INTRODUCTION TO LIVESTOCK & POULTRY MANAGEMENT

THEORY NOTES

FOR

VETERINARY AND LIVESTOCK DEVELOPMENT DIPLOMA (1ST YEAR)

Name_____ **Admission No.** _____

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LIVESTOCK PRODUCTION & POULTRY MANAGEMENT

Livestock Management

Livestock management involves integrated application of the principles of animal breeding, feeding, housing, organization and disease control in a manner suitable for a particular situation.

Animal production involves

- Nutrition
- Fodder production
- Better breeding
- Regular reproduction
- Better disease prevention

But better management includes

- Economic feeding
- Identification of better breeding stock
- Maintenance of their records and implementation of mating plan
- Monitoring the reproductive efficiency

General principles of animal management

The basic requirements for the welfare of livestock are :-

- Provision of readily accessible fresh water
- Nutritionally adequate feed as required
- Provision of adequate temperature and ventilation
- Adequate freedom for movement and to stretch their body
- Sufficient light for satisfactory inspection and also for feeding
- Rapid diagnosis and treatment of injuries and disease
- Emergency provision in the event of breakdown of essential mechanical equipment
- Flooring which neither harms nor cause undue stress to the animal
- Domestication and rearing of animals for production causes considerable strain on the body of the animals.

It is therefore essential that these animals should be looked after well.

ZOOLOGICAL CLASSIFICATION OF DOMESTIC ANIMALS

- Kingdom- Animalia.
- Phylum - Chordata (with back bone animals, birds and fish)
- Class- Mammalia

Mammals possess mammary gland or udder, give birth to a fully developed young one and nurse their young ones with milk produced in the mammary gland or warm blooded hairy animals that produce their young alive and suckle mammary gland.

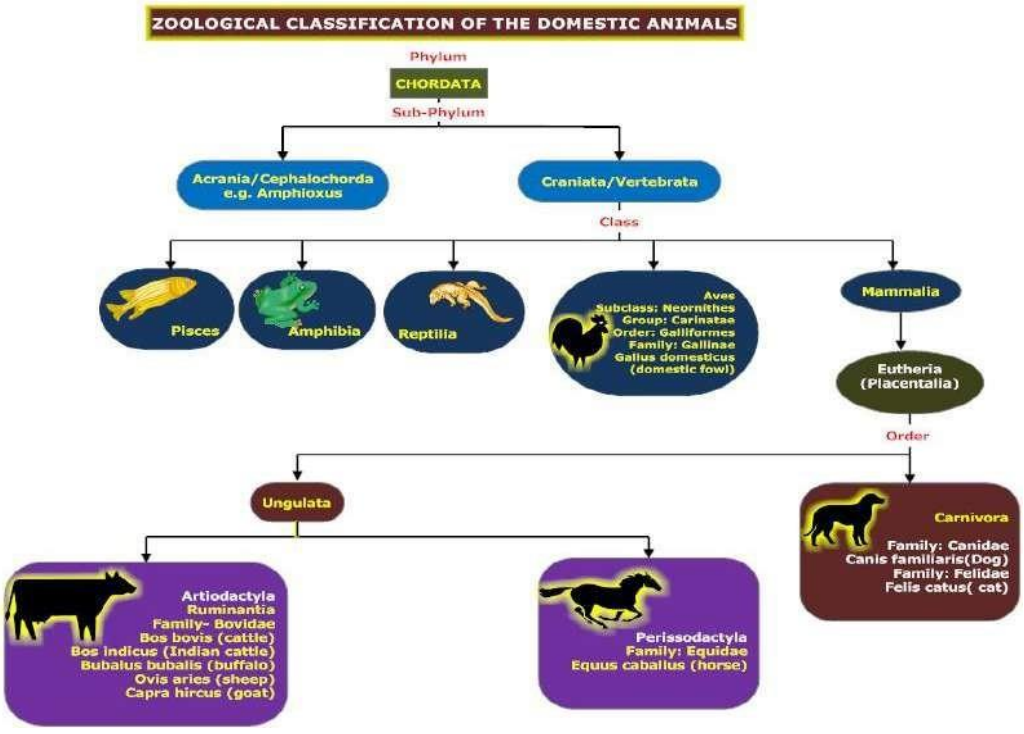
- Sub class - Eutheria (with placenta)
- Order - Ungulata (cloven hoofed animals)
- Sub Order - Artiodactyla and Perissodactyla.

Artiodactyla

- Cloven hoofed animals, the major group of herbivorous animals, stomach compounded and with intestines, enlarged for plant digestion.

Perissodactyla

- They are distinctive from other mammals in that only one toe is developed on each foot as well as non ruminant.



CATTLE AND BUFFALO			
CLASSIFICATION	**ZEBU CATTLE**	**EXOTIC CATTLE**	**BUFFALO**
Kingdom	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia
Sub-Class	Eutheria	Eutheria	Eutheria
Order	Ungulata	Ungulata	Ungulata
Sub - Order	Artiodactyla	Artiodactyla	Artiodactyla
Family	Bovidae	Bovidae	Bovidae
Genus	Bos	Bos	Bubalus
Species	indicus	taurus	bubalis

GOAT, SHEEP AND PIG			
CLASSIFICATION	**GOAT**	**SHEEP**	**PIG**
Kingdom	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia
Sub-Class	Eutheria	Eutheria	Eutheria
Order	Ungulata	Ungulata	Ungulata
Sub-Order	Artiodactyla	Artiodactyla	Artiodactyla
Family	Capridae	Ovidae	Suidae
Genus	Capra	Ovis	Sus
Species	Hircus	aries	domesticus

CAMEL, HORSE AND DONKEY

CLASSIFICATION	CAMEL	HORSE	DONKEY
Kingdom	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia
Sub-Class	Eutheria	Eutheria	Eutheria
Order	Ungulata	Ungulata	Ungulata
Sub-Order	Artiodactyla	Perissodactyla	Perissodactyla
Family	Camilidae	Equidae	Equidae
Genus	Camelus	Equus	Equus
Species	dromedarius	caballus	asinus

COMMON ANIMAL HUSBANDRY TERMS

DETAILS	CATTLE	BUFFALO	SHEEP	GOAT	PIG	HORSE
Species	Bovine	Bovine or Bubaline	Ovine	Caprine	Swine	Equine
Groups of animals	Herd	Herd	Flock	Flock or band	Drove or herd or stock	Pack
Adult male	Bull	Buffalo bull	Ram or tup	Buck	Boar	Stallion
Adult female	Cow	She buffalo or buffalo cow	Ewe	Doe	Sow	Mare
Young male	Bull calf	Buffalo bull calf	Ram lamb or Tup lamb	Buckling or male kid	Boarling	Colt
Young female	Heifer calf	Buffalo heifer calf	Ewe lamb or gimmer lamb	Goatling	Gilt	Filly

New born	Calf	Buffalo calf	Lamb	Kid	Piglet or pigling	Foal
Castrated male	Bullock or steer	Buffalo bullock	Wether or wedder	Castrated	Hog or stag or barrow	Gelding or geld
Sterilized female	Spayed	Spayed	Spayed	Spayed	Spayed	Spayed
Female with its offspring	Calf at foot	Calf at foot	Suckling	Suckling	Suckling	Foal at foot
Act of parturition	Calving	Calving	Lambing	Kidding	Farrowing	Foaling
Act of mating	Serving	Serving	Tupping	Serving	Coupling	Covering
Cry	Bellowing	Bellowing	Bleating	Bleating	Grunting	Neighing
Chromosome number	60	50	54	60	38	64

HOUSE OF ANIMALS

- Cattle and buffalo : Shed / Byre / Barn
- Sheep and goat : Pen/barn
- Pigs : Sty
- Dogs : Kennel
- Horse : Stable
- Rabbit : Hutch

SOUND PRODUCED BY ANIMALS

- Cattle and buffalo : Bellowing
- Sheep and goat : Bleating
- Pigs : Grunting
- Dogs : Barking
- Horse : Neighing

MEAT OF ANIMALS

- Cattle : Beef
- Buffalo : Carabeef
- Sheep : Mutton
- Goat : Chevon
- Pigs : Pork
- Rabbit and Poultry : White meat

DIFFERENCE BETWEEN CATTLE AND BUFFALO

CATTLE	BUFFALO
Dewlap is present	Dewlap is absent
Rounded and conical horns	Broad and flat horns
Legs are comparatively less stronger With smaller hooves	Legs are strong with larger hoof
More no. of functional sweat glands	Less number of functional sweat glands
Dense hair growth on the body	Sparse hair growth on the body

DIFFERENCE BETWEEN SHEEP AND GOAT

SHEEP	GOAT
Usually only one young one is born	Triplets and twins are often produced
Sheep are short	Goats are tall
Female sheep has no horns but male twisted	Both sexes have horns but not have twisted horns
Wattles and beards are absent	Wattles and beards are present
Sheep have dense growth of wool on body surface	Moderate growth of hair
Tail is longer	Tail is shorter
Body conformation is rounded	Body conformation is angular and laterally flattened

CARE & MANAGEMENT DURING & AFTER PARTURITION

- 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.
- Ample amount of drinking water, laxative feed and generous supply of bedding may be provided.
- The calving pen should be scrupulously cleaned and sterilized before brining in the cow.
- Calving pen
  - It is a individual loose box or stall used for calving, which should be 3 m x 4 m size (12 m^2) and well ventilated. Sufficient lighting is essential.
  - It provided better protection to the cow and calf and avoid disturbances from other cows.
  - Special attention can be provided for which attendant quarters may be nearer to calving pen.
  - Attendant quarters may be established nearer to calving pen to monitor calving process during night time.
  - n the calving pen following items should be made available in all time.
- Antiseptic solution like tincture Iodine or Povidone iodine, thread, scissors, lubricants like liquid paraffin, vegetable oils, obstertical equipment like hook, snare, calf puller, wire saw; emergency drugs like local anesthetics, antibiotics, analgesic, calciumboroglugonate, other items like emergency light, towel, soap, buckets, aprons etc.
- In villages or farmers those who are maintaining only one or two animals must tie the animal in advanced stage of pregnancy separately under visibility.
- It must be protected from predators. The floor should be dry and clean and having clean grass cover is essential.
- The cow should not be tethered too close, it must be tied with sufficient rope so that animal can move freely and care the new born easily during night time when calving is unnoticed.
- If any abortion, calves should be examined thoroughly to ascertain the possible cause for abortion (age of the foetus, condition, necrotic foci if any etc).
- In such case the calving pen should be thoroughly sterilized with 4 per cent caustic soda.

MANAGEMENT IMMEDIATELY AFTER PARTURITION

- Udder and hind quarter should be washed with lukewarm water containing an antiseptic solution of potassium permanganate lotion and dried with clean cloth.
- Cows may be milked to relieve the pressure from 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.
- The maternal instinct is more, cow's eyes can be blindfolded before the calf is removed.
- 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, acidosis and should be treated immediately.

HOUSING OF DAIRY CATTLE AND BUFFALOES

- In India, a great diversity exists in the design of dairy animal shelters.
- Traditional animal shelters have grown out of needs, resources and ingenuity of farmers.
- Building design and construction materials largely affect the thermal comfort inside dairy shelters.
- Efficiently designed sheds can help lesser 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,
  - Loose housing and
  - Conventional barns
- The former being widely used in the country.

Type of dairy animal housing

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 retire 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

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

Disadvantages

- It is not suitable for temperate Himalayan region and heavy rainfall areas.
- It requires more floor space.
- There is competition for feed.

- Attention of individual animal is not possible.
- A separate milking barn is needed for milking of animals.

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 wells 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

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

Disadvantages

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

FLOOR SPACE REQUIREMENTS

TYPE OF ANIMAL	Covered area	Open area	MAXIMUM NUMBER OF ANIMALS/PEN	HEIGHT OF THE SHED (cm)
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 and buffaloes	60 – 75	6000 – 7500	600 – 750
Calves	40 – 50	4000 – 5000	400 – 500

DIMENSIONS OF FEED MANGER

Type of animal	Width (cm)	Depth (cm)	Height of inner wall (cm)
Adult cattle and buffaloes	60	40	50
Calves	40	15	20

MINIMUM FLOOR SPACE REQUIREMENT PER ANIMAL IN SHEEP AND GOAT

S. NO	TYPE OF ANIMALS	MINIMUM FLOOR SPACE PER ANIMAL (m^2)
1	Ram or buck in groups	1.8
2	Ram or buck individual	3.2
3	Lamb or kids in group	0.4
4	Weaner in groups	0.8
5	Yearling or goatlings	0.9
6	Ewe or doe in groups	1.0
7	Ewe with lamb	1.5

IDENTIFICATION OF ANIMALS

- Identification of animals is must as a requirement in the daily management to spot and identify a particular animal in a herd/group/flock.

Reasons

- For registration and recording of the parentage in breeding programme / birth
- For individual feeding of animals.
- During milking
- During sale, for participation of animals in the rally, show and exhibition.
- For treating the animal, heat detection etc

EAR TATTOOING

- It is one of the permanent methods of identification system.

Instruments Required

- Tattooing forceps, tattoo no/letters,
- Tattooing ink/paste

Procedure

- The required dies (Numbers and letters) assembled in the tattooing forceps.
- Locate the area in the ear to be tattooed. (above the cartilage equidistance between tip and cartilage of the ear).
- Clean the area with alcohol.
- Position the equipment. Check the Number / letter in a piece of paper before applying in the ear.
- Then squeeze the forceps for puncturing properly.

EAR TAGGING

- Most popular method of identification system.

Equipments required: Tagging forceps & tags

Procedure

- Select the tag type (Single piece / Double piece).
- Use the contrasting ink and style based on the skin colour of the animal.
- Invert the ear tag into the appropriate applicator.
- Locate the area in the ear for tagging) (half the way between base and tip of the ear).
- Puncture the ear with applicator if the tags are non-piercing type.
- Apply the ear tag by puncturing the ear with the applicator.

FORCEPS FOR PLASTIC EAR TAGS	PLASTIC EAR TAGS
	
COW WITH PLASTIC EAR TAG	**PLASTIC EAR TAG FOR CATTLE**
	 Plastic ear tag for cattle

BRANDING

- It is one of the permanent method.

Hot Iron branding

- A good hot iron branding should be visible and recognizable since it destroys hair follicles located under several layers of the skin and leaved a permanent bald scar on the skin of the animal.

Required

- Branding irons / Electric branders made up of iron or steel, squeezechute / Trevice (for restraining)

Procedure

- Assemble and keep the equipment ready
- Heat the branding iron
- Before branding, restrain the animal
- Check the temperature of branding iron. It should be grey ashes.
- Then press the iron and shake the handle against the skin for fixing the iron properly.
- Time of application usually 3-5 sec.
- The brand marks should be big enough to read identify at a distance and each letter separated 2.5cm to prevent sloughing of the skin.
- Apply an antiseptic for healing of wound.

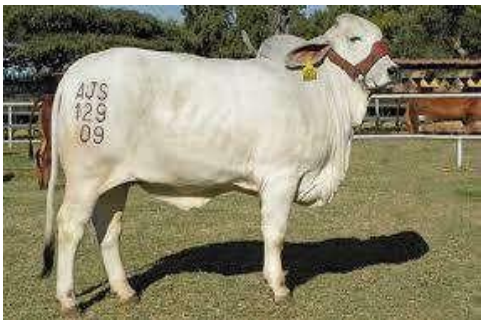
Freeze branding

- Application of cold iron to the skin of the animal causes destruction of melanocytes and white hairs grows on the branded area.

Equipments Required

- Iron/copper branders, Liquid nitrogen / dry ice and alcohol.
  - Assemble the necessary cold branders / iron.
  - Cool the branding irons in the liquid nitrogen or dry ice
  - Before application, restrain the animal
  - Clip the area of the branding site, clean and apply alcohol to the clipped area
  - Apply the cold branders to the clipped area and apply equal pressure by pressing iron properly and evenly on the skin.
  - Time of application 30 sec to 1 min.


Branding rod for cattle



EAR NOTCHING

- Commonly used in pigs and in beef cattle.
- Notching means making a 'V' shaped notches at specific areas of the ear with the help of a sharp scissors or pincers.
- This method is fit for large farms.
- For eg. a notch in lower right ear is no.1. and notch in lower left ear is No.3.
- Though this is a permanent method, notching is painful to animals
- This method is not permitted by Animal Welfare Board.

GENERAL ECONOMIC TRAITS OF DAIRY ANIMALS

- Economic traits means the characters and features in which man has an interest with respect to his animals.
- Usually the owner of animal will have interest with respect to the characters of his animals by which he could make more money.
- Even if his animal is not having a particular beneficial traits or characters by which he could make more money, by selective breeding he can bring or fix all the desirable characters in his animal so that he can produce future generation of animals with all the economic traits.
- The economic traits could be grouped into
  - Fitness traits
  - Production traits
  - Quality traits
  - Type traits
  - Behavioral traits

AGE AT FIRST CALVING

- Age in days of the cow or buffalo on the date of first calving.
- Most indigenous breeds are late maturing and show wide variation due to variation in management and climatic conditions.
- It showed that most of the indigenous breeds did not mature earlier.
- Further nutritional studies showed that the age at first calving could not be reduced below 35 months even after improving the feeding management and it could only be achieved by introduction of new variability.
- In case of buffaloes it is ranged between 40 to 50 months.

INTERCALVING PERIOD

- Days from the date of one calving to the date of next calving and this may designated as first intercalving period, second intercalving period etc.
- (calving interval is equal to service period + gestation period or lactation period + dry period).
- The average calving interval in Indian breeds varied between 16 to 18 months.
- Research findings showed that calving interval could also be improved by better feeding and management.

SERVICE PERIOD

- The interval between calving and subsequent service resulting in conception (as deduced from the birth of a calf).
- All the reproduction traits are dependent mostly on service period, which influence other traits.
- Service period ranges between 138 to 170 days
- In case of buffaloes the service period ranged between 193-236 days.

BREEDING EFFICIENCY

- Measured as the number of service per conception.
- This should be calculated for first calving, second calving etc.
- Reproductive ability/efficiency of cows and buffaloes.

DRY PERIOD

- Days from the date of drying to the date of next calving.
- Dry period of 130-160 days was common in Sahiwal, Red Sindhi, Tharparkar, Hariana, Kankrej.
- Longer dry period over 205 days was noticed in Ongole and non-descript cattle.
- The average dry period in cross bred cattle in India is around 90-94 days.
- The ideal dry period in crossbred dairy cow is 56 days or 8 weeks.

LACTATION LENGTH

- Days in milk from the days of calving to the final drying off or cessation of milking at completion of 7th month of pregnancy.
- Most of the indigenous breed had a lactation length of 230-306 days, still longer lactation length was noticed in buffaloes (228-350 days).
- The standard lactation period considered for all calculation purpose is 305 days in cattle and 310 days in case of buffaloes.

LACTATION YIELD

- Milk yield in kg. from the date of calving to the date of drying (the order of lactation should be indicated as I, II etc.
- But the cross bred cattle produce average milk yield of 2000-3100 kg per lactation.
- The mean lactation yield of most of the buffalo breeds ranges between 1000 - 2500 kg and non-descript buffaloes produced lesser milk (500-650 kg).

PEAK YIELD

- The highest daily yield in kg. during the lactation period.
- Mean daily yield increases from the date of calving reaching a maximum by 4-6 weeks after parturition.
- After attaining this maximum or peak yield, level falls gradually until the animal dries off.
- The peak yield is attained generally by the second months in buffaloes and zebu cattle and their crossbreds.
- The ability of the cow to sustain good daily yield for a longer period i.e. the slope of the descending phase of the lactation curve is known as persistency.
- Age of the cow and order of her lactation or parity affects the peak yield.

AVERAGE FAT PERCENTAGE

- Average of fat tests done with milk samples drawn during lactation at fortnightly intervals.

CARE AND MANAGEMENT OF CALF

- Normally cow will lick and dry the calf immediately after parturition which may stimulate circulation and respiration.

- If the cow fails to do, it can be stimulated to lick by sprinkling handful of bran or salt over the body of the calf.
- Sometime primiparous cows may be nervous and inexperienced or cow may exhaust after a prolonged labour.
- Under such circumstances the mucus (phlegm) from the nostrils of the newborn calf should be wiped and cleaned with a dry towel.
- The calf should be massaged vigorously for some times with a handful of straw rolled into a ball.
- Some times respiratory passage may be block with mucus and interfere with calf's respiration.
- Under such condition the calf should be lifted by holding the hock in such a way that the head is down, so that the phlegm may flow off.
- Care should be taken while lifting the calf, it may slip off. A hand full of straw can be used to have a grip while lifting.
- The calf can also made to sneeze by tickling a twig of hay or grass inside the nostrils.
- If the above methods are failing, little time is left to lose. The attending person should apply his mouth to the nostrils of the animal and suck out the mucus.
- After that he should blow in his expired air through the calf's nostrils closing its mouth.
- Carbon dioxide in the expired air which has been blown-in the lungs of the calf will act as respiratory stimulant to initiate respiration.
- This should be followed with intermittent pressing and releasing of pressure on the chest wall of the calf to give artificial respiration.

- Attending naval: naval or umbilical chord should be ligatured with a sterile thread one inch from the body (under field condition the thread can be soaked with tincture iodine) severed 1 to 2 cm distal to the ligature and tincture iodine or povidone iodine should be painted liberally.
- This is very important because infection can gain easily through naval and cause serious illness like naval ill, naval abscess and joint ill.
- Neonatal ascariasis is common in buffalo calves and deworming should be made as early as possible, preferably in the first week of life.
- A single oral dose of 10 g piperazine adepate is recommended for the calves.
- Newborn calf should void meconium in 4 to 6 hours of first colostrum feeding and first faeces is tarry in colour and consistency.

COLOSTRUM FEEDING

- Colostrum is the first milk secreted after parturition.
- It contains large amount of gama globulins which are nothing but anit-bodies produced by the cow against antigens encounter during her life including those against may disease producing organisms.
- Absorption of these antibodies provide the calf with an umbrella of passive immunity.

Composition of colostrum and milk

- Colostrum is highly fortified source of nutrient having 7 times the protein and twice the total solids of normal milk, thus it gives an early boost in portion and solid intake.
- It contain higher amount of minerals and vitamin A which are essential to combat disease. Ingestion of these through colostrums substantially increase the calf's survivability.
- Colostrums give a laxative effect which is helpful in expulsion of muconium (first faeces).
- The cows should be vaccinated against contagious and infectious diseases which help to increase the quantity and quality of gama globulins in colostrums.
- Similarly colostrums of mature cow posses large quantities of gama globulins because they have greater chance of exposure to many infection.
- The gama globulins must be absorbed as such across the intestinal wall into blood stream without being broken down into the constituent peptides or amino acids.
- If it broken down before entering blood stream it will act as ordinary protein.
- The intestinal wall of the calf will allow the globulin to pass from inside the intestine to the blood stream for only a short period of time after the calf is born.
- This permeability is rapidly lost after the first few hours of life. Many studies have shown that these globulins pass across the gut wall at the most rapid rates during the first 1-2 hours of life.
- Taking this into view. It will be highly useful to feed colostrums in the first 15-30 minutes followed by a second dose in approximately 10-12 hours.
- The absorptive cell lining the small intestine are immature at birth. In this stage they indiscriminately take up large molecules like immunoglobins.
- As the cal grows older hour by hour, there is a transition of epithelia cells of small intestine from immature type to mature type which cannot allow large protein molecules.
- As the more and more cells mature the capacity of the calf to absorb immunoglbins diminishes proportionately until 'closure' when no more absorption can take place.
- This phenomenon is called 'gut closure'. Concentration of antibodies at 'closure' is directly related to the disease resistance of the calf.

- If at closure the calf had absorbed only a small amount of immunoglobins from colostrum, the diminishing concentration soon puts the calf into a critical immune position.
- This increases morbidity and often leads to mortality of the calves.
- Quantity of colostrum to be fed is $1/10^{th}$ of body weight.
    - 15-30 minutes of life - 5-8 % of body weight
    - 10-12 hours of life - 5-8 % of body weight
    - 2^{nd} day - 10% of body weight
    - 3^{rd} day - 10% of body weight
- Excess colostrum can be milked out daily otherwise the calves can drink in excess and results in calf scour.
- The excess colostrum can be stored by refrigeration and can be used to other calves or orphan calves.
- Colostrum can also freezed and stored indefinitely. Colostrums can also be fermented naturally and stored for 5-7 days and can be used.
- Colostrum substitute: in case of non availability of colostrums due to accidental death of mother or agalactia colostrums substitute can be used.
- It can be prepared by mixing 2 whole eggs in one litre of milk and 30 ml of castor oil. It should be fed three times in a day.

COMPOSITION OF COLOSTRUM

CONSTITUENTS	COLOSTRUM OF COW MILK	COLOSTRUM OF BUFFALO MILK	MILK
Total solids	28.30	31.0	12.86
Ash	1.58	0.9	0.72
Fat	0.15-1.2	4.0	4.0
Lactose	2.5	2.2	4.8
Casein	4.76	7.7	2.8
Albumin	1.5	3.6	0.54
Globulin	15.06	12.5	-
Total protein	21.32	23.8	3.34

WEANING

- Making the calf independent of its mother is known as weaning.
- Under early weaning system, the cow is not allowed to suckle its calf.
- Instead, the cow is completely milked out and required quantity of whole milk or skim milk are fed to the calf.

Disadvantages

- Weaning is a problematic in Bos indicus and buffaloes due to strong maternal instinct.
- 0 day weaning can cause reduced milk yield in such animals, and also cause early drying and temperamental problems.

IMPORTANT GUIDELINES IN YOUNG CALF REARING/MILK FEEDING

- In intensive rearing of calves when day old weaning is practices following points should be adhered strictly.
- Each calf should be treated individually, it should be weighed weakly and feed according to the body weight and growth response.
- Group feeding should be avoided to minimize over feeding or under feeding.
- Calves should be fed twice or more times in a day. One time feeding may cause indigestion and diarrhea results in dehydration.
- Milk container, milk pails/buckets and other appliances should be kept clean and hygienic.
- Milk should be boiled and cooled to body temperature (39°C) before feeding.
- Milk feeding should be 3 or 4 times in a day during the first weak and can be reduced to 2 times in a day up to 90 days of age.
- Milk allowance should be correct to the body weight of the calf and over feeding should be avoided in the first month of age.
- If the calves not consume milk, the next allowance should be withheld and it can be drenched with 30-50 ml of castor oil.
- If the milk or milk replacer contains large amount of foam, it should be removed by drawing a paddle on the surface or by filtering through a clean cloth.
- Foam causes the calves to take in entrapped air which may lead to bloating.
- Clean drinking water should be made available all times and the pen floor should be sloped adequately and the pen should kept dry always.
- To encourage early development of rumen calf should be provided with good guality of hay (leguminous hay) by the first week of age and the same should be provided in a hay rack.
- Calves should be dewormed in the first week itself for ascariasis.
- Antibiotics and feed additives should be mixed in the milk or concentrate to improve the growth rate.

TRAINING OF CALF FOR PAIL FEEDING

- Weaned calves should be trained to drink milk from pails so that feeding management is easier.
- Generally crossbred calves learn quickly to drink milk from pail or nipple. But it is little difficult to train buffalo calves.
- Buffalo calves and lazy and slow in learning to drink milk or milk replacer from the pail or bucket.
- The scheduled quantity of boiled and cooled milk poured in the milk pail and should be moved to the calf.
- Care should be taken to avoid frightening.
- The calves should not be forced to drink milk by immersing the head in to the bail.
- Frightened calves may refuse to come close to the pail.
- The attendant should first dip his two fingers (index and middle fingers) in to the milk after cleaning and kept close to the mouth of calf.
- After testing the milk calf will start suckle the fingers.
- Gradually the fingers should be lower to the bail and should be dipped in to the milk.
- When the calf takes one or two mouthfuls of milk remove the fingers.
- This process may be repeated whenever the calf stops drinking and lifts its head.
- Training of buffalo calves required patience and efforts.

FEEDING MANAGEMENT OF CALVES

- Reticulo-rumen is non functional in calves and hence feeding of calves should be treated as non-ruminant and they are not equipped to utilize cellulose.
- The calves cannot utilize roughages containing higher amount of cellulose.
- To encourage the early development of rumen and reticulum the calves should be fed with good quality leguminous hay and other roughages.
- Because of non availability of good quality protein due to lack of ruminal microbial digestion.
- The calves have little capacity to utilize non-protein nitrogenous coumpounds and therefore substance like urea should not be included in their ration.
- Due to the same reason, B-complex vitamins also are dietary essential for calves in addition to vitamin A and D.
- For digestion of milk and enzymatic digestion in the abomasums and small intestine is more important that bacterial fermentation in the rumen, which is more wasteful.
- To avoid this oesophageal groove exist in the reticulum connecting the oesophagus with the omasum.
- During nursing and milk feeding, the sides of the groove are raised by reflex action to form a tunnel through which milk passes from oesophagus to omasum by-passing the rumen and reticulum.
- This continues to function even after considerable development of the rumen if milk feeding is continued.

DISBUDDING A CALF

Disbudding is necessary for all the calves to avoid horn growth. The other advantages are

- Space requirement of the animal will become less
- Less accidents while handling the animal
- Horn related diseases are prevented.

There are different methods of disbudding is in practice. They are

- Chemical method
- Rubber band method
- Electrical method

NURSE - COW METHOD

- Most of the draught breeds produce milk just sufficient to meet the requirement of calves and calves are allowed to suckle form the mother.
- But in case of crossbred cows which produce more milk than the requirement of calf, to regulate the milk production and also to avoid over feeding of calves leaving one or two teats for calf while milk out the other is practiced.
- In nurse-cow method 3 or 4 calves are allowed to suckle one nurse cow.
- To avoid calf rejection the mucous at the time of calving is applied to all the calves to be adopted by the nurse cow and placed before her to lick and dry.
- This will help to avoid rejection of calf. The number of calves to be allotted depends on the production level of nurse cow.
- Use of nurse-cow is an easy alternate way of raising calves and required least managemental skills.

EARLY WEANING AND WHOLE MILK FEEDING

- This method calves are weaned at birth and trained to drink milk from nipple or pail.
- The calves should be weighed every week and the quantity of milk to be fed is calculated accordingly
- If the farmers are not able to weigh the calves as per schedule, calves can also be fed according to its birth weight.
- The general guide line is 8, 9, 10, 8 and 5 per cent of the birth weight during 1st, 2nd, 3rd, 4th and 5t week respectively.
- Those farmer do not have any mean of finding out the birth weight of calves may judge whether calve is small, medium or large and they can follow the schedule category 2, 4 and 6 respectively (from above table).

Economic raising of calve with limited whole milk and calf starter

- For economic way of raising calves, the whole milk can be substituted with skim milk and calf starter. Skim milk is deficient in energy.
- It ca be supplemented by incorporating grain mixture, sucrose, glucose, dextrin, jaggery, oil and lard.
- Calves do not have much capacity to utilize sucrose before 4-6 weeks of age and incorporation of this before this age may cause diarrhoea.
- Jaggery is a cheaply available product. A feeding schedule in which skim milk partially replace whole milk from 5th day and jaggery is introduced from the second week can be followed to produce growth rate similar to whole milk feeding schedule.

WEEK OF AGE	WHOLE MILK	LEGUME HAY	CALF STARTER
4th to 7th day	10% of body weight	ad lib.	ad lib.
2-8th week	10% of body weight	ad lib.	ad lib.
9th week	10% of body weight – 2 kg	ad lib.	ad lib.
10th week	10% of body weight – 4 kg	ad lib.	ad lib.

FEEDING SCHEDULE FOR CALF - II

Feeding	Birth weight	Weeks (kg of whole milk/day)					Total milk
		1	2	3	4	5	
1	23-29.5	2.25	2.5	2.7	2.25	1.8	80.0
2	30-33	2.5	2.7	3.0	2.7	1.8	90.0
3	33.5-37.5	2.7	3.0	3.5	3.0	1.8	100.0
4	38-42	3.0	3.5	4.0	3.5	2.25	115.0
5	42.5-46.5	3.5	4.0	4.5	3.5	2.25	125.0
6	47-51	4.0	4.5	5.0	4.0	2.25	140.0
7	Above 51.5	4.5	5.0	5.5	4.5	2.25	150.0

FEEDING OF CALF

- The following two schedules may be adopted
  - Calf feeding schedule with limited whole milk and calf starter
  - Calf feeding schedule with limited whole milk, skim milk and jaggery

CALF FEEDING SCHEDULE WITH LIMITED WHOLE MILK AND CALF STARTER

AGE	COLOSTRUM/WHOLE MILK (kg)	SKIMMED MILK (kg)	HAY/GREEN	STARTER
1-5 days	3.00	-	-	-
6-7 days	2.75	-	Ad. lib	-
2nd week	3.25	-	Ad. lib	-
3rd week	2.75	1.00	Ad. lib	0.10
4th week	1.75	2.00	Ad. lib	0.20
5th week	1.00	3.00	Ad. lib	0.30
6th week	0.50	3.50	Ad. lib	0.50
7 and 8th week	-	3.50	Ad. lib	1.00
9 to 12th week	-	2.50	Ad. lib	1.25
13th to 16th week (4th month of age)	-	0.50	Ad. lib	1.50
17th to 20th week (5th month of age)	-	-	Ad. lib	1.75
21st to 24th week (6thmonths of age)	-	-	Ad. lib	2.00

CALF FEEDING SCHEDULE WITH LIMITED WHOLE MILK, SKIM MILK AND JAGGERY

AGE	COLOSTRUM	WHOLE MILK	SKIM MILK	CALF STARTER (g)	ROUGHAGE	JAGGERY (g)
	(as percentage of body weight)					
0 - 4	10	-		-		
5 - 12		5	5	To be introduced	Ad lib	30
13 - 20		2.5	7.5	50-100	Ad lib	50
21 - 30			8.3	250	Ad lib	70
31 -			8.3	500	Ad lib	85

40						
41 - 60			6.6	750	Ad lib	110-150
61 - 90			5	800	Ad lib	170-180
91 - 120			-	1000	Ad lib	200-250

MILK REPLACERS

- Milk replacers or milk substitutes consist basically of skim milk powder and lard or vegetable fat although a proportion of butter milk powder and whey powder is often included.
- A small proportion of glucose, soyabean flour and cereal flour may also be added together with certain minerals and vitamins.
- If good quality milk replacer is used, there is no need for feeding any whole milk after the colostrum feeding.

GENERAL CHARACTERISTICS OF GOOD QUALITY MILK REPLACERS

- Contains minimum 50 per cent spray dried skim milk powder
- Contains 10-15 per cent stabilized high quality fat, mainly lard homogenized into skim milk or butter milk before spray drying.
- Supplemented with vitamin A, E and $B_{12.}$
- Incorporated with antibiotic feed additives.
- Should contain 22-25 per cent good quality protein.
- Should not contain starch or fibre.
- Should be readily dispersible in water.
- Should flow well as a powder for automatic feeding equipment.
- Milk replacer should be mixed in correct proportion in warm water, since dilutions which are too weak or too strong tends to create digestive problems.
- Optimum ratio of milk replacer (kg) and water (litre) is 1: 8.
- Good milk replacer composition should contain spray dried skimmed milk powder of 50 parts, dried whey of 10 pars and non-milk source of 40 parts.
- A good milk replacer suggested by Ohio workers is as follows,

ITEM	AMOUNT IN Kg
Dried skim milk	70
Dried whey	18
Lecithin	2
Animal fat	10
Dicalcium phosphate	1.7

Copper sulphates, Ferrous sulphates, Manganese sulphates, Antibiotic	Traces

- The difference between partial milk replacer from milk replacer is these do not contain high proportions of milk or skim milk powder.
- An example of a partial milk replacer is

COMPONENTS	PARTS
Wheat	10
Fish meal	12
Linseed meal	40
Milk	23
Coconut oil	10
Butyric acid	0.3
Citric acid	1.5
Mineral mixture	3.0
Antibiotic	0.2
TOTAL	100

CALF STARTER

- They are first day concentrate mixture fed to calves.
- Calves starts eating small amount of dry starter from the 2nd week of life.
- To train them to eat starter mix, the following procedure may be useful.
    - The calf starter can be introduced to the milk feeding pail, at the end of feeding so that calf will lick it dry, and the quantity can be increased gradually.
    - Small amount of concentrate can be rubbed on the tongue and lips of the calf which will induce it to eat.
- A calf starter should be highly palatable.
- It should be high energy (75% TDN) and contain 14-16 per cent digestible crude protein.
- Calf starter may be fed on free-choice basis until the calf starts consuming about 1-1.5 kg of the starter mix a day after which the amount may be restricted.
- Generally calves reach this stage by 2 ½ months to 3 months of age.
- Milk feeding can be discontinued earliest which the calf is consuming 0.4-0.5 kg of concentrate per day deepening upon the breed.
  A great variety of calf starter are available.
- The constituents of calf starter may be altered according to the availability of feed in the region and cost.

Composition of calf starter

INGREDIENTS	PARTS
Maize	42
GNC	35
Wheat bran or rice bran	10
Fish meal	10
Mineral mixture	2
Salt	1

GENERAL CARE AND MANAGEMENT OF HEIFER

- Better Care and Management of heifer will give high quality replacement stock to the dairy farm.
- The following care and Management practices are recommended for a heifer.
  - Feed the heifer sufficiently to produce normal growth. During the early stage relatively more protein than energy is needed.
  - Most heifers grow well if excellent hay is given as much they can eat. The amount of growth depends upon the quality of forage fed.
  - The heifers should be provided with a dry shelter free from drafts. A loose housing system with a shelter open to one side is sufficient.
  - The size rather than the age of a dairy heifer at breeding time is important.Breeding under sized animals is never profitable.
  - They may be stunted or slow to reach maximum size. Small heifer are more likely to have difficulty in calving.
  - Though the heifer that is bred to calve at an older age yields higher milk yield in the first lactation, the total milk produced by such a cow will be less when compared to the heifers that freshens at an early age. Usually the heifer is bred to freshen at 24-30 months of age.
  - They should be growing and in good flesh at calving time. This is necessary so that she can produce milk at the most profitable level.
  - Place the heifer in a separate shed about 6-8 weeks before she is due to calve.
  - Feed 2 - 3 kgs of concentrate daily and all the forage she eats.
  - Before calving let the heifer becomes accustomed to handling and to the procedures used in the milking herd. Always handle her gently and with kindness.
  - Maintenance of health among heifers is very important for proper growth.
  - The health among the heifers is maintained by hygienie housing,water balanced feeding and taking necessary preventive steps against common diseases.
  - Periodically the heifers in the herd should be checked for their proper growth and other progress.
  - Animals lagging behind below the required standards should be removed from the herd.
  - For the heifer the calving is first time and it may have difficulty in calving. So take extra care during calving.

Early pregnancy

- The heifers in early pregnancy can be diagnosed easily by noting the development of the udder
- Udder development is very much visible from 3 months of pregnany
- See a video clip on "early pregnancy"

GENERAL CARE AND MANAGEMENT OF MILCH ANIMAL

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

- Provide green succulent forage together with leguminous hay or straw to the extent of animal can consume, so that all its maintenance requirements are met with through forage only.

- Extra concentrate at the rate of 1 kg for every 2 to 2.5 liters of milk should be provided. Salt and mineral supplements should be given to maintain the lactation.
- Never frighten or excite the animals. Always treat them gently and with kindness.
- With proper feeding and care, a cow will come to heat within 16 days of calving. Do not with hold service unnecessarily after the signs of heat are noticed in a cow.
- The shorter the interval between calvings,the more efficient the animal is as a milk producer.
- By maintaining properrecords of breeding and calving of the animals will ensure a study flow of milk through out the year.
- Individual attention to feed each animal according to its production is a must. For this purpose maintain individual production records.
- Keep up regularity of feeding. Concentrate mix is fed before or during milking, when as roughage after milking. This practice will avoid dust in the shed.
- Water should be provided to drink at will or at frequent intervals. It is more beneficial, if the animal is maintained on paddy straw as sole rough age.
- Regularity in milking is essential. Increase of milk in the udder will reduce further secretion of milk. Milking thrice is better than twice since 10 - 15 % more milk can be produced.
- Rapid, continuous, dry hand milking should be practiced without undue jerking of teats. milking should be done with whole hand, but not with thumb and index finger.
- Cows should be trained to let down milk without calf suckling. This will held to wean the calves early.
- Loose housing with shelter during hot part of the day should be provided. The animals will get maximum exercise in loose housing system.
- Grooming of the cows and washing of the buffaloes before milking help in clean milk production.
- Daily brushing will remove loose hair an dirt from the coat. Grooming will also keep the animal hide pliable.
- Wallowing of buffaloes or water spraying on their bodies will keep the buffaloes comfortable especially in summer.
- Common ailments should be properly detected and treated.
- Common vices should be properly detected and care should be taken. Eg. Kicking, licking, suckling etc.
- Provide at least 60 - 90 days dry period between calvings. If the dry period is not sufficient, the milk yield is subsequent lactation will be reduced.
- Vaccinate the cows- against important diseases and also guard against insects and pests.
- Every animal should be numbered and particulars pertaining to milk, fat %, feed taken, breeding, drying and calving dates should be recorded.
- Check for mastitis regularly.

GENERAL CARE AND MANAGEMENT OF DRY AND PREGNANT ANIMAL

- The good care and management practices given to pregnant animal will give good calf and also high milk yield during the successive lactation.
  - Extra concentrate mix of 1.25 to 1.75 kgs should be provided for pregnant animal as pregnancy allowance. Feed good quality of leguminous fodder.
  - The animal should not be too lean and too fat in condition.
  - Provide clean drinking water and protection from thermal stress.
  - Do not allow them to mix with other animals that have aborted or that are suffering from or carriers of diseases like brucellosis.

- Allow moderate exercise, which helps in calving normally. Do not tire them by making long distances especially on uneven surfaces.
- Do not allow them to fight with other animals and take care that they are not chased by dogs and other animals.
- Avoid slippery conditions, which causes the animal to fall receiving fractures, dislocation etc.
- If accurate breeding records are available, calculate the expected date of calving. Separate it one or 2 weeks before and shifted to individual parturition pens.
- These pens are thoroughly cleaned and fresh bedding may be provided.
- Feed one kg extra concentrate during last 8 weeks of gestation.
- Feed laxative about 3 - 5 days before and after calving (Wheat bran 3 kgs + 0.5 gs of Groundnut cake + 100 gms of mineral mixture of salt).
- Symptoms of delivery may be observed i.e. swelling of external genitalia, swelling of udder, usually majority of animals will deliver without any help.
- If there is any difficulty, provide veterinary help.
- After parturition external genitalia, flank should be cleaned arid protect the animal from chill and give warm water.
- Placenta will normally leave the cow within 2 - 4 hours after calving. It not take the help of a veterinarian.
- Take care of the animal before calving from milk fever. Give calcium supplement.
- Some times the udder will be swollen just before calving. Remove the milk partially.
- Take care, of the animal, if at all any abortion.
- Provide always free access to drinking water.

GENERAL CARE AND MANAGEMENT OF BULL

- The maintenance of breeding bulls in good condition and suitable for breeding is highly essential requirement for the success of breeding programmes.
- A rising condition is better for reproduction than a falling one. Fat males may produce semen of inferior quality or they may be slow or fail at service.
- Breeding bull should receive plenty of exercise, will usually produce large ejaculation containing more sperms of higher activity.
- Breeding bull should housed separately known as “Bull Shed” with sufficient area of floor and proper covering.
- It is sound practice to provide cool conditions and adequate drinking water.
- A balanced rations should be fed containing adequate energy, proteins, minerals, and vitamins.
- Green fodder must be available both before and during breeding season. Most of the bulls are ferocious and so control them properly using nose rings etc.
- It is of great importance that males should be , fed regularly and not too much at one time, and too little at another.
- For bulls two mating a day has been found to be openings. Moderate exercise should be provided to keep the breeding bull in active and non fatty conditions.
- Regular grooming of the breeding bull be practiced. In buffalo bulls regular shaving may be practiced.

Care and management of bullock

- Bullocks are normally used for agricultural operations and or transport purpose.
- Some bullocks are ferocious and so control them properly with nose rope or nose rings.
- The hooves of the bullocks should be provided with metal shoes to protect the hooves from wear and tear.
- The working hours for bullocks are recommended as follows :
  - Normal Work - 6 hours of carting or 4 hours of ploughing.
  - Heavy Work - 8 hours of carting or 6 hours of ploughing.
- Sufficient roughages and 1-2 kgs of concentrates may be provided for feeding of bullocks during break period in works, the animal may be left for free grazing.
- The bullocks are housed in separate sheds with sufficient space and protection from hot and cool conditions.
- Free access to drinking water is essential. Regular grooming of animals should be practiced.

MANAGEMENT OF BULLS

- The bull is half of the herd. Not only the bulls should be genetically superior quality, but they also have to be in prime breeding condition by proper feeding and management.
- Bulls should be selected based on their pedigree and the bull calves should be separated from breedable cows and heifer by the time of attainment of puberty, which is between 1 ½ to 2 ½ years in zebu and buffalo breeds and still lower in crossbreds.
- The bull calf should be dehorned within a few days of birth by disbudding with chemical or hot iron.
- This practice is considered to make the bull less dangerous.

RESTRAINING

- The bull should be ringed by the time of about one year of age, by which time he begins to show his strength.
- A smaller ring can be put at this age, and can be replaced with bigger one when he matures.
- Nose rings are made in two semi-circular pieces hinged together and are of aluminium, copper or some alloy which does not rust.
- Since the nose is extremely sensitive to touch, ring in the nose enables the attendant to keep the neck extended and the head raised while restraining or parading.
- Nose ring is an essential item in control of bulls. Bull leading poles can be conveniently hitched to the nose ring and this is mostly felt necessary also.
- The bull can be effectively controlled by means of a chain or rope around the horns threaded through the nose ring.

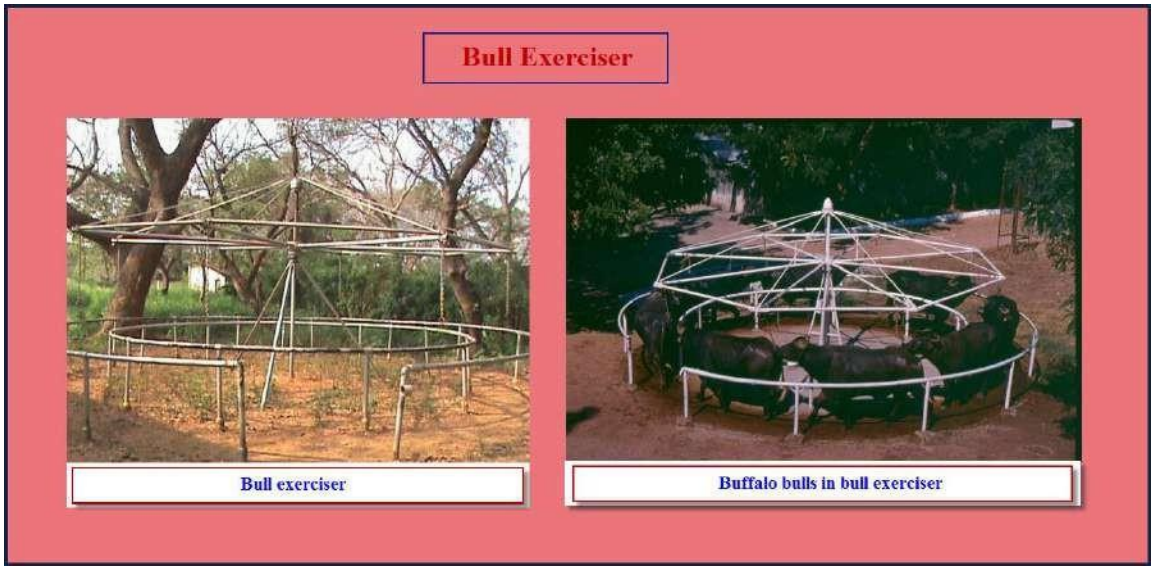
TRAINING

- The young bulls should be trained for handling and leading.
- It is much easier to maintain control on a mature bull if he was properly trained when young.
- Even when the bull is 4-6 months of old a simple halter may be put over his face and he become accustomed to handling.
- After the nose ring is put he should be led either by chain or pole.
- While leading, the attendant should never walk in front of the bull, but must lead from the side holding the nose always higher than natural level.
- If the nose is allowed to drop, the bull may get inclination to butt.

- While handling and leading, all bulls should be considered as potentially dangerous and no complacency should be shown at any time even in case of old as well acquainted bulls.

EXERCISE

- Growing as well as mature bulls should be regularly be exercised. So that they do not put on fat and thus remain in thrifty condition.
- This will also helping keeping their toes well worn. Over grown toes may hinder walking as well as mounting behavior of bulls.



CARE OF MATURE BULLS

- Breeding bulls should never be allowed to run with the herd. They should be housed in separate paddock, individually.
- This helps in controlling number of services by the bulls for recording breeding data.
- The hair around the prepuce should be trimmed periodically.
- The hair should not be clipped too close which maycause irritation and itching to the prepuce. About 1 cm length may be ideal.

MAINTENANCE OF SEXUAL LIBIDO

- There are several factors which can reduce libido in bulls like young or old age, inexperience, tiring exercise, or too frequent usage, semen collection at unusual places in unfavourable conditions and using unsuitable fittings, faulty feeding, obesity or run down condition, inherent defects, temporary injury or chronic defect of legs, back and penis. All such problems should be rectified as soon as noticed.
- Some bulls are sensitive to artificial vagina whereas others seem able to withstand considerable rough handling.
- The well known reflexes of mounting the cow, projecting the penis, thrusting and ejaculation can easily be retarded or even inhibited in a bull by unnatural method of handling. Majority of the bulls serve well in familiar surrounding and are handled by the same attendant provided these are associated with previous satisfactory experience.
- The sexual reflexes can be inhibited by painful, uncomfortable or even distractive situation.
- In a sensitive bull, inhibition may develop quickly, even when collections are taken carefully.

- The animal should be give rest from collection for as long as possible when inhibition starts developing. This can be overcome by changing the surrounding.
- Overwork is common in young bulls allowed free access to cows and heifers.
- The number of services and not the number of cows served is the important consideration. No bull should be allowed to serve each cow more than twice in a heat period.
- A young bull may be placed with 2 or 3 cow per week and it can be put into service after 2-2 ½ years of age.
- A mature bull may ejaculate many times per week without effect on libido or semen quality.
- The bull with reduced libido should be teased by delaying the service. Bulls become bored in their surrounding, particularly if in small paddock and may lose interest.
- Presence of another bull or change in the surrounding will overcome this problem.
- Summer stress leads to low sexual libido and poor semen quality, especially in purebred exotic and crossbred bulls.
- To overcome such problems during summer, bulls should be housed in cool, well ventilated dry sheds.
- Showering or splashing cold water on bull 2 or 3 times during hot part of the day and protection against direct and reflected radiation were found to be very useful.

FEEDING OF MATURE BULLS

- A good rule to feed mature bulls is to feed daily about 1 kg hay and ½ kg concentrate per 100 kg body weight.
- Thus a 400 kg bull should get 4 kg hay and 2 kg concentrate.
- These amounts should be adjusted according to the body condition of various bulls because there is individual variation in response.
- Excess fatness in mature bull should be avoided at all costs as it reduces libido and may cause severe stress and strain on their feet and legs.
- Excess calcium in bull ration cancause problem particularly in older bulls.
- When legume roughage is fed the concentrate mixture should not contain a calcium supplement.
- Generally bulls donot lose calcium and in time excess calcium may cause vertebra and other bones to fuse together.
- Therefore bulls may need a different concentrate mixture than the milch cows.

ROUTINE FARM MANAGEMENT PRACTICES

- **Exercising:** Exercise keeps animal thrifty and active. This helps normal body metabolic processes and the maintenance of good health. Too much standing at one place weakens the leg muscle, causes the toes to overgrow and puts abnormal strain on legs and feet. Exercise is most necessary for male breeding stock. Breeding bulls must be regularly exercised to keep them in good condition. Providing loafing area of about 120 square metres for each bull can do this. The bull can be paraded for an hour each day. Bull exerciser can be used for exercising a number of bulls simultaneously.
- **Grooming:** Grooming comprises brushing the hair coat of animals. It is performed for cleanliness and appearance, to massage and stimulate the cutaneous blood and lymph circulation, to remove waste products like skin secretions, loose hair and to remove lice and other skin parasites from air coat. Face should never be brushed but wiped with a clean khadi or flannel cloth. These operations should be carried out immediately before milking.
- **Bedding:** In tropical countries like India provision of bedding to farm animals is not that important as in western countries. However, winters in northern parts of the country are generally cooler, often accompanied by cold winds. Bedding or litter is used primarily for the purpose of keeping animals clean and comfortable. Bedding also soaks up urin, makes manure easier to handle. During winter, suitable bedding should be provided in young calf lamb and furrowing pens. Wheat straw, sugarcane baggase, chopped grass or crop residues are ideal for animal bedding. The bedding should be about 10-15 cm thick.
- **Disbudding & Dehorning**

Disbudding and Dehorning are two different practices. Disbudding means the arrest of horn growth at an early age when the horn root is in the form of a bud or button while dehorning means removing well grown horns of an older animal. Horn serves no useful purpose on dairy cattle; they can be nuisance and cause many body and udder injuries. Horned cattle require more space. Planning of disbudding should be done when the calf is of about 4-10 days old, or as the horn buttons can be easily detected- the earlier, the better.

- **Disbudding can be done by using: - 1. Chemicals 2. Hot iron**

1. **Chemicals:** Use of chemicalsshould be limited to small herds kept under close supervision. Caustic potash (KOH) or caustic soda (NaOH) is the common chemicals used. These are available in the form of sticks or paste. The hair around the horn bud of the calf should be clipped and area is surrounded with a ring of heavy grease or Vaseline to protect the eye against the chemical. Then the chemical is rubbed in a circular fashion until redness appears. This will destroy the horn bud and there will be arrest of horn growth. After disbudding the animal should be protected from crow and other birds.
2. **Hot iron:** this comprises applying a specially designed hot iron to the horn buds of young calves. The disbudding iron rod is heated in a portable forge. Where electricity is available the electric disbudding rod should be used. It keeps an even temperature. In electric disbudding a temperature of 1000°F or 538°C should be maintained. The hot iron method is bloodless and may be used in any season of the year, but it can be used on young calves only.

- **Dehorning can be done by using- 1. Dehorning saw 2. Elastrators**

1. **Dehorning saw:** Any handy wood cutting saw can be used for dehorning.
2. **Elastrators:** The elastrator is an instrument for use in stretching a specially made rubber ring which may be used in dehorning cattle. This method is very painful and can be used on cattle with horns 5-10 cm long. Smaller horns drop off in 3-6 weeks; larger horn may take two months.

- **Castration**

Castration is the process of making a male animal unfit for breeding purpose either by removing the testicle, the gland that produce male germ cells or by stopping the blood supply to the testicle so that atrophy takes place and there is no production of germ cells. Male cattle meant for work should be castrated so that they can be rendered docile.

Age of castration

Horse:	3 years
Calves:	6 months
Sheep & Goat:	3-4 weeks
Pig:	1 week

Methods of castration: Closed & Open method

1. **Closed method:** Calves, Sheep and Goat are castrated by this method.

a. **Burdizzo castrator method:** This method of castration is bloodless in which the testicles are made functionless through destroying of their channels of nourishment. In using Burdizzo castrator care should be taken to see that cord does not slip out, that only one cord is clamped at a time and that there is no interference with the circulation of blood through the central portion of the scrotum. After throwing the animal on ground and securing properly the Burdizzo should be clamped at about 3-5 cm above the testicle where it is held for few seconds. Same process is repeated on other side and finally some antiseptic should be applied on the clamp impression.

b. **Elastrator method:** Elastrator rings can also be used for castrating the animals, but this method is very painful and takes much longer time.

2. **Open method:** Pigs are generally castrated by open method. Sharp knife or BP blade can be used for removing the testicle by opening the scrotum.

- **Isolation:** Isolation means segregation of animals which are known to be or suspected to be affected with contagious disease from the apparently healthy ones. Preferably such segregated animals should be housed in a separate isolation ward situated far away from the normal animal houses. The isolation ward should never be at a higher level than that of the healthy shed.
- **Quarantine:** Quarantine is the segregation of apparently healthy animals specially animals being brought in to the herd for the first time. The idea is to give sufficient time for any contagious disease that the quarantined animals may be having, to become active and obvious. Hence, the quarantine period depends on the incubation period of the disease. But in practice a quarantine period of 30 days covers almost all diseases. For rabies, the quarantine period should be about six months. During the quarantine period, animals should be thoroughly screened for parasitic infestation by faecal examination and deworming carried out on 23/24th day, if need be. The animals should also be subjected to dipping or spraying on the 25/26th day for removing ectoparasites if any.
- **Disposal of carcass:** Proper disposal of carcasses of animals died of infectious diseases is of utmost importance in preventing the spread of diseases, and as in case of anthrax, to prevent the human infection. All carcasses should be disposed of properly either by burying or by burning.

- **Burial of carcass-** The most common method of carcass disposal is burial. This is a reasonably safe method if done deeply enough. The pit should be so dug that the highest part of the carcass must be at least 1.5 m below the level of the surrounding.
- **Burning of carcass-** The most sanitary method of destroying carcasses is to burn them. Preferably close to the site of their death, without dragging them any more than is absolutely necessary.

- **Disinfection**: Disinfection means destruction of pathogenic micro organisms from a place so that the place becomes free from infection. Disinfectant, germicide or antiseptic is a substance able to kill organisms and their spores at appropriate concentrations.
  - **Disinfectants:** The common disinfecting agents available to the stock owner are- sunlight, heat and chemical disinfectants. Some common chemical disinfectants used for disinfection are bleaching powder, boric acid, caustic soda, phenol, washing soda etc.
- **Culling** of animals:- On an organized dairy farm there should be regular culling of undesirable and low producing animals be followed.

DIPPING

- Dipping of sheep and goats in an insecticide or spraying them with one will kill external parasites and pests and prevent the damage they cause to animals and the disease they carry.
- The frequency between dipping depends on the disease risk.
- The points to be considered while dipping are
  - Dip the animal with insecticide once in six months
  - Dipping agents are Sumathion, Malathion and etc. at 0.5 % concentration
  - Dipping should be done during sunny days
  - Water the animal before dipping
  - Care should be taken to avoid contact of eyes and mouth with the solution·
  - After dipping place the animal in the open place for quick drying

Washing

- The animal should be washed with milk soap and the hair should be washed thoroughly.
- It is advisable to keep the animals, lightly blanketed to avoid exposing them to draft and cold until they dry.
- All the animals should be washed and allowed to dry.

SHEARING

- Removal of wool from a sheep is called shearing. Shearing is done mechanically either with clippers, a pair of scissors or by power-operated machines.
- Hand shearing is most primitive and time consuming. It cause stress to both the animal and the shearer, leaves up to 1.25 cm of wool on the body and the fleece are not cut evenly, resulting in double cuts and reduced staple length. Machine shearing is faster, leaves less wool on sheep and cuts most evenly; it is used extensively all over the world.

TIME OF SHEARING

- Most flocks are usually sheared twice a year, i.e. March-April after thewinter and September-October after the rain.
- In Jammu and Kashmir, and Rajasthan sheep are shorn thrice a year, although this is not a correct way it produces wool with very short staple.

Basic Milk Management

- Milk may be defined as entire lacteal secretion of mammary gland of animals obtained by the process of milking during the period following at least 27 hrs. after calving. During 27 hrs. after calving it is called colostrum. Milk is a white opaque colloidal fluid with some exception, it is tan yellowish in color in some breeds of cattle, milkcontains essential nutrients required for human and animal health especially for infants and children. Milk is of great importance in world economy and some countries like Denmark, Netherlands, new Zealand etc. their economy is based on milk production. For commercial purpose milk is divided into two constituent:

i. Fat
ii. SNF(solid not fat)

Water serves as medium in which these two constituent are carried. Milk producer are not only paid for quantity but on the basis of fat and SNF. The quality of milk constituent mainly depends on nutrition.

Cow milk	Buffalo
Fat=3.5-5.5 %	Fat=5.5-7.5%
SNF=8.5-9.0%	SNF=8.0-9.0%
Water=85.5-88%	Water=84.0-86.5%

Colostrum:-

Water= 77.5%
Fat=3.6%
Lactose=3.1%
Protein=14.3%
Ass=1.5%
Colostrum has huge amount of protein. This protein make antibody in new born.

Properties of Milk:-

1. Chemical property: - pH of milk is 6.5-6.7 and it is some acidic in nature due to presence of lactic acid in milk. This acidity helps in curdling and heat stability.
2. Physical property

i. Taste and color: - Normal taste of fresh milk is slightly sweet and aromatic order. These two things come from presence of lactose and fat in the milk. The aromatic odor is greatly affected by the feed intake by animal.

ii. Colour:- Milk is generally white opaque liquid with some exception. There is tan yellowish in some breed of cattle.
iii. Specific gravity:- milk is heavier than water. Specific gravity of milk is 1.018 – 1.038. It varies with temp. higher the temp. less the specific gravity.
iv. Boiling point:-The boiling point of milk is higher than water at normal temp. and pressure. The boiling point of milk is 100.5'c as compare to 100'c of water.
v. Freezing point:- Freezing temp. of milk is slightly lower than water. It is 0.545'c as compare to 0'c of water.
vi. Surface tension:- Surface tension of milk at 20'c is 54.5 dyne per cm. which decreases with increase of temp.
vii. Viscosity:- Viscosity of milk is higher than water due to presence of dissolved solids.

Factors affecting Milk composition:-Basically there are two factors which are affecting milk composition:-

a) Physiological
b) Environmental

Physiological control is not much under control but we can change and manage environmental factors for better production in term of quality and quantity. There are following environment factor which affect the quality and quantity of milk:-

I. Breed and species of animal:- Breed is the main non nutritional factors which affect the quality and quantity of milk. Some breeds have high fat and SNF constituent and some low.
II. Changing occurring during a normal lactation:- During a normal lactation period the constituents of milk change with great deal. First 2-3 days it is colostrum which rich in a protein. During peak yield fat and SNF portion decrease due to more quantity of milk production similarly during the end of lactation decrease the quality increase.
III. Day to day variation:- Day to day variation in milk quantity and quality change by excitement, estrus cycle, incomplete milking , some disease etc. first and last milk of milking and evening milking also varies in quality.
IV. Age of animal:- older animal's milk has low fat constituent and lesser quantity.
V. Interval between milking:- milking interval effect fat constituent larger the interval less the fat.
VI. Pregnancy:- in later period of animal pregnancy SNF decreases but not effect on fat. quantity also less.
VII. Excitement:- if animal is exciting then there is incomplete milking and lower is the fat but no effect on SNF. quantity also less.
VIII. Environmental temperature:- at lower temperature fat increases at a higher temperature SNF increases.
IX. Excessing:- heavy exercise decreases quantity and increases fat and higher temperature SNF portion.
X. Diseases:- increase in body temperature is increase fat and low SNF.
XI. Feed and feeding:-milk fat is higher if we feed the following feeds to the animal :-

(a) High concentrate and low roughages
(b) Lush green fodder

(c) Finally green feeds
(d) Heat treated feeds
(e) Feeds in pelleted form

XII. Dry period and body condition:- lower the dry period higher the quantity and quality. Good health of animal also increases quality and quantity

XIII. Season of year:- during summer there is availability of good and green fodder therefore quantity and quality of milk is better

XIV. Effect of milker:- change of milker may affect the milk yield.

Some terms related milk and milk management:-

1. Lactation:- Lactation impulse the secreting and giving of milk by the mammary glands. It also used to denote the period of milk production. In cows it is 305 days and in buffalo it is 270-300 days.

There are three phases of lactation:-

a) Up to 100 days
b) 100-200 days (maximum milk production)
c) Above 200 days

2. Milk secretion:- It refers to the synthesis of milk by the epithelial cells of mammary glands and passage of milk from the cytoplasm of cells into the alveolar lumen.
3. Galactopoeises:- Maintenance of lactation.
4. Lactogenesis:- Initiation of milk secretion.
5. Involution:- It means shrinking of any organ to its normal position. As the lactation of animal process the number of mammary gland alveoli starts decreasing. After cessation of lactation the number of alveoli decreases in a huge extent and this is called involution of udder. This same process is observed in uterus and other reproductive organs of females. In female this involution of breast is absent or has some little effect.
6. Milk secretion rate:- This is the rate of secretion of milk per unit of alveolar tissue. The secretion rate is controlled by some hormones and the pressure in the alveolar lumen there are 3 distinct phases of milk secretion:-

a) Within 1 hour after milking there is maximum pressure.
b) The slow increase in pressure decrease to accumulation of milk in alveolar lumen.
c) Then there is accelerate milk secretion rate.

7. Residual milk:- It is the amount of milk left in udder after normal milking. This milk can be got by oxytocin injection. Older cow and low yielder cow has more residual milk.
8. Galactocele:- The udder cyst containing milk by the closer of teat duct.
9. Galactogogue:- Any agent or medicine which increase milk flow down.
10. Glactorrhea:- It is abnormal copious milk secretion is called galactorrhea. This is particularly found in women when they stop breast feeding to the baby but the milk secretion continue.
11. Glactophore:- A milk duct.

Clean Milk Production:- Clean milk is defined as milk coming from healthy milch animal such as buffalo, cow, camel, goat etc. Possessing good flavor devoid of dirt and filth containing relatively small number of bacteria/virus and other pathogens. Clean milk production is always profitable to producer, manufacturer and consumer.

Producers Interest:- Mastitis milk can easily contaminate other animal and milk so clean milk production is necessary to protect healthy animal and milk if milk is not produce hygienically than other microbs contaminate the milk. This contamination of milk may spoil the milk and it is very difficult to dispose the milk at time consuming destination and thus it effect the profit of producer.

Manufacturers Interest:- Those who make the byproducts of the milk they must have to receives clean milk. It is essential to produce good byproduct to earn the good profit.

consumers Interest:- Clean milk provide better beeping quality and less chances of spoilage. It also give them guaranty against milk borne diseases such as typhoid, diarrohea etc.

Method of clean milk production:-

1. Health of herd:- Milk herd should be free from pathogens. The infected animal may spread infection to human beings through milk. All milchanimal should be testing against diseases every year.
2. To clean milk animal:- The flank and udder of milch animal should be clean before milking to prevent the dust particle be mixed in milk.
3. Clean surrounding:- The milking parlor should be clean for production of clean milk.
4. Flies control:- This is most important point for production of clean milk. Flies especially house flies should be control to produce clean milk.
5. Clean milkers:-Milker should be free from communicable diseases and must be of good habits. They should wear clean clothes, nails of hands should be trimmed and they do not spit around the milk parlor.
6. Clean utensils:- All milking utensils should be free from pathogens as possible. The best way to keep the utensils clean and wash just after the milking. Utensils should be ringed and washed with clean warm water mixed with detergent.
7. Milking pails:- Milking pails should be of doom shaped instead of open bucket or utensils.
8. Straining:- Straining is done by cloth or sieve to remove sediments and other foreign material from milk. If straining is done by cloth then cloth should be washed daily.
9. Feeding the animal:- Feeding of animal should be done before 1 hour. If it is necessary to keep the animal busy during milking then concentrate may be fed because concentrate are less dusty.
10. Cooling and storage of milk:- After milking pasteurization of milking is necessary because it prevent the milk from spoiling for a longer period.

Disease transmitted to human being through milk:- These diseases is milk borne diseases.

1. Infection of milk directly from milch animal:- If milk is consumed without pasteurization or boiling then many diseases may transmitted to human being such as bovine T.B., undulant fever/malta fever etc.

2. Infection from man to animal and then to men:- Some milkers may contaminate milch animal and milk. This infected milk may contaminate human being or consumer.eg- Septic sore throat diseases.
3. Direct contamination of milk by man:- Some milkers or milk handlers may contaminate the milk and then to consumer.eg-thyroid fever, para thyroid fever, dysentery and gastroenteritis.
4. Indirect contamination of milk by man:- Some pathogens of diseases may enter the milk through contaminated bottles, utensils, water supply, insect/flies and dust.eg- typhoid, dysentery, diarrohea etc.

Hormone which regulates the lactation:-

1. Growth hormone(STH=Somatotropin hormone):- This is secreted by pitutory gland. It influence the substance which help in synthesing the milk in mammary glands. It increase the availability of amino acids, fat and sugar which are used by the mammary gland to synthesis the milk.
2. Parathyroid hormone(TSH= thyroid stimulating hormone):- it regulate the blood level of calcium and phosphorus which are required to synthesis the milk.
3. Adrenaline(ACTH= Adrenocortico-tropic hormone):- It helps in secretion of milk, when dose is higher than it inhibit the secretion of milk.
4. Oxytocin(Pitutory injection):- it secrets by the pitutory gland and it helps in ejection/let down of milk.

Dental Formulae:

The numerators of the fractions represent the number of particular type of teeth in upper half of one side the jaw, whereas the denominator represent the same in lower half of same side of jaw. These are then multiplied by 2 to get total teeth in the mouth cavity.

I = Incisor, C = Canine, P = Premolar, M = Molar

Species	Temporary dental formulae	Permanent dental formulae
Cattle, Buffalo, Sheep & Goat	2 (0/4, 0/0, 3/3, 0/0)= 20	2 (0/4, 0/0, 3/3, 3/3)= 32
Horse	2 (3/3, 0/0, 3/3, 0/0)= 24	2 (3/3, 1/1, 3/3, 3/3)= 40
Pig	2 (3/3, 1/1, 3/3, 0/0)= 28	2 (3/3, 1/1, 4/4, 3/3)= 44
Dog	2 (3/3, 1/1, 3/3, 0/0)= 28	2 (3/3, 1/1, 4/3, 2/3)= 40
Camel	-	2 (1/3, 1/1, 1/2, 3/3)= 30 or 2 (1/3, 1/1, 2/3, 3/3)= 34

POULRTY MANAGEMENT

Poultry: - Poultry is applied to the birds of several species which render the economical and other interest of human being. Poultry includes chicken, turkey, ducks, geese, swan, guinea fowl, pigeon, ostrich, quail and other game birds.

Fowl chicken: - Like other birds fowl has:-

- Coat of feathers.
- No teeth.
- Multi stomach
- Legs with spur.
- The very presence of comb distinguish it from other birds.
- Fowl has high rate of breathing and pulse rate.
- Body temperature is higher than other domestic animals. It ranges from 105-109 F.

Morphology of fowl:- Comb, eyes, ear lobs, nostrils, hackle, breast, thighs, hock joint, shank, toes, claw, spur, fluff, primary and secondary feathers, axial feathers, wing bow, beak, shade, cope, sickle feathers, tail etc.

Comb of fowl:- These are 8 types of comb but three are common and useful for us.

1. Single type comb
2. Rose type comb
3. Pea type comb

Color of comb:- There are 13 color of comb:-

1. White
2. Buff(sandy brownish)
3. Blue
4. Black
5. Barred
6. Red
7. Spangled (glittering spots)
8. Matted (two color folded together)
9. Laced
10. Cresentic penciled
11. Parallel
12. Stripped
13. Stripped having dots

Classification of fowl according to economical point of view:-

Fowl are following 5 types:-

1. Meat types
2. Egg types
3. Dual purpose
4. Game type
5. Ornamental types

Classification of fowls according to distinct types of color and pattern of comb:-It divided into 4 category:-

1. Class:- Class refers to the specific area or region. They are developed as Asatic, English, American, Madetarian.
2. Breed:- Breed denotes to the established group of fowl having color, generally body shape, size, weight and other characterstics.
3. Variety:- It refers to the sub-breed differ by color pattern of comb, shape of comb, comb type and feather pattern.eg- leg horn bred.
4. Strain:- Strain term is used to denote a particular breeder who has done the breeding of the chicken/fowl and introduced certain economical characters in the bird.

Digestive system of fowl:-

Poultry is not a single stomach animal. A little digestion take place in poultry by bacterial action and can not digest more fibres as compare to domestic animals. The digestive process poultry is very rapid. There are following digestive organ in poultry:-

(i) Mouth :-There are no teeth and lips but there are horny mandible in each jaw called Beak.The tongue is is like a barked head of arrow.Thus tongue helps in forcing grains and feed to the gullet. The amount of saliva is very small.

(ii) Esophagus and Gullet :- Esophagus is expensible and food passes from mouth to crop through esophagus and gullet.

(iii) Crop :- The crop is an expension of esophagus and gullet and helps in storage of softening the food.

(iv) Preventricular:- This is a sort of glandular part of digestive system in poultry. It is situated next to the crop and functions as to mix some digestive enzymes and some acids which help in digestion.

(v) Gizzard:- This is situated next to the preventricular. It has thick horny epithelial lining which help in grinding and crushing the food. It works as a filter to the food.

(vi) Duodenum :- It is situated next to the gizzard. It is loop like organ and pancrease situated with in this loop. Gastric digestion and some pancreatic digestion takes place in duodenum.

(vii) Pancrease:- It lies in the loop of the duodenum and it is larger than mammals. It secretes protiolytic, amilolytic and lypolytic enzymes.

(viii) Liver :- largest gland of the body of the bird.It secretes bile which help in digestion of fat.

(ix) Spleen :- It is a round reddish body situated near the liver. It works as haemopoiesis and storage of WBCs.

(x) Small intestine :- It extends from gizzard to caeca and 2 ½ feet long in a mature bird. It works as a organ of digestion and absorption of food.

(xi) Caeca :- At the junction of small and large intestine there are two blind folds of 5-7'' length. It works as temporary storage of faeces and do some help in digestion of fibres.

(xii) Large intestine :- It lies between caecal junction and extends to the cloaca. It is short in length. It works as Absorption of food , nutrients and water. Last part of large intestine works as rectum.

(xiii) Cloaca :- The faecal material from rectum and urine from kidneys pass through this organ. Both are mixed in cloaca and excreted through vent.

Blood and circulatory system of poultry:- Poultry birds have 4 chambered heart for efficient circulation of blood because metabolism of poultry bird is too high. In chicken has 7-8% of blood by body wt. ratio. Adult chickens heart beat is 250-300 per minute and chicks is 350-450 per minutes.

- Respiratory system :- It consists of nasal cavities, larynx, trachea or wind pipe, syrinx(voice box), bronchii, lungs, airsacs and air containing bones. Lungs of chickens are small as compare to mammals. They expands and contract only slightly and there is no true diaphragm in poultry birds. The lungs are supplemented by 9 airsacs and air containing bones. Air freely moves out of sacs and in of sacs. Although lungs are responsible for most of the breathing. Both air sacs and lungs works as cooling mechanism of poultry bird. The respiration rate of chickens is 15-25 cycle per minute in resting bird.
- Reproductive system of Poultry :-

1. Male reproductive organ :- It consist of following parts:-

(a) Testis :- the two testis are small and avoid organs situated at the anterior end of kidneys. Left testis is larger than right one. Each testis has large no. of seminiferous tubules. These seminiferous tubules produce spermatozoa. They are also produced a fluid which expel spermatozoa through vas deferens to the cloaca.

(b) Vas deferens :- It is a tube which connect testis to the cloaca and spermatozoa from testis travel through vas deferens.

(c) Papillae :- This is rudimentary copulating organ located on the cloaca. During mating spermatozoa are introduced by the papillae in to the oviduct. Which is also situated in the cloaca of female.

(d) Cloaca :- It is enlarge section of alimentary canal that connect large intestine and the vent. Spermatozoa from testis, faeces from large intestine and urine from kidneys all passes through cloaca and excreted through vent.

2. Female reproductive organ :-The female reproductive system of poultry is greatly differs from the mammals. The reproductive cell is known as gamete or ovum or egg. Egg of the poultry is the article of food also. Egg is large and enclosed with a food supply for development of the embryo.

Following parts of female reproductive system:-

i. Ovary:- At the time hatching there are two ovaries and two oviduct in a female chicken but on maturity(20 weeks) the right ovary become rudiment and left ovary and oviduct remain functional.

The functional ovary appears as a cluster of many spheres each of which is individually attached by a stalk. Each sphere is a more or less developed ovum (yolk enclosed in a thin membrane). The yolk

varies in color pale straw, redish yellow and orange. Yolk contains a germinal disc from which embryo is developed after fertilization with spermatozoa of cock. In a laying there may be 900-3600 ova. Some ova are so small which could not be seen by naked eye and some are as big as egg.

ii. Oviduct:- the oviduct of a laying hen is a long coiled tube which occupies mostly of the whole area of left abdominal cavity. The egg moves towards the uterus while developing.

Oviduct is divided into 5 parts:-

a) Funnel/infundibulum:- it receives the ova.
b) Magnum:- It secretes thick albumin or white.
c) Isthmus:- it secretes cell membrane.
d) Uterus:- it secretes the white, the cell and cell pigment.
e) Vagina:- it helps the till it is laid. Then egg is laid through the vent.

Formation, structure and nutrition value of egg:-

The knowledge of formation and structure of egg is necessary for following reason:-

1. To understand the fertility of egg.
2. To embryo development of egg.
3. If there is any diseases in the reproductive organ of the hen.

A. Yolk formation:- The ovarian tissue of a hen appears as a cluster of tiny ova or yolk. When ovary starts functioning, few of the ova starts to increase in size. The ovum or yolk enclosed in a thin membrane called vitelline membrane. This ovum and vetilline further enclosed in highly vascular coat of connective tissue called follicle. During first 10 days ovum increases very slowly upto about 6 mm then suddenly some ova began to grow very reapidily and with in next 10 days they attain the size of 40 mm. these ova are attached with a stalk called follicle stalk.

B. Ovulation:- When the yolk or ova reached at maturity then follicle ruptured. The ova is shed in to the body of hen then engulfed by the funnel of oviduct and then forced in to the oviduct.

C. Fertilization:- If the hen is mated with the male then fertilization take place in the funnel of oviduct. The sperms remains in the oviduct of a hen about 2-3 weeks. Sperms enter the vetilline membrane of the ova and reached to the germinal disc and fertilization takes place.

D. Embryo formation:- The embryo development starts just after fertilization but if the environmental temperature is remain below 82 F then there will be no further development in embryo within the egg. If there is need of unfertilized egg then there is no need of mating with male.

 # Nutrition value of egg:-main composition of a poultry egg-

Parts of egg	Percentage by weight
1.Shell	10-11
2.Shell Membrane	1

3.Yolk	30-35
4.White albumen	58-60

Chemical composition of a Poultry egg:-

Parts of egg	Water(%)	D.M.(%)	Protein(%)	Fat(%)	Carbohydrate (%)	Mineral (%)
Complete egg with shell	66	34	12.5	10	0.5	11
Complete egg without shell	74	26	13.5	11	1	1
Egg yolk	48	52	17	33	1	1
Albumen (Egg White)	88	12	11	0.2	---	0.8
Egg shell and membrane	20	98	6	----	---	9.2

Agmark standard for market table egg:-

1. Grade A:-

Grade	Weight in gram	Shell	White (albumin)	Yolk
A (extra large)	60 and above	Clear, unbroken, sound and shape normal	Clear and reasonably firm	Wellcent red & free from any defect, outline indistinct

A (large)	53-59	Do	Do	Do
A (medium)	45-52	Do	Do	Do
A (small)	38-44	Do	Do	Do

2. Grade B:-

Grade	Weight in gram	Shell	White (albumin)	Yolk
B (extra large)	60 and above	Clear but moderately stained, sound shape may be some abnormal	Clear but may be some slightly weak	May be slightly colored outline slightly visible or distinct
B (large)	53-59	Do	Do	Do
B (medium)	45-52	Do	Do	Do
B (small)	38-44	Do	Do	Do

 # Egg production career of a poultry hen:- A laying hen may produce egg for many years but it is economical to keep a laying hen for only 72 weeks age. Egg production starts when a pullet attains the age of 22 weeks. The production of egg in peak at the age of 32-35 weeks and after 35 weeks age egg production starts decline. The is an usual routine to replace the laying hen at the age of 72 weeks.

There are 3 phases of egg production of a laying hen:-

1. Phase I:- This phase is form 22 weeks to 42 weeks. In this phase the increase in egg production is 0-85 % of production.
2. Phase II:- It is the period from 43 weeks to 62 weeks of age. In this egg production is upto 65 % of production.
3. Phase III:- This is period from 63 weeks to 72 weeks of age. In this egg production is below 65 % of production.

 # Factors affecting size and quality of eggs:-

1. Breed:- Certain breeders have developed some strains of breeds which produce required sized egg.
2. Feeds:- Poultry feed should be balanced to produce good quality eggs.
3. Feed Restrictions:- Every bird should get full feed. No birds should be devoided of feeds due to lack of space and also should not forget to feed the bird.
4. Lack of water:- Abundant quantity of clean, freshed and warm water should be made available for better production of egg.
5. Protein level in poultry feed:- The crude protein level in poultry feed should not be less than 15 % to produce good quality of egg.
6. Laying house temperature:- The temperature of laying house should be at 55 F level. In summers special arrangement for cooling of laying should be ensured.
7. Diseases:- Diseased birds will lay less and of poor quality eggs. Good hygienic condition and good management will produce good quality eggs.
8. Age of maturity of pullet:- Pullet with early maturity will produce smaller egg.
9. Age of bird:- Birds at age 22-29 weeks will produce small egg. At 40-50 weeks will produce maximum size egg and after 50 weeks size will decreases.
10. Egg cooling and storage:- Eggs should be stored at 50-55 F temperature. Temperature is high then weight of egg will decrease due to evaporation.

 # Abnormal eggs:-

1. Double yolk eggs:- When two ova are shed at same time in the oviduct than there is developed double yolk egg.
2. Meat spots on eggs:- In some eggs there are meat spots. It is due to haemorrhage in oviduct.
3. Blood spots in the egg:- This is also due to haemarrhage in the oviduct.
4. Small and yolk less egg:- Some eggs are small in size and yolk less this is due to some physiological disorders during egg development.
5. Soft shelled eggs:- It is due to deficiency of calcium in the poultry feed.
6. An egg within egg:- After egg is formed than it forced back in infundibulum then it reenter the oviduct and develop egg within egg.
7. Foreign matter in egg:- Sometimes some feathers or other foreign matters enter into the oviduct. Than these matters enter into the egg albumin.
8. Pale yolk egg:- This Is due to lack of keratin and other coloring agents in poultry feeds.
9. Rotten newly laid egg:- It is due to over fat hen or due to other diseases of vent.

#Selection and improvement of poultry:- Selection as used in connection with breeding and choosing future parents of next generation. Good breeding practices help in creating a profitable poultry farm. It should not be done in hurry and sentiments.

Two basis of selection:-

1. Pedigree selection:- birds should be selected of best ancestry and on the basis of performance of its brothers, sisters, daughters, cousins etc.

2. Selection of appearance and performance of the birds:- Following points should be taken into consideration:-

i. Vigor:- bird should be of good health. They should be attractive, run and walk properly, fly properly and showing good interest in sex. Comb should have large and bright.

ii. Head:- Head should be clear cut rugged and alert.

iii. Eyes:- Eyes should be bright, prominent and well placed and perfect.

iv. Face;- Face is clean cut and clean. Comb and wattle should be of reasonable size.

v. Abdomen:- it should be large.

vi. Pigmentation:- Pigmentation gives the information of past performance of the bird. Birds should have good reserve of yellow pigment.

vii. Moulting:-Moulting is the process of shedding and removing of old feathers. Late moulting should be taken as good bird.

viii. Temperament:- A good layer should be more acute alert and easily be handled.

ix. Broodiness:-Broodiness is the maternal instinct. A good layer should be less broody.

x. Sexual maturity:- good layer should be early sexually matured.

xi. Persistency in laying:- layer should be persistent.

xii. Trapnest record:- It shows only mother side. Therefore it is not taken into consideration.

xiii. Progeny test:- Birds should be selected through proper progeny testing.

Hatching of eggs :- Hatching is a process in which during 21 days a microscopic germ situated into the yolk changed into a downy chick.

Hatching time of various poultry birds :-

Chicken - 21 days

Duck – 28 days

Turkey – 28 days

Quail – 17-18 days

For the production of best chicks egg should be selected very carefully. Following steps/points should be taken into consideration for hatching of eggs:-

1. Size of eggs:- Egg should be of medium weight of 58 g.
2. Shell color:- If we wants white chicks than white eggs should be selected and if we want brown chicks than brown egg selected.
3. Shell texture:- Eggs of poor shell texture will be of poor hatching.
4. Cracked shell:- Cracked shell eggs should not be selected for hatching.
5. Soiled eggs:- soiled eggs will be resulting in poor hatching.
6. Age of eggs:- Egg should not be more than 3 days old in summers and not more than 8 days old in winters.

 # Types of hatching :-

1. Natural hatching:- It is a process in which a brooding hen sits on the eggs for the full time i.e. 21 days. In this, hens body provides proper temperature and moisture to the hatching eggs. Natural hatching gives better result than artificial hatching. Desi hens are the best natural hatchers.

- Procedure of natural hatching :-

i. Hatching nest:- The hatching nest should be placed at a quiet place. The best nest is made by earthen pot of 15"- 8" diameter or tin pot. This nest is half filled with soil or ash and put straw or leaves. Insectisides powder may be sprinkled over the leaves and straw.

ii. Care of hatching hen:- Hatching hen should be fed properly before sitting during hatching period. Hen should be comes out ones a day for feeding, drinking and some exercise.

iii. Care of hatching eggs:- After putting eggs for hatching, these should be inspected daily. If whether is drying then sprinkled water on eggs or in the nest. Avoid the egg from rats, snakes, cats, dogs etc. for testing the egg, if it is fertile or not on 7^{th} day do candle test if egg is transparent then egg is infertile. If there is a dark body floating in the egg, than egg is fertile.

iv. Number of eggs under a hen:- It depends on the size of hen and whether. In hot whether six eggs and in cold whether eight eggs are placed.

2. Artificial hatching :- Artificial hatching is done by machines called incubator. There efficient and technically develop incubator present in the market now-a-days. They are so efficient and reliable, so that incubating or brooding hens are no more required. The numbers of egg incubated at one time are so great that natural hatching. There are three types of incubator:-

i. Hot radiation from pipes on the eggs.

ii. Hot air infusion directly into the egg:- The capacity of this type incubator is small i.e. 50-500 eggs. Hot air enters at the side of machine. Eggs are placed on the wire bottomed-tray. Incubator is heated by lamps.

iii. Forced draft hot air mammoth:- In this eggs are placed in upright position broad end above and eggs are tilted at 40-45 degree. The ventilation of air is controlled by fan.

Last two types of incubator is commonly used.

 # Management of incubator during incubation :-

Following points should be taken into consideration during incubation :-

1. Level of incubator is very necessary to control heat.
2. Sanitation and fumigation:-

Following points are prescribed:-

i. Sweep the compartment with brush.

ii. Scrub the egg trays, carrier racks and water tray.

iii. Disinfect and dry these before use.

iv. Fumigate the incubator with 40% formaldehyde/formalin and potassium permanganate. Place the chemicals before the fans.

3. Regulating the incubator:- A trail should be taken.

4. Placing of eggs:- Eggs should be placing according to the types of the incubator.
5. Temperature regulation:- Temperature should be ensured accordingly i.e. 1st weak 101 F, 2nd weak 102F, 3rd weak 103 F.
6. Sufficient ventilation:- Ventilation in the incubator is required to expel carbon dioxide which produced during hatching. Therefore proper ventilation should be maintain.
7. Turning of eggs:- Turning of eggs is very essential during early stages of hatching. During 1st weak 4-6 times daily turning is required and after 1st weak 3 times daily is sufficient.
8. Testing of eggs:- Egg should be tested by candling at 7th days & 14th day. After testing on 14th day remove the unfertilized egg.
9. Care during hatching:- hatching eggs should be sprinkled with powder of sulphurupto 18th day. Never help the chicks to come out their shells. The chick which hatched, allow it to remain for 18-24 hours in the incubator without feed. Temperature should be reduced gradually to 93-95 F after hatching.

 # Brooding and rearing:

Brooding is a rearing sequence of chicks from day old to 8 weeks age. Then there is grower 8-20 weeks and layer is 20 weeks to till they lying.

There are two general system of brooding:

1. Natural method
2. Artificial method

1. Natural method:

This method is practiced where no. of chicks are small and this method is used in Desi hens. Desi hens have a motherly instinct (Broodyness). One hen can take care of 15-20 chicks at one time. Hen gives proper temperature to the chicks. Following measurement should be followed in natural brooding :

i. Rearing coop:-

A coop of packing box of 2*2*2 feet dimensions is required. The box should be day durable cheap and safe.

ii. Feeds for chicks and mother:-

During 1st week chick should be given feed in small amount but frequently after every 2 hours. Feed should consist of chicks mash mixed with water. Feed may be given on board into the coop. Hens should be given wet dry balanced grower feed. This feed should not be accessed to the chicks. Frequent clean water be made available to the chicks and the hen.

iii. Other managerial practices:-

Coop should be sprayed and cleaned daily to control mites and pests. Coop should be safe from rats, snakes, owls and other predatory animals. During 1st week debeaking and vaccination should be done. 1st week vaccination is done against marek's disease and Ranikhet diseases. At the age of 6-8 weeks vaccination against fowl pox should be done.

iv. Movement of coop:-

Coop should be move here and there to the fresh site. This will help to control infection and parasitic infestation.

2. **Artificial method :-**This is a commercial type of brooding. This is done without the help of a hen and thousands of chicks may be brooded at one time by a single man.

❖ **Advantages of artificial brooding:-**

i. Thousands of chocks may be brooded by a single man.

ii. Chicks can be reared at any time and at any season.

iii. Sanitary and temperature may be controlled easily.

iv. Feeding can be done according to the plan.

 # Essentials of a good brooder:-

I. There should be a proper mechanism for temperature control.

II. Dry and proper availability of light and space should be ensured.

III. These should be easily disinfected.

IV. There should be safety from predators.

V. Brooder should be economical in construction.

A. System of brooding:-

i. Hot room brooding:- It requires centrally air conditioning to maintain appropriate temperature i.e. 65-75 F. It is very costly and therefore practiced where weather is of extreme nature.

ii. Cold room brooding :- in this system extra temperature is maintained through various sources. This system is used commonly and this is cheap also.

B. Types of brooder:-

i. Battery brooders:- It is a multitier system with 4-5 tiers in one battery. Each tire can accommodate 100 chicks. The floor area of one tier is about 6 x 3 feet. The temperature is maintained by a heater or by an incandescent bulb.

ii. Floor brooders:- These brooders are made up of wood or iron sheets. One unit of this brooder may accommodate 350 chicks. Similarly temperature is maintained by heater or candescent bulb.

 # Management of chicks in the brooders :-

Following points must be taken into consideration during brooding:-

1. Proper temperature (65-75 F)
2. Brooder should be dry and free from dump.
3. Proper ventilation.
4. Chicks should be taught to roost when they are of 4-6 weeks age. It will avoid litter borne diseases.
5. Provide clean and plenty of water to the chicks.
6. At the age of 3 weeks, make available green grass chops.
7. Clean the brooders and utensils daily.
8. Follow the proper vaccination programme.
9. Avoid over crowding.
10. Avoid the brooders from direct sunlight and cold & hot winds.

11. Daily inspection of the chicks & brooders.
12. Chicks should be given antibiotics and vitamin B complex.
13. Debeaking should be done at the age of 2-4 weeks.
14. Provide the chicks proper and balanced chick feeds.

 # Management of growers (8 weeks to 20 weeks):-

Following steps should be followed during management of grower:-

i. Underdeveloped and diseased birds should be culled.
ii. Provide sufficient floor space, feeders space and drinkers space.
iii. During grower period day light is sufficient, no extra lighting is required.
iv. Depth of litter should be 5-6 inches and keep the litter clean and dry.
v. If necessary do the debeaking at age of 15-16 weeks.
vi. Ensure adequate ventilation.
vii. Avoid the birds from adverse climate.
viii. Place the laying boxes 4 weeks in advance.

 # Management of layers (20 weeks onward):-

Following steps should be followed for layer management:-

i. Provide sufficient floor space, feeders space and drinkers space.
ii. Laying boxes should be placed before 4 weeks of laying. One laying box (nest) should be of 1x1x1 ft. for 5 hens. One community box of size 5x1x1 ft. for each 25 hens. For pedigree breeding, trap nest is required.
iii. Provide 14-16 hours light including day light.
iv. Increase the depth of litter to 6-8 inches.
v. Use layer feeders and drinkers.
vi. Collect the egg atleast 3-4 times a day and place the egg on filter crats at cool place.
vii. Deeping, deworming and dusting should be done regularly. It will protect the birds from ecto and endo parasites.
viii. Culling of hens should be done time to time.

 # Debeaking:-It is process of cutting normally or abnormally developed beak. It is done to avoid cannibalism and feed wastage. It is done at the age of 3-4 weeks and after 15-16 weeks if necessary. It is done by two ways:-

a) Cold debeaking:- It is done by the help of a sharp knife or a pair of scissors. Bird should be held tightly during debeaking.
b) Hot debeaking:- It is done by an electricity run machine called debeaker.

Steps for debeaking:-

i. Machine is heated by electricity.
ii. Open the mouth of the bird by finger.

iii. Cut 1/3rd of upper teeth and 1/4th of lower teeth.
iv. Cauterize the beak to prevent bleeding.

 # Poultry housing:-It is needed for protection, comfort, efficient production of birds and convenience to poultry men.

Two essentials of poultry housing:-

1. Comfort:- For good production birds should be comfort and happy. Comfortable must provide adequate space to the birds and must be protected from adverse climatic condition.
2. Protection:- Birds should be protected from predators such as dog, cat, snake, owl etc. and also protected from flies, insects, lices, ecto parasites.

 # Location of poultry housing:-For selecting location for poultry housing following 4 steps should be taken into consideration:-

1. Relation to the other buildings:- Poultry house should not be located near the residential area because poultry farming is a great nuisance to the residents of the area. And it should not be located too far from poultry men house because it will create difficulties in management.
2. Exposure:- Poultry house should be faced south or east directions. South will provide maximum sun exposure and east will provide morning sun.
3. Soil type and drainaze:- Poultry house should be located at the slop of hill for better drainaze. Soil should be fertile because fertile land will grow vegetation and this vegetation will provide a good range to the birds.
4. Shade and protection:- Poultry house should be shady with trees which will protected the birds from hot and cold winds. And should provide protection from predators.

 # Housing requirement of poultry:-

Following recommandations are given for requirements are given for requirements of poultry birds:-

1. Floor space:-

Sr. No.	Age of birds in weeks	Space/bird in cm square
1.	0-8	700
2.	9-12	950
3.	13-20	1900-2300
4.	Above 20	2300-3700

2. Feeder space requirement:-

Sr. No.	Age of birds in weeks	Space/bird in linear cm
1.	0-2	2.5 minimum
2.	3-6	4.0 minimum
3.	7-12	7.5 minimum
4.	13 and Above	10 minimum

3. Water and watering space:-

Sr. No.	Age of birds in weeks	Amount of water/100 bird in liter per day	Water Space/bird in linear cm
1.	0-4	2.8-4	0.6
2.	5-8	12-14	1.2
3.	9-12	20-25	10.0
4.	13-16	35-40	12.5
5.	16 and above	45-48	15.0

 # Poultry housing:-Basic requirement for the construction of poultry house:-

1. Roof:- Cement asbestos sheeting, corrugated iron and zinc sheet.
2. Floor:- Floor should of such type which is easy to clean disinfectant. Also free from rats and floor should be durable.

Three types of floor are recommend for poultry housing:-

a) Cemented:- Cemented floor complete to the all above requirement.

b) Wire mesh floor:- Wire mesh of metal having ½ x ½ inches mesh is sufficient for poultry housing. This type of floor is ideal from sanitary point of view because excreta, will fall down. Although it is costly.

c) Kachha floor:- This type of floor is very cheap although not good from sanitary point of view.

3. Walls:- The walls should be water-tight, wind-proof and interior should be of such type which is easy to clean and disinfectant.
4. Ventilators:- There should be a proper provision of ventilators because poultry birds breath very rapidily.
5. Windows:- Windows of a poultry house should be on all four walls and opposite to each other.
6. Doors:- doors of a poultry house should be south facing and sufficient in size so that poultry man can work conveniently.

 # Housing system of poultry housing:-generally there are 4 types of system of poultry housing. These systems depends on availability of land and capital.

I. Free range of extensive system:- This is the oldest system of poultry housing used for centuries. This system is used where land availability is in abundant. In this system birds have unlimited space and natural feeds such as vegetation, insects etc. birds should be protected from prediators, infections and parasites. Now-a-days this system is not used.

II. Semi-intensive system:- This system is used where land is available in limited amount. In this system open space of 20-30 sq. yard per bird and a poultry house building is required.

III. Intensive system:- In this system birds are kept totally confined. This system is practiced where land is very limited and this system is very expensive. There are two types of intensive system:-

(a) Battery system:- This is the latest system adopted by the commercial poultry farmers. This is practiced where land is very expensive such like big city. This is used for the layers. In this system each hen is kept into a wire cage of dimension 14" x 16" x 17" several cages are combined together. Cage has small slop so that egg laid slids into egg collecting duct. The dropping are collected into trays placed below the cages. Feed and water is supplied outside the cage.

❖ Advantages of this system:-

i. Minimum energy is consumed by the birds due to lack of movement.
ii. Dropping are collected in the trays below. So good hygiene condition is maintained.
iii. Eggs are collected automatically, therefore good saving of labor.
iv. Culling and selection of hens are easy.

(b) Deep litter system:- This is the best system of poultry farming. Deep litter is defined as the accumulation of material use for litter with poultry dropping. When it is reached 8-12 inches depth then it is called deep litter. Upto 250 birds can be kept in closed pen. The litter includes – straw, sawdust, leaves etc.

Following precautions should be taken while practicing deep litter system:-

i. Pen should be well ventilated.
ii. Litter should be kept dry. Stir the litter at least once a week.
iii. Deep litter should be started during dry weather.

iv. Keep adding the litter material till it is reaches upto 8-12 inches depth.
v. Do not keep more than 250 birds in one pen.

❖ Advantages of deep litter system:-

i. Safety of birds from predators.
ii. Litter is a source of feed supply:- Bird obtained animal protein factor such as riboflavin and other vitamin B complex. The level of these animal protein factor increase three folds in deep litter system.
iii. Diseases control:- Deep litter is kept dry which protect the bird from coccidiosis and other worm infestation.
iv. Labor saving:- There is no need of daily or weekly cleaning. If deep litter is kept dry then no need for cleaning or changing of litter.
v. Valuable fertilizers:- Deep litter has a great fertilizing value. It contains 1-3 % nitrogen, 2% phosphorus and 2% potash. 35 laying hen can produce upto 1 ton fertilizer in one year.
vi. Hot and cold weather safe guard:- Deep litter work as thermodynamics i.e. keep the pen cool in summers and hot in winters.

Due to all these advantages deep litter system is best system for poultry farming. This may be practiced for layers, brooding, broilers and growers.

IV. Folding units system:- In this system birds are confined into folding units. The position of these folding units changed daily. A folding unit of 5 x 20 feet may hold 25 birds.

 # Poultry house equipment:-In a poultry house their needed several equipment. There are required for efficiently running of poultry house and better production. Equipment should be simple constructed, cheap, moveable, easily cleaned and disinfected.

List of equipment/instruments:-

1. Perchers or roosters:- When chicken become 8 weeks old, they need roosting/perching. Roosters are made from wooden bar of about 2" square and it is hung horizontally 8"-16" the floor near the walls.
2. Nest boxes fort laying:- Nest are required to lay conveniently. A 14" square and 6" deep nest is required for 5-6 hens. These are made of metal wire. Kerosene empty tin is ideal for laying nest.
3. Trap nest:- These are required for breeding and selection purpose.
4. Feed hoppers or feeders:- Feed hoppers/feeders must have following features:-

➢ To avoid wastage of feed.
➢ To prevent the birds to put their feet in the feed.
➢ Easy to clean.
➢ To make easy so that the birds can eat from the bottom of the hopper.

There are following types of feeders:-

i. Linear feeder with reel.
ii. Linear feeder with opening.

iii. Rombo feed hoppers.
iv. Hanging or tube hoppers.
v. Hanging feeders with grill.

5. Waters or water device:- These must have all the features of feeder/feed hoppers. These are following types:-

I. Simple water fountain
II. Jar and plate waterer
III. Water trough with wire grill top
IV. Bottle and bowl waterer
V. Earthen waterer with pots, bowl.
VI. Automatic linear waterer float valves.

6. Grit and shell containers:- ordinary hoppers can be used for the grit/shell containers. These are required in less number and should be placed near the feeder.
7. Dust baths:- For dust bath a earthen pot or a hole of 2 feet diameter is sufficient. This should be placed east side of poultry house. These should be refilled continuously with sulphur flower, some dry tobacco leaves, coal ash, cow dunk ash.

 # Poultry feeding and nutrition:-Nutrition is necessary for the production, reproduction, growth and maintenance. Feeding includes procurement, ingestion, digestion, and absorption.

 # Principles of poultry feeds and feeding:-60-65 % of total cost of poultry farming is of feeds. Therefore poultry feed is the most important aspect of the poultry farming. Following 4 principles should be taken into consideration while compounding and procuring of poultry feed:-

1. Poultry birds have no teeth and lips hence, they require more concentrate feed.
2. Poultry birds although have compound stomach but its works is simple. The digestion of poultry is very rapid. A layer's feed takes only 2.5 hours and a broiler's feed takes 10 hours to pass from mouth to cloaca. Therefore compounding of poultry feed requires special precision.
3. There is no microbial digestion in poultry birds. Therefore essential amino acids and vitamin B-complex requirement is done through feed.
4. Poultry birds are fed collectively.

 # Nature and functions of poultry nutrients:-These are classified into physical, chemical and biological properties. These are divided into following rules:-

1. Water
2. Protein
3. Carbohydrates
4. Fats and oils
5. Minerals
6. Vitamins

7. Feed additives

I. Water:- Water is an essential part of poultry nutrients. 1.5-2.5 g water is needed per g of poultry fedd.

II. Proteins:-The poultry products are of high percentage of protein. Eg. Broiler's dressed meat has as high as 65 % protein. & egg has 50% proteins. Therefore high quantity of proteins is required in the poultry feed i.e. 22-24 % proteins in broiler's feed and 16-17 % in layer's feed.

III. Carbohydrates:- Carbohydrates provides energy. Poultry birds can not digest complex carbohydrates such as cellulose. Cereal grains and their byproducts are excellent source of carbohydrates.

IV. Fats and oils:- Eggs and poultry meat have a good quantity of fats. Fats containing feeds such as barley, sunflower, wheat, rice bran etc. contains upto 2-5% of fats and these are sufficient for poultry feeds.

V. Minerals:- Minerals such as Ca, P, Mg, I, Fe, Cu, Zn etc. are very essential for poultry feed. Laying hens requires extra Ca& P for the formation of egg shell. Grains and vegetables are poor source of these minerals. Therefore extra mineral supplement are required for poultry feed. These are some mineral supplements such as :-

- Lime stone
- Bone meal
- Oyster shell
- Sodium chloride
- Potassium iodide etc.

VI. Vitamins:- About 13 vitamins are essential for poultry. There are two types of sources of these vitamins:-

i. Natural sources

ii. Commercial vitamin mixture.

VII. Feed additives:- These are not-nutrients but these help in :-

- Digestion.
- Works as stimulant.
- Works as medicines.
- Flavoring.
- Help in change of texture of feeds.

Following additives are used in poultry feed:-

i. Antioxidants:- These prevent oxidation of feed when spoiled feed is fed to the poultry. These are added at the rate of 0.01%.

ii. Flavoring agent:- these are added at the rate of 0.05%.

iii. Pellet binder:- Such as molasses and wood pulp wok as pellet binder and these change the texture of feed. These are mixed at the rate of 2.5%.

iv. Grits:- Oyster shell and lime stone are common grits used in poultry feed. These help in digestion and grinding in the gizzard.

v. Chelates:- These increase the absorption of mineral.

vi. Enzymes:- These help in digestion of some complex proteins.
vii. Probiotics:- These help in the growth of some useful bacteria in GIT.
viii. Antibiotics:- These help in stop growth of harmful bacteria.
ix. Hormones:- These are added in the poultry feed to bring desirable metabolic changes in the poultry which enhance egg and meat production.
x. Antifungal additives:- These are mixed to destroy some harmful fungus in the poultry feed.
xi. Anticoccidial:- These are mixed to prevent Coccidiosis.
xii. Anthelmintic drugs:- These are added to prevent internal and external parasitic infestation.

 # Broiler management #

 # Raising of broiler:- Broiler or fryer is a young chick of either sex below age 8-10 weeks and weighing 1.5-2.0 kg. Broiler has soft, pliable and tender meat with smooth textured skin and flexible breast bone.

 # Roaster:- Roaster is a young chick of either sex but much older than broiler about 12-16 weeks. Meat is also soft, pliable and tender & also skin is smooth textured but breast bone is some harder.

 # Breeds and breeding of broiler:-Parental broiler stock consists of male lines and female lines selected at the age of 8 weeks.

Two breeds :-

White ply mouth for female.

White Cornish for male line.

The broiler must have characterstics:-

1. White color
2. Yellow shank
3. Growth faster than either parents
4. Meat sot, pliable and tender

 # Broiler housing:- In modern commercial production of broiler, the bird spend entire life in one house. In special breeding of grower housing where broilers are kept, they must be protected from heat, cold, winds and other adverse weather condition. House should be situated at higher landscape. Should have good drainaze system and be accessible to clean water, electricity and sewage system.

 # Managemental practices for broiler:-

1. Broiler house temperature:- On 1st week 98 F temperature is needed. Than temperature be reduced at the rate of 5 F per week when it reach to 70 F.

2. Ventilation of broiler house:- The digestion of broiler birds is very fast therefore level of oxygen and carbon dioxide exchange is very high. Hence maintainence of good ventilation and moisture is must be ensured.
3. Lighting of broiler house:- One 60 watt bulb for each 200 sq. ft. of floor space is ideal.
4. Floor space requirement:- 0.8 to 1.0 sq. ft. floor per bird is sufficient for broiler bird.
5. Debeaking:-Debeaking must be done on day old chick. Debeaking is necessary to avoid wastage of feed and cannibalism (to eat own species animal).

6. Sexing:- Male birds have following peculiarities of female:-

(i) Male are about 1% heavier than female.

(ii) Male grow faster than female. At normal market age male will attain some body weight 9 days earlier than females. Therefore males are more efficient feed converter into meat.

Therefore in the view of about point sexing of broiler birds is necessary. Sexing is done by vent.

7. Broiler feeds:- since feed constituents 70% of total cost. Therefore special attention given to the broiler feeds. There are two types of broiler feed:-

i. Broiler starter:- It is given upto 5 weeks of age. It give higher crude protein content i.e. 21-22 % lower carbohydrate.

ii. Broiler finisher:- It given from 5 weeks upto marketing. Crude protein portion is lower i.e. 19-20% carbohydrate portion is higher.

8. Broiler health programme:-

Following steps should be taken for broiler health programme:-

i. Start with healthy birds.

ii. Vaccination against Ranikhet diseases at the hatchery.

iii. Effective drugs and vaccine is used to control coccidiosis.

iv. Keep feeds free from Aflatoxin.

v. Clean the litter before the arrival of batch.

vi. Do not allow visitors without wearing disinfected boats or cloths.

9. Marketing of broilers:- Marketing of broilers means moving birds from broiler house to the consumers house.

Following steps must be followed for marketing:-

a) Stop grits feeding to the birds before 2 weeks of marketing.

b) Feeding should be stop before 2 days of marketing.

c) Catching of birds:-

i. Use expert attendants.

ii. Catch the birds under dim light.

iii. Make small group of birds before catching.

iv. Catch the birds at shank.

v. During the journey avoid the birds from adverse climate conditions. Use open carets during hot weather

SHEEP MANAGEMENT

 # Some common terms in relation to cattle:-

1. Species – ovine
2. Group of animal – flock
3. Adult male – Ram/Tup
4. Adult female – Ewe
5. Young male – Ram lamb
6. Young female – Ewe lamb
7. New born – lamb
8. Act of parturition – Lambing
9. Act of mating – Tupping
10. Female with spring - Suckling
11. Pregnancy – gestation.
12. Gestation period – 144-150 days
13. Age of puberty – 8-9 months
14. Rate of respiration – 12-20 per minute
15. Average body temperature – 100.9-103.8 ° F
16. Average heart beat – 60-72 per minute

Sheep are reared and bred for – meat, wool, milk, hide and manure.

 # Some famous breed of sheep:-

A. Indigenous breed:-

- Gaddi
- Nali
- Chokla
- Sonadi
- Malpurea etc.

B. Exotic breeds:-

- Merino
- Rambouillet
- Corridale etc.

 # Feeds and feeding habits of sheep and some other specifications of sheep:-

1. Upper lip of sheep has a cleft, which helps in prehensing of small grasses and cereal grains left during harvesting.
2. Sheep foundation stock is very cheap and they multiply very rapidly.
3. Sheep do not required any supplementary feed. They can survive on – weeds, small grasses, roots, shrubs, cereal grains, leaves, bark etc. These all substances are the products of waste and baron hilly lands.

4. Sheep is a wonderful animal which convert waste products into valuable meat and wool.
5. Sheep is a wonderful weed destroyer.
6. Unlike goats, sheep never harm the trees.
7. Sheep dung is a wonderful manure .
8. Sheep produces wool which is the basic unit of textile industries.
9. Meat of sheep is of good quality.
10. Sheep has herd-instinct. This instinct help in controlling the herd and there is a good saving of labor.

 # Management jobs for sheep rearing:-

1. **Sheep housing:-**Sheep do not requires any costly building for housing. Just like to goat the like to rest in open area. Sheep should be protected from predators. An open space made of fire proof material is sufficient. Due to wool sheep need not to be protected against winter.
2. **Deeping:**- To avoid ectoparasites such as maggot, lice, ticks, scab etc. deeping is required. Deeping is done by sulphur powder, DDT, BHC, lime sulphur solution.
3. **Deworming:**- Sheep is dewormed against endo parasites. Broad spectrum anthelminitic such as banmith, albendazole, zenil etc. Deworming is done before and during rainy season especially Zenil against liverfluke.
4. **Castration:**- Castration of male lamb is done at the age of 2-4 weeks. It is done by mini Burdizo's castrator.
5. **Identification:**- Identification is done by ear notching, tattooing and ear tagging.
6. **Holding of sheep:-**Sheep should be caught by nose flank and hind limb. Never catch a sheep by wool.
7. **Vaccination:**- Vaccination against entero toxemia, sheep pox and H.S.

 # Some important diseases of sheep:- Some diseases FMD, Rinderpest, enterotoximia, lamb dysentery, black quarters, H.S., sheep pox, lung worm infestation and pneumonia.

GOAT MANAGEMENT

Goat was domesticated and reared around 900-700 BC. It is reared for milk, meat, hides, fibers and manure.

 # Some common terms related to goat:-

17. Species – caprine
18. Group of animal – flock or band
19. Adult male – buck
20. Adult female – doe
21. Young male – buckling
22. Young female – goatling
23. New born – kid
24. Act of parturition – kidding
25. Act of mating – serving
26. Sound produced – bleat
27. Pregnancy – gestation.
28. Gestation period – 145-153 days
29. Birth weight of kid – 1-4 kg
30. Adult weight – 19-40 kg
31. Age of puberty – 4-5 months
32. Duration of estrus – 12-48 hours
33. Rate of respiration – 12-20 per minute
34. Average body temperature – 101.3-103.5 F
35. Average heart beat – 20-35per minute
36. Average milk produce – 800 g-4 kg daily

Indian breed of goat kid twice in a year and generally kid twins.

 # Feeding habits of goat:-It have following peculiarities:-

1. By mean of their upper mobile lip and very prehensive tongue goat are able to graze on very short grasses. These grasses are so short that other domestic animal can not graze.
2. Goats have very fastidious eating habit. They accept a wide variety of feed and vegetation which sheep or cattle can not eat.
3. Although goat can distinguish bitter taste, sweet taste, salty taste, sour taste but they are highly tolerance to those taste. Specially bitter taste vegetation are being digested by goat.
4. Goat can easily digest crude fiber.
5. Goat can consume/eat aromatic herbs.
6. Goat can browse and can get their required nutrients.

Thus goat can get their nutrients by grazing but if extra milk is needed than additional leguminous fodder and concentrate is required. Goats like leguminous fodder only but no other fodder such as

sorghum, wheat straw, maize. Milk conversion rate of goat is 45-71 % as compare to 30% of cattle. Goat have special liking of salts.

 # Routine operation for goat management:-

1. **Handling of goat:-** Goat is a docile animal and frequently learn to come for feeding and milking. Never held a goat with horns and ears. Hold them with neck and collar.
2. **Castration:-** Castration of male is done by Burdizzo's castrator at the age of 2-4 weeks.

Advantages of castration:-

i. Palatability of meat increases.
ii. Body weight gain faster.
iii. Quality of skin (hide) become superior.

3. **Dehorning:-** Dehorning is done at the age of 1 week by caustic potash.
4. **Care of feet:-** Hooves of goat grow frequently. Therefore trimming of hooves should be done time to time.
5. **Identification:-** It is done by ear tattooing and also may be done by ear notching at early age of 1 week.

 # Housing of goat:- Goats generally don't like being closely confined. They like plenty of fresh air and love a clean & dry place for sleeping and resting. However some housing is needed for the goats to protect them for adverse weather conditions. Under farm and city condition an economical housing is practiced. A pen of 5x2.5 feet and 6 feet height is sufficient for a pair of goat. Several pens may be constructed according to the requirement. For milching goat a separate pen for kid may be constructed in the hot area. The shelter should be made of fire proof materials.

 # Deworming and vaccination in goats:-Deworming against endo and ecto parasites should be done time . vaccination against FMD, Black Quarters (B.Q.), enterotoxaemia, H.S. etc. should be done according to the schedule.

 # Common diseases of goats:-

1. Mastitis
2. Foat Rot
3. Brucellosis
4. External and internal parasitic infestation.
5. Poisioning
6. Bloat
7. Tearing of teats and udder.

SWINE MANAGEMENT

 # Some common terms related to pigs:-

1. Species – Swine of Sus
2. Group – Stock/Herd
3. Adult male – Boar (8-9 month)
4. Adult female – Sow (6-8 month)
5. Young male – Boarling
6. Young female – Gilt
7. Newborn – Piglet/Pigling
8. Castrated male – Hog/Stag/Barrow
9. Castrated female – Spayed
10. Female with its offspring – Suckling
11. Act of parturition – Farrowing
12. Act of mating – Coupling
13. Sound producing – Grunting
14. Pregnancy – Gestation (114 days, 3M-3W-3D)
15. Respiration rate – 10-16 per minute
16. Heart beat – 96-378 per minute
17. Temperature – 101.6 – 103.6^{o} F

 # Breeds of swine:-

There are two types of swine:-

1. **Indigenous:-** Indigenous are mostly village hog called domestic pigs. This is a scrub animals having no special characterstic. These are kept by the poor society of our country and they are left loose to pick up waste product especially human faeces. Their meat is of poor quality. Rate of body weight gain is very low and have less number of litter.
2. **Exotic breed:-** These are very profitable and meat & other products are very of high quality. These are some breed like large white Yorkshire, middle white Yorkshire and landrace etc. China is leading country to rear pigs and 1/3 population of pigs is in China.

 # Management of Exotic Swine:-

1. **Care of Sow during farrowing:-** A sow reproduce large number of litter. Therefore special trained attendant is required during farrowing. A good hygienic condition is to be maintained.
2. **Care of litter:-** Special care must be taken for the piglet upto 8 weeks of age and should be given in creep feed.
3. **Weaning:-** At the age of 3-6 weeks piglets are weaned. Advantages of weaning are:-

i. An uniform development of piglet is ensured.

ii. The Sow's comes in heat of cycle earlier.
iii. Protection from diseases and parasites of the pigs is easy.
iv. Less weight loss of sow therefore saving of sow feed.

4. **Castration of male pigs:-** At the age of 4-6 weeks castration of a male piglet is done and it is done by surgically.
5. **Identification:-** It is done by ear notching and sometimes by tattooing.
6. **Clipping of tusks:-** When a boar attain the age of 2 years then they developed to tusk teeth. These are very dangerous weapon and should be clipped.
7. **Housing of pigs:-** Pigs are very sensitive animals to the extreme weather. There is no sweating system in the pigs therefore cooling during sumer is very important. There are two system of housing:-

i. Open air system
ii. Closed or indoor system.

The combination of these two system are practiced. There should be separated farrowing pens, piglet pens, boar pens, store room. Floor should be cemented and door gates should be strong.

Floor space requirement:-

	Covered	Open
Farrowing pens	**10-16 Sq. Ft.**	**30-40 Sq. ft.**
Farrowing sow with piglet	**60-80 Sq. Ft. per litter**	
Boar pens	**40-50 Sq. ft.**	

 # Somecharacterstics of swine and their products:-

1. Superior feed conversion power:- pig is an single stomach animal therefore it can not survive on roughages it requires special computed ration. 3-3.5 kg feed is required per kg body weight gain.
2. Swine is very prolific animal and gives quick return and litter size may be 6-12 piglet. 80 kg of body weight is attained within in 6 month.
3. Investment amount for piggery far4ming is very low.
4. Swine stored fat very rapidly.
5. Swine has 65-80 % dressed weight. Whereas cattle 50-60%, sheep and goat 45-55%.
6. Due to small bones edible part of meat is very high.
7. Pork is most nutritious due to higher content of fat and therefore pork has higher energy.
8. Because of rapid growth swine is very sensitive to unfavorable ration and careless management.
9. Swines are susceptible to various diseases and parasites. Therefore proper treatment should be ensured.

Equine Management

INTRODUCTION TO EQUINES

- The horse was probably last of present – day farm animals to be domesticated by man.
- According to early records, after subduing the ox, the sheep and goat, man domesticated the ass and then the camel; and finally the horse become this servant.
- Horses appear to have been domesticated first in central Asia or Persia, more than 3000 years B.C.
- Species Equus caballus , the horse is distinguished from asses and zebras by the longer hair of the mane and tail, the presence of "chestnut" on the inner side of the hind leg and by other less constant chara, larger hoofs, more arched neck and smaller head and short ears.cters such as larger size

ZOOLOGICAL CLASSIFICATION

	Horse	Donkey	Mule
Kingdom	Animalia	Animalia	Animalia
Phylum	Chordate	Chordate	Chordate
Class	Mammalian	Mammalian	Mammalian
Sub-class	Eutheria	Eutheria	Eutheria
Order	Ungulate	Ungulate	Ungulate
Sub-order	Perissodactyla	Perissodactyla	Perissodactyla
Family	Equidae	Equidae	Equidae
Genus	Equus	Equus	Equus
Species	Caballus	Asinus	
Zoological name	Equus caballus	Equus asinus	E. caballus + E. asinus

HOOF CARE

Hoof care

- Foot care is one of the most neglected of all horse management practices. Most lameness that impairs the usefulness of a horse can be prevented by proper foot care. Foot care should b as routine as feeding and watering. It should include
  - Routine cleaning
  - Periodic trimming
  - Corrections of minor imperfections
  - Treatment of foot disease and injuries.
- Ideally, a horse's foot should be inspected and cleaned every day. A hoof pick or or fine-bristled wire brush can be used for cleaning the sole, frog and hoof wall. This will improve the likelihood of detecting pr0oblems early.

- The hoof wall grows an average of ¼ inch per month. Most horse' hooves are trimmed and shod every 6 to 8 weeks. This depends on rate of growth and wearing of hoof wall.

Tools required

- Hoof pick – used to clean any dirt or rocks from the hoof crevices
- Nippers used to remove extra hoof wall
- Clinch cutter or pincher or puller – used to remove shoes that have been worn and are ready to be taken off
- Hammer – two kinds can be used one for driving the nail in and the other for shaping or rounding the horseshoe on the anvil
- Rasp need for leveling the foot
- Hoof leveler used to determine the angle of the hoof wall and check that the hoof is level to the ground

			
Hoof pick	**Nipper**	**Clinch cutter**	**Rasp**
			
Hoof leveler	**Hammer alter shoe**	**Hammer to drive nail**	**Hoof care kit**

TREATMENT OF HOOF INJURIES AND FOOT DISEASES

- Moisture in the horse's feet helps to maintain flexibility and prevent cracking. Most of the moisture needed in a healthy and well protected foot can come from within. One way to maintain proper moisture in the foot is to regularly apply a good hoof dressing containing some animal fat such as lanolin.

- When a shoe is lost, it is important to promptly cut the hoof wall level with the sole to preen it from breaking about the point while awaiting the farrier. Removing the opposite shoe and lowering the hoof wall to equal the length of the other hoof will balance the gait of the horse.
- Much lameness results from nail pricks. Horse should not be ridden in areas littered with trash and board containing nails. Injury caused by nails can ruin the horse. As soon as the nail prick is identified, prompt medical attention and packing is needed to prevent infection by ground borne disease organisms.

FOOT CLEANING

- **The foot should be cleaned from the heel towards the toe with a hoof pick.**
- **Special care should be taken to clean the commissures on each side of the frog and the cleft of the frog itself, but the heal should not be opened excessively. This weakens the area and interferes with proper contraction and expansion of the heal.**
- **After the hose has been ridden, its sole must be cleaned and checked for gravel or other foreign objects that could be lodged in the natural depression of the foot.**
- **A nail, gravel, stick, other other object can work into the foot and cause lameness for a long time.**

PERIODIC CLEANING

- **Trimming of the feet is important, although it is not needed as frequently as cleaning. Trimming should be done at about 4 weeks intervals on horse kept in stall or paddocks or about 6 weeks interval for horse used heavily or running in pastures.**
- **The main goal in trimming is to retain the proper shape and length of the foot. The bottom of the foot should be kept level, and the inside and outside walls should be maintained at equal lengths. The toe of no4rmal feet and pastern should be 3 inch long; the quarter, 2 inches and the heal 1 inch.**
- **The hoof wall should be trimmed with nippers to remove excess length, then a rasp is used to smooth and level the bottom of the foot. Each stroke of the rasp needs to run from the heel through the toe to prevent uneven area in the hoof wall.**
- **Trimming the sole, referred to as lowering the sole, is done to keep the pressure on the hoof wall rather than on the sensitive inner part of the foot. The dead, flaky tissue should be trimmed from the sole. Live tissue, elastic when stretched between the fingers, should not be trimmed away.**
- **The frog should not be trimmed excessively because it should contact the ground with each step. It is trimmed only enough to remove dead tissue and to provide uniform and adequate fissure along the junction of the sole and the frog.**
- **After the bearing surface has been rasped to the level surface of proper length, the edge of the wall should be rounded if the horse will not be shod. This prevents chipping and peeling as the foot contact rocks, logs or other obstructions.**
- **The heel should be trimmed enough to promote expansion and prevent contraction of the heels. The main concern is to trim often enough to prevent cracking and uneven wear, which could eventually contribute to improper set of the feet and legs.**

Maintaining hoof-wall angle

- **The proper hoof wall angle in relation to ground and the angle of the pastern is very important. The angle of the hoof wall should approximate the angle formed by the shoulder and the pastern usually 45 to 55 degrees.**

INTRODUCTION TO FEEDS AND FEEDING OF HORSES

- Optimum feeding of brood mare is one of the most important aspect of management of any breeding stud, to achieve higher conception rate, growth of foetus through in utero nutrient, birth weight of foal and its further development of bones, body growth and protection through passive immunity gained through colostrum.
- The level of feeding can be gauged from the condition of horse and its response to it.
- It is advisable to avoid any extreme condition of fatness or thinness

PRINCIPLES FOR FEEDING HORSES

- The individual variation of feed requirement and body condition must be given due consideration for planning the feeding regimen of the horses. Some horses perform best while being trim or empty stomach whereas others exhibit their best when their body condition is optimum.
- The growth, development and expectations from the horse regarding its performance will determine the extent of feeding especially in early days.
- Both over-feeding and under-feeding are harmful for horses, therefore, the diet has to vary as per the requirement of the horse and its physiological status.
- All feed ingredients of horses should be free from extraneous substances such as weeds, dust, mould etc. The hygiene of feed box should also be maintained.
- The time of feeding the horses should be strictly adhered to. Also no abrupt changes in the diet should be permitted.
- Well being of horses depends a lot on the exercise. It helps to keep them in shape for riding racing work and performance
- A clear, wholesome and fresh water source should always be available to the horses.
- A source of salt or complete mineral mixture should always be available for horses at all times which give them an opportunity to take extra minerals depending upon their requirements.
- The feed of the horses must contain roughages, otherwise the heavy feed concentrates are likely to pack the stomach. However, feeds too high in fiber (should not exceed 30%) may also cause discomfort or digestive disturbances.
- Oral hygiene and dental care should receive due attention as teeth problems limit the horse's ability to chew.
- Weighing of horses to find out gain or loss in the condition is a valuable parameter to decide the response of feed and effect changes
- Horses should be fed in groups according to their age, growth or development stage to prevent over-feeding or under-feeding which may occur if horses of varying sizes and age are fed together.
- Foals should be allowed access to creep feed so that they achieve the maximum for their growth and bone development as the mare's milk.
- Regular deworming and health inspections are important to keep horses healthy. The stables should be kept cleaned and manure removed to reduce parasitic infestation as they decrease feed intake feed efficiency and body weight.

- The digestive tract of horses is limited in size and feeding large quantities of grain or concentrate feeds at one time results in higher frequency of colic and grain founder. Therefore, high performance horses, which require large amount of energy from grain or concentrate sources, should be fed three to four times daily instead of two times.
- More frequent feeding with less portions in each one will reduce founder, colic and other digestive problems. Recommended feeding schedule is as follows:

Type of feed/fodder	Morning	Noon	Night
Hay	25%	25%	50%
Grain/concentrate	33%	33%	33%

- The grain portion of the diet of high performance horses should be reduced if they are not being exercised. The roughage portion can be suitably increased. This is essential to prevent azoturia or Monday Morning Sickness, which causes muscle spasms or tetany.
- The diet of horses must contain roughage to provide fibre or bulk. This will reduce the incidence of vices such as wood chewing, tail and mane biting. It will also decrease the incidence of digestive disorders.
- The horses should not be exercised after feeding as the stomach contents are likely to cause pressure on the diaphragm leading to laboured breathing due to restriction in the lung expansion. Secondly, the absorption of nutrients is also affected as the blood circulation is diverted from splanchnic bed of blood vessels around the intestines to vital organs, reducing the absorptive process.
- There is little microbial action in the stomach of horse. As result the horse does not break more than bout 30 per cent cellulose of feed, whereas the ruminant breakdown 60-70 per cent.
- Antibiotic supplementation in the feed increases the growth rate and feed efficiency and reduces the non-specific infections.

Role of water

- Water is an ideal dispensing medium because of its solvent and ionizing powers which facilitates cell reaction and because of its high specific heat, it is able to absorb the heat of these reactions with a minimum rise in temperature. The latent heat of vaporization also plays an important role in regulating body temperature.
- It aids in digestion, in the transport of metabolic products and excretion of waste products.
- It is a constituent of cells and body fluids. Surplus water is excreted via urine, faeces, perspiration and vapors from the lungs via breathing.
- Water as a constituent of synovial fluid lubricates the joints and as cerebrospinal fluid, it acts as a water cushion for the nervous system.
- In the ear, it transports sounds and in eye, it is concerned with sight.
- It provides cushion to the body organs and system.

CEREAL GRAINS

- **Oats:** Oats have traditionally formed a very important component of horse diet. It is known for low density and high fibre content which helps to avoid over feeding and at the same time its grain size is more appropriate for chewing. There are very less chances to produce grain founder or other digestive disturbances as a result of feeding excess quantity of oats as compared to the other cereals.

- **Barley:** It is another grain which is enveloped in a hull and constitutes 10 14 percent of the total grain weight. It is relatively smaller and more tightly apposed to a grain which is larger as compared with oat hull. Therefore, barley grain should be crippled or tightly rolled to rupture the hull before feeding. Because of higher starch content and weight of the barley, it may cause digestive disturbances when fed alone, hence mixing barley with more bulky feeds such as 15 percent or more wheat bran or 25 percent oats may minimize the occurrence of colic. It is normally fed in combination with oats.
- **Corn:** It is widely used in feeding of horses and ranks second to oats. As the grains are very hard, they should be cracked before feeding. Corns contain twice the energy per unit volume of oats and therefore, it is fed at higher level in cool weather and its level is decreased during warm weather. It contains about 65 percent starch and the crude protein levels range from 8 to 10 percent.
- **Sorghum:** The kernel of sorghum is naked like that of maize and wheat. It is more spherical in shape and smaller in size than that of wheat. When compared to corn, it contains more crude protein but less oil. The sorghum protein is deficient in lysine as such it should normally be fed in combination with heavy feeds. The size and shape of sorghum warrants that it should always be rolled, cracked, coarsely ground or steam flamed before feeding to horses. Since it is a high energy cereal, it should form only a portion of the cereal intake to avoid digestive disturbances.
- **Wheat:** It is not commonly used in feeding of horses, as it contains gluten, which is a sticky substance. When wheat is ground, it is rather doughy and tends to ball up moisture and poses palatability problems. If it is to be fed, it should be mixed with other bulky feeds. It should be cracked; coarsely ground or steam flaked before use. Wheat protein is deficient in h sine. Its level in feed should not increase above 10 20 percent of the concentrate diet.

FEEDING OF MARE

- The most important period of feeding of a pregnant mare is the last 90 days of gestation. 60-65 percent of weight of foetus gets deposited during these last 90 days as growth rate of embryo is the greatest during this period.
- During lactation, the mares are estimated to produce milk equivalent to 3 and 2 2 percent of body weight daily during early lactation (1:12 weeks) and late lactation (13-24 weeks) respectively. Therefore, a lot of body energy of mare is utilised for synthesis of milk energy and this process of conversion of digestible energy of feed into milk energy is about 60 percent efficient.
- The dietary requirements of the breeding mare can be arbitrarily divided into three stages
  - Requirement upto 8 months of gestation,
  - Requirement during last 3 months of gestation, (c) Lactation and 0-4 months post parturition.

- The first 8 months of gestation have no practical impact on the nutrient needs i.e. they do not raise requirements above maintenance level nor do they increase the already high requirement of the lactating mare. Thus, mare's energy requirement during this stage are approximately those of maintenance.
- The DE requirements for the ninth, tenth and eleventh months of gestation are formulated by multiplying the maintenance requirements by 1.11, 1.13 and 1.20 respectively.
- The protein requirements also increase during period and with a protein utilization efficiency of 60 percent, a 500 kg gestating mare requires 127, 130, 178 gm of DP/day for foetal deposition above maintenance, for a total of 427, 430 and 478 gm of DP during the ninth, tenth and eleventh months respectively. Presuming digestibility of protein to be 55 percent, a 500 kg mare would need 776, 782 and 869 gm of CP daily during ninth, tenth and eleventh months respectively.

First 8 month of gestation no additional feeding

- The requirements of calcium would be 11, 25 and 11 gm/day for ninth, tenth and eleventh month of gestation assuming the efficiency of calcium absorption to be 50 percent, whereas phosphorus requirements have been estimated to be 7,12 and 6,7 mg/kg of body wt/day during ninth, tenth and eleventh month of gestation respectively.
- The requirement of other macro and micro minerals are also enhanced during this period.
- The requirement of fat soluble and water soluble vitamins too increases considerably.
- The requirements of energy, protein, minerals and vitamins are the maximum for a mare during the first phase of lactation i.e. from 1 to 12 weeks post parturition.
- The energy requirement of lactating mares depends upon the composition and amount of milk produced. The requirement of energy are 792 K Cal of DE/kg of milk produced above the maintenance level. The protein content of milk is highest immediately after parturition and it decreases gradually as lactation progresses.
- Crude protein requirements are calculated presuming that mare's milk contains 2.1 and 1.8 percent protein in early and late lactation respectively. Utilisation of digestible protein for milk protein formation is 65 percent and digestibility of protein in the digestive system is 55 percent.
- The requirement of calcium for lactation, ranges from 1.2 gm/kg of milk during the first post partum week to 0.8 gm/kg of milk during 15 to 17 week postpartum, above maintenance requirement, whereas requirement of phosphorus ranges from 0.75 gm/kg of milk in early lactation to 0.50 gm/kg of milk in late lactation.
- In the last quarter of pregnancy, foetus occupies an increasing proportion of mare's s abdominal cavity. Accordingly, her capacity for bulky feeds declines during the period in which nutrient requirement increases.
- The quality of hay and concentrate. should improve during the last 3 months of gestation. The diet in this period should contain concentrate mixture with 16percent protein upto 25 to 35 percent of the diet which can increase or decrease depending upon the condition of the mare, its response to feed and quality of the hay and pasture used.
- It is recommended that the total diet fed during gestation contains at least 12 percent protein which means that hay or pasture should contain 11 to 12 percent protein.
- The higher level of protein should provide a safety factor for hay and pasture which may have protein of low digestibility depending upon kind of pasture used and its stage of maturity when consumed .

Last three months of gestaion the CP should be 16%

CONCENTRATE DIET

Feed**	Percentage in Diet
Oats	30
Corn	10
Barley	13
Wheat Bran	10
Soyabean Meal	11.5
Linseed Meal	04
Alfalfa Meal	10
Black Strap Molasses	07
Dicalcium Phosphate	02
Limestone	00.5
Salt trace Mineralised	01.0
Vitamin Supplement	01.0

** The concentrate diet should contain 16 percent protein, 1 percent calcium and 0.9 percent phosphorus.

- A study on pony mares has revealed that protein percentage in diet does not affect general .reproduction parameters (oestrus or ovulation) but did affect progesterone concentration which in turn may be responsible for the differences in conception rate which is low with low level of protein and high with optimum protein levels.
- Needless to mention that pregnant and lactating mares require high quality of protein for proper foetal development and milk production.

FEEDING OF MARE DURING LACTATION

- The mare suffers from maximum stress after parturition as it has to recover from parturition stress, produce enough milk and even rebreed during the next season.
- Inadequacy in energy, protein, vitamin and mineral content of feed will lead to decreased milk production and also her ability to breed back while suckling the foal.
- Inadequate feed intake will lead to poor rebreeding performance, delayed post-partum intervals, low conception rates and increased embryo mortality.
- During the 1st phase of lactation i.e. first 3 months of lactation, feed intake increases by 37 percent over feed intake during the last quarter of the pregnancy.
- The feed intake also rises from 1.5 to 2.0 percent of body weight. In this phase, concentrate diet should be 45 to 55 percent of total feed intake of the mare.
- However; the amount of concentrate intake can vary depending upon the quality of hay and pasture used, milk production level of the mare, her condition and other factors.

- During the first 3 months of lactation, the total diet of mare should contain at least 12.5 percent protein but it can be up to 14 percent.

First three months of lacation 45-55% of total feed should be concentrate, 12.5-14% CP

- The higher protein percentage level will be safer to use with higher milk producing mares and also it will provide a safety factor to compensate for hay and pasture with lower digestibility because of stage of maturity at which they are consumed or harvested.
- The hay/pasture should contain at least 10 percent protein in feed. Minerals should be self fed to mares especially if they need more than that is supplied in the concentrate mixture, especially if milk production is more, concentrate level in diet is less and quality and digestibility of hay/pasture is poor.
- Inclusion of soyabean meal has been shown to improve the protein content of early lactation mare's milk and it is considered to be accompanied by faster growth of the foal.

SUGGESTED CONCENTRATE DIET FOR LACTATION

Feed**	Percentage in Diet
Oats	15
Com	30
Barley.	10
Wheat Bran	07
Soyabean Meal	15
Linseed Meal	05
Alfalfa Meal	07
Black Strap Molasses	07.0
Dicalcium Phosphate	01.25
Limestone	00.75

Salt	01.00
Vitamin Supplement	01.00

**The level in the concentrate diet should be adjusted to 16 percent protein, 0.8 percent calcium and 0.7 percent phosphorus.

- In the second phase of lactation that is from 13 weeks to 24 weeks, the milk production decreases to about two third the level of milk produced during the first three months after foaling. As a result, there is decrease in level of feed intake.
- During this period, the foal also starts supplementing its nutrient requirement from creep feed and hay/pasture feeding.
- The mare's intake of concentrate also decreases to 30 to .40 percent of the total feed intake. The average protein requirement during this stage should be 11 percent but 12 to 12.5 percent is preferable with high milk yielders.
- The concentrate level can be about one third of the total diet during this stage of lactation.

FEEDING THE FOAL

- Neonatal feeding of the foal depends upon how well the mare has been fed during the gestation.
- A well balanced diet supplies all nutrients needed for development of foal and also enables the mare to produce optimum milk after foaling.
- Also the foal should receive adequate nutrients post-natal, and pre-weaning, to have a good start in bone development and growth, especially if the foal is to become a high level performance horse.

COLOSTRUM FEEDING

- The mare has to pass adequate passive protection to foal which is provided through colostrum feeding. Besides, colostrum has laxative substance that promotes bowel movement and elimination.
- Mare has to, there fore, be in foaling area preferably a month before foaling so that she confers immunity to microbial strains peculiar to her environment, especially those causing scours, joint ill and septicemia etc.
- Immunoglobulins do mot pass through dam's placenta and are absorbed only through first part of intestine during first few hours of life. The immunoglobulins get concentrated by the mare in her udder within last two weeks of gestation.
- The mare's colostrum contains protein upto 19 percent immediately after parturition which falls to 3.8 percent after 12 hrs and to a fairly constant level of 2.2 percent, after 8 days.
- The foal absorbs gamaglobulin as intact undegraded molecules throughout first 12 hours of life which gets reduced to a great extent in next 24 hours.
- Amounts of these specific antibodies so acquired by foal, start to decline from 24 hours of age, by 3 weeks the values are halved and by 4 months, the titre of specific immunity provided by the mother is barely detectable.

Protein % drops from 19% to 3.8% after 12 hours of foaling

- The foal's own system of building active immunity in the form of autogenous gamaglobulins first provides detectable products at 2 weeks of age in the blood of colostrum deprived foals and at ,4 weeks in those reared normally.
- By 3-4 months of age, the gamaglobulins attain adult plasma concentration, Upto this stage, therefore, the foal is more susceptible to infection than is an adult in the same environment, particularly when it has received inadequate quantity of colostrum.
- The foal may at times be deprived of colostrum because of premature birth of foal, small intestine malabsorption, delayed suckling, premature leakage of milk through teats or death of the mare. In case of colostrum deprivation due to leakage of colostrum through teats of mare or due to some other reason except malabsorption, it is necessary to give foal colostrum from another mare preferably one accustomed to the same environment or failing this, cow's colostrum rather than milk.
- The foal should receive about 500 ml of colostrum by nipple or stomach tube every hour for three or four feeds before 12 hrs of age.

- After 18 hrs, the colostrum has little systemic immune value, although it does have some beneficial local effects within the intestinal tract.
- If the plasma concentration of immunoglobulins falls below ,400 mg per 100 ml blood then foal may be given blood plasma from another horse at the rate of 22 ml/kg body weight over a period of 1-2 hours which is approximately 1 litre per foal.

FEEDING OF MARE'S MILK

- Milk meets the needs during 2 to -3. weeks of life of a foal, and how adequately it meets these needs depends upon how good a milk producer the mare is, and also the growth and development one expects of the foal.
- The foal needs supplementation of other feeds after 2-3 weeks of life. Vigorous foals nurse within 30-45 minutes.
- Mare's milk is not a perfect food to foal. It is deficient in energy, protein, vitamins and minerals and, therefore, it alone is insufficient for foal to sustain it. Mare's milk is also deficient in calcium, phosphorus, iron and copper.
- Milk production on an average ranges at about 3.1 percent of the mare's body weight at 11 days post-partum, 2.9 percent at 25 days and 3.4 percent at 39 days which supplies about 3.1, 2.1 and 2 percent DM of the foal's body weight.
- The Mare's milk contains on an average 2.1 MJ of gross energy per kg. The milk yield is markedly influenced by the mare's innate ability, by feed consumption during the later stages of pregnancy and more importantly, by water availability and intake of energy and nutrients during lactation.

Foal need supplementation after 3rd week of age, mare's milk is not a perfect food

CREEP FEED

- At about 7-15 days of age, the foal starts to nibble on the feed given to the mother. To meet the inadequacy of nutrients in mare's milk and avoidance of imbalance diet to the foal, horse owners prefer to feed well balanced creep feed to the foals.
- It is usually recommended that creep feeding be started after 1-2 weeks of foaling. The creep should be located where the mare goes periodically during the day for water or shade.
- The use of creep feed helps to ensure that inherited potential of growth and development is realized.
- The creep feed also helps to avoid set backs that can occur when the foal is weaned from its mother.
- Creep feeding also accelerates anatomical and physiological maturation of the gastro-intestinal tract.
- At 5-6 weeks of age, a foal should be consuming at least 0-1 kg of creep feed daily per 50 kg of body weight. By weaning time, the foal should be consuming at least 2-3 kg of creep feed per day which depends upon milking ability of the mother and development desired in the foal, kind of creep feed used and economics involved.
- Creep feeds also help in conditioning to the change of dependence on mother's milk to a man made diet. If the mare and foal are doing well during the first 6-12 weeks of age, creep feeding may be deferred until then when the mare's level of milk production starts to decrease and foals requirements are increasing.

Creep should be introduced by 2nd week, 1 kg creep per 50 kg body weight

Suggested Creep Feed for Nursing Foals

Feed	Percent in Diet
Oats	35
Corn/Barley or combination	35.4
Soyabean Meal	15
Dried Skim Milk	5
Black Strap Molasses	5
Dicalcium Phosphate	2
Limestone	0.8
Salt trace mineralised	1
Vitamin Supplement	0.8

NUTRIENT REQUIREMENT FOR GROWTH

- The digestible energy requirement increases with age of the foal. However, high energy intake is associated with developmental orthopaedic disease.
- Starch feeding causes significant changes in serum insulin, thyroxine and triidothyronine which retards cartilage maturation.
- The protein requirement for growth have been found to be 50 and 45 gm/MCal of DE/day for weanling and yearling respectively.
- Lysine is the first limiting amino acid in the diet of growing foals which is 2.1 and 1.9 gm/MCal DE per day for weanling and yearling ,respectively.
- The growing foals deposit approximately 16 gm calcium per kg of gain whereas phosphorus requirement is 8 gm/kg of gain.
- The requirement of vit A to support normal growth has been estimated to be 20 IU/kg of body weight or 1760 IU/kg of feed, whereas requirements of vit D has been calculated to be 275 IU/kg of feed.
- Alternatively, 6.6 IU of vit. D per kg body weight is sufficient for most circumstances.

FEEDING OF THE WEANLING HORSE

- Weaning of foals may be before or after six months but preferably at six months. Weaning before six months is practiced where the owner can supplement the feed of the foal with creep feed, starter diets which are excellent substitutes for or supplement mare's milk.
- Delayed weaning is preferred by some in order to take advantage of the nutritional value of the mare's milk especially when feed supply available for the weaned foal is limited in quality and quantity.
- Early weaning, however, requires excellent diet fortified with minerals, vitamins, amino acids, protein, besides superior managerial ability.
- Weanlings grow rapidly and develop considerable bone and muscle s and, therefore, their diet has to be well balanced in terms of energy, protein, minerals and vitamins.
- It is important to note that fastest gains are made during the first year, and horses with. heavier mature weights, gain faster than horses of lighter mature weight.
- Thoroughbred foals have been seen to attain, 4.6, 67 and 90 percent of their mature weight at 6, 12, and 18 months of age respectively. However, ponies attain 55, 75 and 84 percent of their mature weight at 6, 12 and 18 months of age which indicates that lighter breeds attain mature weight at an early age.

- Thoroughbred foals attain 83, 90 and 95 percent of their expected mature height at 6, 12 and 18 months of age which indicates that during the first few months after birth, the fastest growth and most elongation of bones occurs.

Maximum growth, height, weight occurs with in 18 months period

- It, therefore, warrants a balanced feeding for mare to produce plenty of milk for the foal and a well balanced creep feed to supplement the mare's milk if they are being developed for high level performance at an early age.
- The creep feeding to foal before weaning is given at an approximate rate of 0.5 to 0.75 percent of the body weight which after weaning should be increased to 1 to 1.5 percent of body weight. In addition, the foal should be given forage at least at the rate of 1 kg per 100 kg body weight.
- The individuality of horse, its likes and dislikes, eating habits, quality of concentrate feed, quality of the hay/pasture provided are some of the factors which determine the roughage to concentrate ratio of the weanling's feed.
- However, whether the weanling is being developed for sale or for performance, is also an important factor.

Suggested Concentrate Mixture for Weanlings

Feed Percentage in Diet

Feed	Percentage
Oats	25
Corn	31
Milo	7
Soyabean meal	23
Dehydrated alfalfa meal	5
Black Strap Molasses	5
Vitamin Supplement	0.75
Dicalcium Phosphate	2
Limestone	0.25
Salt trace mineralized	1.00

- Table gives the suggested concentrate mixture which can be fed to weanling foals being developed for high level performance.
- Oats and corn are the energy sources whereas soyabean meal is plant protein source which is rich inlysine, the indispensable amino acid required for growth.
- The molasses is [a]dded for palatability and to help control dust. The vitamin supplement is used to reinforce the diet and make sure it is adequate in all the vitamins needed whereas salt trace mineralised makes sure that essential mineral elements required by the horse are supplied.

- The concentrate diet should be about 70 percent of total dry matter intake Whereas remainder should be a high quality hay or pasture which should contain at least 12 percent crude protein whereas concentrate ration should have 18 percent resulting into an average of 16 percent protein in the total diet.
- The feeding of weanling should be individually carried out so that aggressive ones do not dominate the timid weanlings. The concentrates should be fed at leasttwice daily whereas pasture or good quality hay should be provided on a free choice basis.
- Regulated exercise is a must for weanling to help develop sound bone and fitness. However, forced and excessive exercise may lead to development of joint inflammation, soreness, lameness, pulling up on their pasterns, bending over on the knees etc.
- These external disorders represent a variety of internal skeletal problems and are inaccurately put together under epiphisitis. There are three factors which are known to cause skeletal disorders in horses
  - Genetic predisposition associated with large size at maturity,
  - Nutrient imbalance or deficiencies in the total diet,
  - Confinement coupled with forced exercise.

FEEDING RACEHORSES

- The racehorses must not be allowed to become fat. They need to be kept in trim and thrifty condition for which it is important that they receive
- protein, energy, vitamins and minerals in adequate amount to develop their body and perform to the maximum of their inherited potential.
- The concentrate diet should be upto percent of the total diet, however, it will vary depending upon condition of the horse, how it responds to the diet and amount and quality of the hay and/or pasture used.
- The concentrate feeding can increase or decrease depending upon whether the horse is under light training or heavy performance. The condition of the horse can serve as a guide as to whether too much or too little concentrates are being fed in relation to forage intake.

Suggested Concentrate Diet for Racehorse

Feed	Percentage in Diet
Oats	30
Corn	10.75
Barley	9.50
Wheat Bran	7.0
Alfalfa Meal (dehydrated)	8.0
Soyabean Meal	23.0
Black Strap Molasses	7.0
Dicalcium phosphate	2.0
Limestone	0.75

Salt trace mineralized	1.0
Vitamin Supplement	1.0

- The racehorses should be fed high quality hay/pasture and should always have access to mineral lick and fresh clean water should always be available.
- The energy level in the concentrate diet could be increased by replacing some of the oats with corn and decreasing wheat bran and alfalfa meal. Excess high energy grain is to be avoided since it may cause digestive disturbances because of carbohydrate overloading.
- Many horse trainers prefer to add 5-10 percent fat to the concentrate diet for high level performance, however, its additional benefit to the performance of horse is not definitely known. Fat increases the energy density of the diet and may allow reduction in total feed intake required to meet energy requirements which is important as it is difficult to take enough total feed during intense work.
- Moreover, it minimizes the possibility of colic, founder and other digestive disturbances occurring from too heavy concentrate consumption during intense activity.
- Addition of fat also increases the muscle glycogen of exercising horses. If fat is used, it needs to be a high 'quality product and it has to be protected against rancidity by a proper antioxidant, which can cause digestive disturbances and decrease in the palatability of the diet.
- Increased fat level in the diet also calls upon to increase the protein and calcium phosphorus level in the concentrate diet. The concentrate diet of high performance horses should supply about 18 percent protein which will allow the use of hay and/or pasture with a protein percentage of 7 to 10.
- So overall, a protein percentage of 12 to 14 percent would be supplied. It is always better to supply protein on higher side rather than run the risk of a lack of protein.

FEEDING DURING NON BREEDING SEASONS

- When the stallion is not being used for breeding purpose, a high quality pasture will supply a large part of the nutrients needed.
- Stallion should have access to adequate minerals, vitamins and fresh clean water during this period.
- Green and leafy hay can also be fed. if pasture is not sufficient.
- Concentrate feeds should be fed in small amounts to supplement the forage used and to keep the stallion in a trim and thrifty condition.

FEEDING DURING THE BREEDING SEASON

- Breeding season imposes increased activity on the stallion and will, therefore, need more energy, protein, minerals and vitamins which can be accomplished by feeding a higher level of concentrate in the diet.
- During this period, the concentrate and roughage can be in equal proportion, however, level of concentrates can increase or decrease depending upon the quality of forage, condition of stallion and number of services required weekly.

CAMEL MANAGEMENT

- There are mainly two breeds of camel – Camelus bactrianus (double humped), Camelus dromedaries (single humped) and found in India and neighbors country/India sub-continent.
- The height of animal may be upto 7 feet and weight 454-590 kg. They have soft and thin coat. Camel has 34 teeth just like cattle except two canine in lower jaw. The age of maturity is 8 years in male and 4-5 years in female.
- Body temperature is 36.1-37.9º C. heart rate is 32-40 per minute and respiration rate 5-12 per minute. Average gestation period is 390 days (365-400 days). Life span is 40 years. Camel is a pseudo ruminant.
- Stomach is compound and have varies sac unlike cattle. Camel are even toed and digitigrade. Mature female camel called cow camel and breeding male are called stud camel.

Some other characterstics of camel:-

1. Camel is a stupid animal and very difficult to trained.
2. Camel is slow maturing animal and patience animal.
3. They are energy cost effective animal and very useful for draught purpose.
4. Milk of camel is very useful and milk yield may be 3-5 liter per day.
5. Hide and hair of camel is very useful.
6. Meat of camel is not good quality although eaten in varies country.
7. Camel is very useful in desert and called ship of desert.
8. Camel can survive 4 weeks without water it can survive upto 30% of body weight loss.
9. The hump works as reservoir of water.

Feed and feeding habits of camel:-Camel is a herbivors and browse on coarse and throny plants and bushes such as Acasia. They can be stall-fed with forages and straw such as gawar and jawar etc.

Various type of concentrates and millets or oats beam, cotton seed maize etc. are also given to the camel.

Some diseases of camel:-

1. Trypanosomiosis:- Surso and protozonic diseases (parsities)
2. Antrax :-Bacterial disease with bacillus anthracis.
3. Rabies :- viral and fatal disease.

- Camel seldom require any housing. They are let loose for grazing and browsing throught out the day.
- Breeding season is November to March.
- Training of camel is done during 2.5 – 3 years age and control by nose peg By puncturing the nostrils. A rope and leather strap is attached to the nose peg.
- For breeding a stur camel is let loose in herd.