The soluble carbohydrate of grasses ranges in the dry matter from 4-30%. The cellulose and hemicellulose are generally within the range of 20-30% and 10-30% of the dry matter respectively. Grass proteins are particularly rich in arginine, glutamic acid and lysine. Green forages are excellent source of carotene 250mg/kg, the precursor of vitamin A.

Generally leguminous fodder contain 8-12% DCP and 45-60% TDN. The phosphorus content of leguminous fodder are poor. It is advisable to supplement a ration containing a large amount of leguminous fodder with a limited quantity of wheat or rice bran, which is rich in phosphorus. The non-leguminous fodder are having 2.5% DCP and 45-60% TDN on dry matter basis. Green fodder is the primary source of vitamin A. Vit.A is present in the form of precursor. Green fodder contains 100 mg carotenes /Kg when compared with about 20 mg /Kg in silage. Carotene requirement of milch animals is 60 mg for production,30 mg for pregnancy, for growth requirement is 11 mg carotene per 100 Kg live weight.

Vit A is directly related to vision, maintenance and function of mucous membrane, essential for reproduction (for conception, maintenance of pregnancy, shedding of placenta), deficiency leads to diarrhoea, mal absorption of nutrients, incidence of stone in the kidney, ureter & bladder. During lactation 2000 I.U. of Vit.A is eliminated in milk.

VALUE OF TREE FODDER

Trees, which can be grown either in combination with agricultural crops or on separate land usually not fit for agriculture, offer opportunity of producing green nutritious fodder for the livestock. It is seldom realised that in some parts of our country, probably more animals feed on shrubs and trees than on grass or grass legume pasture.

- Trees can produce as much, if not more, green fodder per unit area as agricultural fodder crops. The more important desirable agronomic features of a tree species are
- Be reasonably easily and reliably established
- Exhibit a good competitive ability against weeds
- Remain regally productive under repeated ability or grazing and browsing.
- Be well adopted to the particular climatic and edaphic features of the environment
- Require, no or little fertilizer
- Be resistant to local pests and diseases
- Have adequate forage production or be reliably vegetatively propagated and
- Have good nutritive value and reasonable palatability and acceptability to animals.

MILKING METHODS

Definition : Milk is defined as whole, fresh, clean lacteal secretion – complete milking of healthy milch animals excluding that obtained 15 days before or 5 days after calving and containing prescribed % of fat and SNF

PRINCIPLES OF REMOVING MILK:

3 PRINCIPLES

1. Natural Technique (calf suckling)
2. Manual Technique (hand milking)
3. Mechanical Technique (machine milking)

Natural Technique:

This method calf is able to draw the milk from the udder. To extract the milk the calf presses the teat with the tongue and pallet on the other side. The tongue encircles the teat and vacuum is created in the mouth by separating the jaws and retracting the tongue nearly 100-

200 alternating cycles may be observed per minute. A calf's suckling is the best method of evacuating the milk with least damage to the delicate tissue of mammary gland .The art of milking is a cycle. **1.**

Active Phase

2. Restive Phase

ACTIVE PHASE:

- a) Creation of vacuum in the teat canal
- b) Pressure is applied over the teat canal
- c) The base of the teat is apparently occluded with the help of the tip of the tongue with the idea to prevent the back flow of the milk into the gland cistern when the pressure is applied which is followed by restive phase

RESTIVE PHASE:

At this stage 20mm Hg pressure is created at the teat end .in the phase both active and restive phase are alternated and it has been scientifically proved that the amount of pressure applied over the teat canal by calf is 535mm Hg pressure whereas in the case of hand milking the pressure is 310mm of Hg.

In the mechanical milking pressure on the teat is with the range of 350 mm-400mm Hg. In the case of buffalo's 400mm of Hg of pressure is applied but in the case of cattle it can be restricted to 360-380mm of Hg .It has been proved that cycling rate during nursing is twice as fast as hand or machine milking .Thus the difference along with increased cycling rate facilitates and explains the removal of milk from the udder at a faster rate by a calf when compared to hand or machine milking
Hand milking: It is commonly practiced in the harvesting of milk .In order of milking of various teats also differ.

1. Teats crosswise left four and right hind or right four and left hind.
2. Fore quarters teat together
3. Hind quarters teat together
4. Teats appearing more distended should be milked first. The milk should only be squeezed and not drawn

STRIP CUP:

It is a device with four circular plates for each quarter which has the quantity of milk normally first few strip of milk are drawn in the respective circles to assess the physiological status of the udder. If there is any change in color, consistency appearance, etc., the milk should be drawn at the end so as to prevent spreading the disease from one quarter to other.

Prevention of Kicking of the cow:

1. Application of milk man's rope.
2. Anti cow kicker.

Methods of milking

1. Hand milking

2. Machine milking

1. Hand milking

Hand milking is the most common practice in India. Cows are milked from left side.

Stripping and Full hand milking are two commonly used methods of milking. **a. Wet hand milking**

It is done by lubricating the milker's hand and teat either with water or oil. These make the teats dry and chaffed. Crack and sores may appear which will cause pain to the animal. Instead, apply some antiseptic cream after the end of milking in such animal. **b. Dry hand milking**

In this method, the milking operation is practised without lubrication of the milker's hand and teats. It is considered to be the best method as it doesn't cause any chaffing /sore on the teats.

Different Methods of Hand Milking: i.

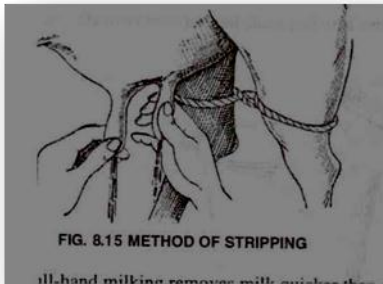
Full hand milking

It comprises holding the whole teat in the ring formed by the palm and the forefingers. Simultaneously, the teat is squeezed using middle, ring and the little fingers and hollow of the palm thus forcing the milk out. This process should be repeated in quick succession. Full hand milking removes the milk quicker than stripping. Cows with large teats and buffaloes are milked by full hand method. Full hand method is superior to stripping.



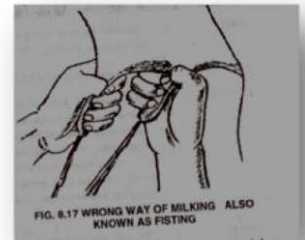
ii. Stripping

It consists of firmly holding the teat at its base between the thumb



and the forefingers and drawing down the entire length of the teat pressing it simultaneously to force the milk to flow down in a string. The process is repeated in quick succession. Both the hands may be used, each holding a different teat stripping alternatively. Stripping is practised in cows with very small teats. It causes more irritation and teat injuries due to repeated sliding of the fingers. In spite of this few

strippings are done to milk the cow completely especially at the end of the milking process. The last drawn milk is called stripping which is richer in fat.



iii. Knuckling: This method is painful to the animal and hence not recommended

iv. Fisting: This method is not normally practiced.

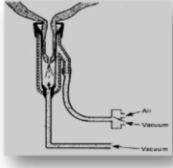
v. Pinching: This method is painful to the animal and hence not recommended

Knuckling

2. Machine milking

It is popularly used now-a-days in most of the western and industrialized countries. They use alternating negative and atmospheric pressure with the help of double chambered teat cup assembly, the continuous partial vacuum inside the inflatable rubber tube that is teat cup liner into which teat is inserted. A partial vacuum and normal atmospheric pressure is alternated in the space between rubber liner and metal shelf of the teat cup by means of pulsator. When negative pressure is applied between the liner and shelf, milk flows from the teat. When atmospheric pressure enters the chamber, the rubber liner inflation collapses with the result the teat is compressed and massaged. The continuous vacuum would cause congestion and irritation of teats.





Ideal practices used in machine milking

1. Get the cow ready by wiping and massaging the udder and teats for half to one minute. Use the cloth dipped and squeezed out of warm mild antiseptic solution.
2. Strip cup test: use the strip cup, draw the first milk into the cup from each quarter and check it for any abnormality.
3. Put on the teat cups promptly.
4. It is a good practice using a timer to avoid over use of machine.
5. Break the vacuum first. Pull down the teat cups and massage the udder with hand.
6. Apply teat dips.
7. Record the milk weight.
8. After every milking, thoroughly and properly clean the machine.
9. The manufacturer's direction may be followed and service the milking machine.

HYGIENIC MILK PRODUCTION / CLEAN MILK PRODUCTION

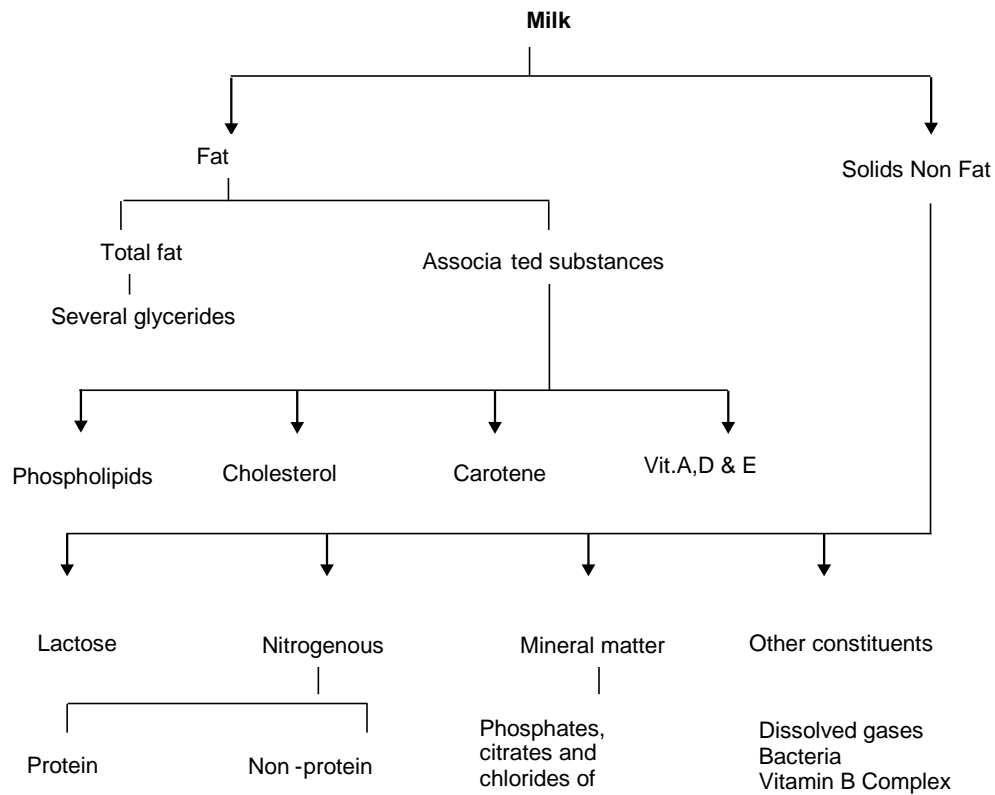
Milk is the lacteal secretion of the mammary glands of animals. It is obtained generally from the cow or the buffalo during the period following at least 72 hours after calving or until the milk is colostrum free. Milk is a white opaque fluid in which fat is present as an emulsion, protein and some mineral matters in colloidal suspension, and lactose together with some minerals and soluble proteins in true solution.

STEPS IN CLEAN MILK PRODUCTION

1. The animal should be washed before milking.
2. 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.
3. Hands of the milker -clean and dry.
4. Nails of hands of the milker -trimmed.
5. Milker -free from all diseases.

6. Dusty feed like Rice polish should not be fed to the animal at the time of milking.
7. Milking shed well ventilated free from flies.
8. Utensils used for milking should be clean, sanitized, smooth and copper free.
9. The hind legs knotted with milk man's rope at the time of milking.
10. Milk is kept in cool place to maintain the flavour and keeping quality.
11. 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.
12. Raw milk with not exceeding 2,00,000 specific count in one ml of milk can be graded as very good raw milk

Milk Composition



K,Na,Ca,Mg: Vitamin C traces of |
 Cu, I
 Fe, chromium,
 cobalt,
 manganese
 Zinc.

Average composition of milk of different mammals (in per cent)

Species	Water	Fat	Protein solids	Total	SNF	Lactose	Ash
Human	87.43	3.75	1.63	12.57	8.82	6.98	0.21
Cow	86.61	4.14	3.58	13.19	9.25	4.96	0.71
Buffalo	82.76	7.38	3.60	17.24	9.86	5.48	0.78
Goat	87.00	4.25	3.52	13.00	7.75	4.27	0.86
Sheep	80.71	7.90	5.23	19.29	11.39	4.81	0.90
Camel	87.61	5.38	2.98	12.39	7.01	3.26	0.70
Mare	89.04	1.59	2.69	10.96	9.37	6.14	0.51
Breed	Total solids		Fat	Protein	SNF	Lactose	Ash
Red Sindhi	13.66		4.90	3.42	8.76	4.81	0.70
Jersey	14.91		5.37	3.73	9.54	4.93	0.70
Friesian	12.26		3.40	3.13	8.86	4.86	0.67
Crossbred	13.13		4.50	3.37	8.63	4.92	0.67

FACTORS AFFECTING QUALITY OF MILK PRODUCTION

The milk from a individual cow is subject to variation in chemical composition and amount produced is not recognized. Some of the variations from day to day are called

—Normal variations and no causative factor has been associated to them.

Other variations in the quantity have been associated to them due to a large number of factors

Normal Variations

It is not uncommon for fat % to vary as much as % and for milk production to vary as much as %. Usually a low fat % accompanied a low milk production is accounted for failure of —Complete letting

down of milk, the later part of milk is rich in fat. The other constituents of milk also vary from day to day although the magnitude of variation is not so great as that of the milk fat and the amount of milk. In the order of the degree of variation, fat, protein are first, lactose next and salts are the least. The degree of variation for the various constituents is as follows.

S.No	Constituents	Minimum	Maximum
1	Fat	2.60	8.37
2	Protein	2.44	6.48
3	Lactose	2.41	6.11
4	Ash	0.56	0.93
5	Total Solids	10.56	17.9
6	Solid not Fat	7.20	11.90

Factors affecting milk composition

I. Genetic factors

a. Breed and individual cow

Milk composition varies considerably among breeds of dairy cattle: Jersey and Guernsey breeds give milk of higher fat and protein content than Shorthorns and Friesians.

Zebu cows can give milk containing up to 7% fat. **b.**

Variability among cows within a breed

The potential fat content of milk from an individual cow is determined genetically, as are protein and lactose levels. Thus, selective breeding can be used to upgrade milk quality. Heredity also determines the potential milk production of the animal. However, environment and various physiological factors greatly influence the amount and composition of milk that is actually produced. Herd recording of total milk yields and fat and SNF percentages will indicate the most productive cows, and replacement stock should be bred from these.

II. Environmental factors

a. Interval between milking

The fat content of milk varies considerably between the morning and evening milking because there is usually a much shorter interval between the morning and evening milking than between the evening and morning milking. If cows were milked at 12-hour intervals the variation in fat content between milking would be negligible, but this is not practicable on most farms. Normally, SNF content varies little even if the intervals between milking vary. **b. Stage of lactation**

The fat, lactose and protein contents of milk vary according to stage of lactation. Solids-not-fat content is usually highest during the first 2 to 3 weeks, after which it decreases slightly.

Fat content is high immediately after calving but soon begins to fall, and continues to do so for 10 to 12 weeks, after which it tends to rise again until the end of the lactation.

c. Age

As cows grows older the fat content of their milk decreases by about 0.02 percentage units per lactation. The fall in SNF content is much greater. **d. Feeding regime**

Underfeeding reduces both the fat and the SNF content of milk produced, although SNF content is more sensitive to feeding level than fat content. Fat content and fat composition are influenced more by roughage (fibre) intake. The SNF content can fall if the cow is fed a low-energy diet, but is not greatly influenced by protein deficiency, unless the deficiency is acute. **e.**

Disease

Both fat and SNF contents can be reduced by disease, particularly mastitis.

f. Completeness of milking

The first milk drawn from the udder is low in fat while the last milk (or strippings) is always quite high in fat. Thus it is essential to mix thoroughly all the milk removed, before taking a sample for analysis. The fat left in the udder at the end of a milking is usually picked up during subsequent milking, so there is no net loss of fat.

Pre requisites for good milking

Milking is an art requiring experience and skill. Milking should be done gently, quietly, quickly, cleanly and completely. Cows remaining comfortably yield more milk than a roughly handled and excited cow. Maintenance of clean conditions in the milking barn results in better udder health and producing milk that remains wholesome for longer period. The milking process should be completed within 5 to 7 minutes. Complete milking has to be done. If any residual milk is left it may act as nidus for mastitis causing organism and the overall yield also getting affected.

Preparation for milking

1) Dairy cows and sheds

1. Milking barn should be thoroughly washed and scrubbed after each milking and kept clean and dry before the next milking starts.
2. Dusty feed and silage should be avoided in the milking barn.
3. The hindquarters, thighs and udder should be washed thoroughly before milking.
4. If more hair growth is seen in the udder region, it should be clipped periodically.
5. Buffaloes should be invariably washed before milking.
6. Just before milking udder should be wiped in dry cloth.
7. The teats should be dipped in weak antiseptic solution. In cold weather, warm antiseptic solution can be used. **2) Milkers and pails**

1. Milker's hands and milking pails / cans should be thoroughly washed or scrubbed and kept clean.
2. Milkers should wear clean clothes and cover their heads with suitable cap so as to prevent loose hair falling in the milk.
3. The nails should be periodically trimmed and made smooth. Hands should be thoroughly washed and cleaned with antiseptic solutions.

DISEASES OF CATTLE – CLASSIFICATION – SYMPTOMS - PREVENTING AND CONTROL MEASURES.

Health

The condition in which all the organs and tissues in the system functions normally and harmoniously. Health is fundamental for a sound enterprise.

Disease

Any change from normal state either to single or great extent is called disease stage. Most of the disease can be avoided by proper attention, sanitation, hygiene, nutrition and management practices. **Control of Disease**

- Provide well ventilated and proper housing
- Provide balanced nutritious diet
- Strict hygiene and sanitation of animal houses.
- Adhere regular and routine 'vaccination' schedule □ Avoid entry of outsiders within the farm-premises.
- Follow up of latest scientific know how and management practices.
- Prevention is better than cure and so periodical vaccination
- Quarantine the newly purchased animal to avoid spread of disease

Classification of disease

Infectious or contagious	Non infectious or non contagious
<p><i>Bacterial</i> a) Anthrax b) Black quarters c) Hemorrhagic septicemia d) T.B e) Brucellosis f) Mastitis</p>	<p><i>Metabolic</i> Milk fever or Hypocalcaemia Acetonemia or Hypo glycaemia, Ketosis</p>
<p><i>Viral</i> a) Rinderpest b) Foot and Mouth Disease (FMD) c) Epimeral fever</p>	<p><i>Dietary</i> Tympanites or Bloat, impaction Non specific enteritis</p>
<p><i>Parasitic</i> Ecto parasite : Tick, lice and mite Endo parasite : Tape, Round</p>	
<p><i>Fungal</i> Aflatoxicosis</p>	

BACTERIAL DISEASES

ANTHRAX

B.anthraxis causes Anthrax in animals. *Bacillus anthracis* spores remain viable for many years in soil, water and animal hides and products. Cattle, sheep and goats are most susceptible to infection. **Symptoms**

- In peracute septicemia death occurs within 2 hours after animal collapsing with convulsions, sudden death in animals that appeared normal is common.
- In acute septicemia death occurs within 48 to 96 hours clinical signs include fever, anorexia, ruminal stasis, hematuria and blood tinged diarrhea.
- Pregnant animals may abort and milk production often abruptly decreases.
- Terminal signs include severe depression, respiratory distress and convulsions. **Diagnosis**
- Examination of blood films from dead animals made by puncturing the superficial vein of the ear or in the region of the foot. **Prevention and Control**
- Prevention of anthrax in animals is aided by active immunization. The organism is susceptible to penicillin-G, tetracyclines, erythromycin and chloramphenicol.

BLACK QUARTER

C. chauvoei causes black quarter or black leg in Cattle. Gram positive, rod shaped with rounded ends. Worldwide distribution in soil and pastures.

Symptoms

The disease usually occurs in young cattle of 6 months to about 2-3 years of age. Crepitating swelling in the hind or fore quarter, lameness, muscles shows trembling with violent twitching. Death usually occurs within 24 hours. **Diagnosis**

- Based on Symptoms **Control and prevention**
- Hyper immune serum (HIS) is used to control explosive outbreaks. Penicillin along with HIS is used to treat the disease.
- Oxytetracycline & Chlortetracycline can also be employed effectively in early stages.

HAEMORRHAGIC SEPTICEMIA

Pasteurella multocida is small Gram –ve rods or coccobacilli that show *bipolar staining*

Symptoms

- Fever, a sudden drop in milk yield, signs of abdominal pain, severe diarrhoea and dysentery, respiration becomes rapid and shortly before death the mucous membranes appear cyanotic.
- In less acute cases there will be odema development in the region of the head, neck and brisket. The nasal discharge may be blood stained or purulent. Death occurs within 2-4 days. **Diagnosis**
- By symptoms and lesions **Control and prevention**
- *Pasteurella* is amenable to Penicillin-G, streptomycin, chloramphenicol, chlortetracycline, sulpha and trimethoprim, enrofloxacin and oxytetracycline. □ Vaccination

VIRAL DISEASES

FOOT AND MOUTH DISEASE

Causative agent - Members of the family Picornaviridae, genus Aphthovirus and species Foot and mouth disease virus. Foot and mouth disease (FMD) is the most contagious disease of mammals and cause severe economic loss in susceptible cloven-hoofed animals (cattle, pigs, sheep, goats, and water buffalo).

- Smallest of the Animal virus : 7 types virus : O,A,C Asia I, SAT 1,2,3

- Transmission : Direct contact : Thro water : manure : Pasture and cattle attendant

Symptoms

The disease is characterised by the formation of vesicles (fluid-filled blisters) and erosions in the mouth, nose, teats and feet. Initial signs are pyrexia (39.4-40.6°C), dullness, anorexia, and fall in milk production. These signs are followed by excessive salivation; drooling, serous nasal discharge; shaking, kicking of the feet or lameness; and vesicle (blister) formation in the tongue, dental pad, gums, soft palate, nostrils, muzzle, interdigital space, coronary band, and teats. Pregnant cows may abort, and young calves may die without developing any vesicle. The course of an FMD infection is 2 to 3 weeks. Secondary infection may delay recovery.

Diagnosis

- Symptom and lesion **Treatment:**
- Antibiotics may be administered to counter bacterial infections.

Prevention & Control:

- Thorough disinfection of shed, utensils, clothes of attendants.
- Vaccination – polyvalent – once – 4months or varies with type of vaccine

METBOLIC DISEASES

MILK FEVER: (Parturient paresis)

Milk fever is a metabolic disease in cows soon after calving. Due to fall in serum calcium level in cows after calving as a result of failure to mobilize calcium reserves and of the development of negative calcium balance in late pregnancy.

Symptoms:

Disease flares up within 72 hours of calving initially the cows show excitement, incoordination of movement muscular tremors in limbs and head, lying in recumbent position with her head directed towards flank. In final stages subnormal temperature, dilatation of the pupil, impalpable pulse, coma and death.

Diagnosis of the disease is based on the occurrence of milk fever in recently calved animals.

Treatment & Control:

Dramatic recovery by intravenous administration of 300-400 ml calcium borogluconate with Vitamin D3 injected intramuscularly. Continued mixing of ½ liter of supernatant lime water for cow may reduce the incidence.

KETOSIS: (Acetonaemia)

Disturbance of carbohydrate metabolism in high producing dairy cattle that leads to hypoglycaemia and appearance of ketone bodies.

Causes:

Dr. Abha Nutan Kujar, YBN University

Disease is caused by deranged metabolism of carbohydrate and volatile fatty acids resulting in reduced level of sugar in blood (hypoglycemia), increased level of ketones in blood (ketonemia) and in urine (ketonuria) **Symptoms:**

Cardinal signs in digestive and nervous type of ketosis usually appear in good milkers from 7 days to six weeks after calving. Loss of appetite, rapid loss of weight and marked reduction in the milk yield observed in digestive type of ketosis. In nervous type symptoms include depression, a starring expression, walking, in circles, treading with the feet, incoordination of movements, convulsions, sudden falling on the ground with wide expression of bulged eyes. Respiration becomes shallow emanating fruity odour on the breath.

Diagnosis:

Examination of ketone bodies in the urine helps in diagnosing the disease besides the symptoms noticed.

Control and Treatment:

Intravenous administration of 500-1000 ml of 40 per cent glucose, Repeat for 5 days. Cases not responding to glucose therapy, intramuscular injection of 100-200 mg of hydrocortisone or 50 to 200 mg of prednisolone acetate. Concentrate feeding with good fodder during dry period in high yielding cows, ½ to one kg maize or cholam made as gruel mixed with ¼ kg of jaggery or molasses daily to be given to cows nearing parturition.

BLOAT: (TYMPANY)

Bloat is a disease of ruminants in which rumen and reticulum is over distended with the gases of fermentation.

Cause:

Excess intake of fresh legumes and feeding of high grain ration lead to frothy bloat. Obstruction to normal expulsion of gases from rumen by choking the oesophageal passage by corncob, turnip and sugar beet cause free gas bloat.

Symptoms:

Acute form of tympany results in sudden death before rendering any aid to the affected animal. In acute cases, the distension of the rumen occurs quickly, the flank and the whole abdomen is enlarged. On percussion the left flank produces a drum like sound, initially the animal frequently gets up and lies down, kicks at belly and even rolls. Breath becomes difficult and is evidenced by oral breathing, protrusion of tongue and salivation. When the distension of abdomen becomes extreme, the animal exhibits uncoordinated movement, inability to stand, falls all of a sudden. Collapse and death occur quickly. In chronic tympany, the distension of abdomen and intra-abdominal pressure are not serious.

The gas is free but retained because of obstruction of the passage thereby preventing normal eructation of gases.

Diagnosis:

Based on characteristic symptoms of distension of abdomen and distress by the affected animal.

Control and Treatment:

In per acute cases puncture the rumen with a sharp knife or with a trocar and canula to expel the gases. Administer orally oil of turpentine 60 ml well mixed with one litre of groundnut oil or gingelly oil or cocounut oil. After six to eight hours administer powdered ginger 30 grams, Asafoetida 30 gram, well mixed to jaggery. Fresh legumes should be wilted and then fed to stallfed animals. Feed dry roughages before turning the cattle to luxuriant pasture to avoid bloating.

ACIDOSIS

Rumen acidosis is a metabolic disease of cattle. Acidosis is occur when the pH of the rumen falls to less than 5.5 (normal is 6.5 to 7.0). In many cases the pH can fall even lower. The fall in pH has two effects. Firstly, the rumen stops moving, becoming atonic. This depresses appetite and production. Secondly, the change in acidity changes the rumen flora, with acid-producing bacteria taking over. They produce more acid, making the acidosis worse. The increased acid is then absorbed through the rumen wall, causing metabolic acidosis, which in severe cases can lead to shock and death.

Cause

The primary cause of acidosis is feeding a high level of rapidly digestible carbohydrate, such as barley and other cereals. Acute acidosis, often resulting in death, is most commonly seen in ‘_barley beef’ animals where cattle have obtained access to excess feed. In dairy cattle, a milder form, sub-acute acidosis, is seen as a result of feeding increased concentrates compared to forage.

Symptoms

Acute acidosis often results in death, although illness and liver abscesses may be seen before hand. Cattle may become depressed, go off feed, have an elevated heart rate or diarrhea.

Sub-acute:

- Reduced feed intake
- Poor body condition and weight loss
- Unexplained diarrhoea
- Temperature
- Pulse rate and respiratory rate may rise
- Lethargy

Treatment

Because subacute ruminal acidosis is not detected at the time of depressed ruminal pH, there is no specific treatment for it. Secondary conditions may be treated as needed.

Prevention

The key to prevention is reducing the amount of readily fermentable carbohydrate consumed at each meal. This requires both good diet formulation (proper balance of fiber and nonfiber carbohydrates) and excellent feed bunk management. Animals consuming wellformulated diets remain at high risk for this condition if they tend to eat large meals because of excessive competition for bunk space or following periods of feed deprivation.

Feeding excessive quantities of concentrate and insufficient forage results in a fiberdeficient ration likely to cause subacute ruminal acidosis. The same situation may be seen during the last few days before parturition if the ration is fed in separate components.

Including long-fiber particles in the diet reduces the risk of subacute ruminal acidosis by encouraging saliva production during chewing and by increasing rumination after feeding. However, long-fiber particles should not be easily sorted away from the rest of the diet; this could delay their consumption until later in the day or cause them to be refused completely.

Ruminant diets should also be formulated to provide adequate buffering. This can be accomplished by feedstuff selection and/or by the addition of dietary buffers such as sodium bicarbonate or potassium carbonate. Dietary anion-cation difference is used to quantify the buffering capacity of a diet.

Supplementing the diet with direct-fed microbials that enhance lactate utilizers in the rumen may reduce the risk of subacute ruminal acidosis. Yeasts, propionobacteria, lactobacilli, and enterococci have been used for this purpose. Ionophore (eg, monensin sodium) supplementation may also reduce the risk by selectively inhibiting ruminal lactate producers.

MASTITIS

Introduction

- Mastitis is an inflammation of the mammary gland. In which the milk undergo physical, chemical and microbiological changes whereas mammary glandular tissue undergo physical and pathological changes. In which infected milk colour, consistency change and contains more amount of leucocytes. **Etiology**
- Mastitis is caused majorly by Staphylococcus, Streptococcus and coliform bacteria and less importantly by other organism such as other bacteria, viruses, and fungus.

Source of infection

- S.agalactiae and S.aureus resides primarily in the udder of infected cows.

- Exposure to uninfected quarters is limited to milking process.
- *Streptococcus uberis*, *S. dysgalactiae* and coliforms are normal inhabitants of the cows environment.

Transmission

Infection occurs via the teat canal – contaminated environment – skin of udder, milking equipment, milker etc. **Clinical signs**

- Per acute form: Pyrexia, anorexia, respiratory distress, swollen, hot and painful udder. Cessation of milk production. Exudate are often blood stained. Mostly, *Staph. aureus*, *Str. Dysgalactiae*, *Cory. pyogenes*, *E. coli*, and *P. aeruginosa*.
- Acute form: Swollen udder, changes in quality of milk. Milk become curd like, yellow, brown fluid with flakes and clots.
- Subacute form: No changes in the udder tissue.
- Chronic form: Udder is haemorrhagic, and fibrotic. Swollen and palpable supra mammary lymphnode,. Udder is thick, firm, nodular and atrophic, yellowish or white fluid with clots and flakes.

Diagnosis

- Physical examination of the udder. **Treatment**
- Stripping out the milk from the infected quarters. Cleaning of infected quarters with normal saline and distilled water. Infusion of antibiotic therapies immediately after the infection. Continuous use antibiotics as per the antibiogram.
- Use of inactivated vaccine containing *Str. agalactiae*, *Str. uberis*, *Staph. pyogenes*, *Staph. aureus* and *E. coli* in some countries.

Control:

- Hygienic measures are important.
- Animals diagnosed positive should be milked at last.
- Milkers should wash their hands before milking and should use well washed white overalls.
- A separate clean cloth for each cow is used for washing the udder with a disinfectant.
- The first stream of milk from each quarter should not be allowed to drop on floor but collected in a separate container. Milkers should not wet their hands with first stream of milk.

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