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CHAPTER - 1

IMPORTANCE OF SHEEP, GOAT AND POULTRY PRODUCTION IN NATIONAL ECONOMY

- Contribution of Sheep, Goat and Poultry to people
- Role of Sheep, Goat and Poultry in farmers' economy

Sheep, Goat and Poultry plays an important role in Indian economy. About 20.5 million people depend upon livestock for their livelihood. Livestock contributed 16% to the income of small farm households as against an average of 14% for all rural households. Livestock provides livelihood to two-third of rural community. It also provides employment to about 8.8 % of the population in India. India has vast livestock resources. Livestock sector contributes to overall GDP is 4.11% and 25.6% of total Agriculture GDP.

1. Livestock resources in India :-

- Second rank in the population of goats - 148.88 million goats
- India is third largest poultry market in the world - production of 95.2 billion eggs and 649 million poultry meat.
- Third rank in the population of sheep, in the world - 74.26 millions
- Fourth rank in the population of chicken, in world

Contribution of Sheep, Goat and Poultry national economy :-

The livestock provides food and non-food items to the people.

- **Food :** Sheep, Goat and Poultry provides food items such as Milk, Meat and Eggs for human consumption. India is number one milk producer in the world. It is producing about 176.34 million tons of milk in a year (2018) and in this 4 % milk contribution of goat. Similarly, it is producing about 95.2 billion of eggs, 7.7 million tonnes of meat in a year.
- **Fiber and skins :** Sheep and Goat also contributes to the production of wool, hair, hides and pelts. Leather is the most important product which has a very high export potential. India is producing about 41.5 million Kg of wool (2017-18) per annum. 5% appaerl wool, 85% carpet wool and 10% coarse grade wool.

Marketing quality of wool :-

18 micron 235 Rs / kg, 19 micron 225 Rs / kg, 20 micron 218 Rs / kg, 23 micron 171 Rs / kg.

- **Dung and other animal waste materials :** Dung and other animal wastes serve as very good farm yard manure and the value of it is worth several crores of rupees.
- **Storage :** Goat is considered as "moving banks" because of their potentiality to dispose of during emergencies. They serve as capital and in cases of landless agricultural laborers many time it is the only capital resource they possess. Livestock serve as an asset and in case of emergencies they serve as guarantee for availing loans from the local sources such as money lenders in the villages.
- **Weed control :** Sheep and Goat are also used as Biological control of shrubs, plants and weeds.
- **Cultural :** Livestock over security to the owners and also add to their self-esteem

especially when they are owning prized animals such as pedigreed bucks, rams and high yielding etc.

- **Sports / recreation :** People also use the animals like cocks, rams for competition and sports. Despite ban on these animal competitions the cock fights and ram fights are quite common during festive seasons.

2. Role of Sheep, Goat and Poultry in farmers' economy :-

Sheep, Goat and Poultry plays an important role in the economy of farmers. The farmers in India maintain mixed farming system i.e. a combination of crop and livestock where the output of one enterprise becomes the input of another enterprise thereby realize the resource efficiency. The livestock serve the farmers in different ways.

- **Income :** Sheep, Goat and Poultry are source of subsidiary income for many families in India especially the resource poor who maintain few heads of animals. Poultry will provide regular income to the livestock farmers through sale of egg and chicken. Animals like sheep and goat serve as sources of income during emergencies to meet exigencies like marriages, treatment of sick persons, children education, repair of houses etc. The animals also serve as moving banks and assets which provide economic security to the owners.
- **Employment :** A large number of people in India being less literate and unskilled depend upon agriculture for their livelihoods. But agriculture being seasonal in nature could provide employment for a maximum of 180 days in a year. The land less and less land people depend upon livestock for utilizing their labour during lean agricultural season.
- **Food :** The Sheep, Goat and Poultry products such as milk, meat and eggs are an important source of animal protein to the members of the livestock owners.
- **Social security :** The animals offer social security to the owners in terms of their status in the society. The families especially the landless which own animals are better placed than those who do not. Gifting of animals during marriages is a very common phenomenon in different parts of the country. Rearing of animals is a part of the Indian culture. Animals are used for various socio religious functions. Cows for house warming ceremonies; rams, bucks and chicken for sacrifice during festive seasons.
- **Dung :** In rural areas dung is used for several purposes which include fuel (dung cakes), fertilizer (farm yard manure), and plastering material (poor man's cement).

Note :-

In India availability is 74 eggs per person per year in the country, while as per National nutrition Institute this should be about 180 eggs per person and 11 kg. of chicken.

ROLE OF SHEEP AND GOAT IN INDIAN ECONOMY

In India goat and sheep husbandry play an important role in rural economy. Both the animals have been popularly described as *mortgage lifters* of India.

- The total sheep population is 74.26 million in 2019, increased by 14.13% over previous census (5 per cent of world's population) and the total goat population

is 148.88 million in 2019, increased by 10.1% over previous census (20 percent of the global population)

- About 13.8% of the total livestock contributed by sheep and 27.8% contributed by goat.
- Goat meat occupies 37 per cent of the total meat produced in the country and goat milk occupies 4 per cent of the total milk produced.
- Goats are hardy and well-adapted to harsh climates. Due to their grazing habits and physiological characteristics, they are able to browse on plants that would normally not be eaten by other livestock species. Thus, the presence of goats in mixed species grazing systems can lead to a more efficient use of the natural resource base and add flexibility to the management of livestock. This last characteristic is especially desirable in fragile environments.
- Sheep and goats contribute to a broad range of production systems. The most common system throughout the developing countries involve either the extensive system with large her is and/or flocks grazing on arid and semi-arid rangelands or the intensive system with smaller herds and/or flocks kept in confinement, mostly in the humid tropics. Both systems are characterized by low input use (Safilios-R, 1983).
- Sheep and goats are important in development because of their ability to convert forages and crops and household residues into meat, fibre, skins and milk.
- The economic importance of each of the products varies between regions, especially in the developing countries.

Unique characteristics of Goat :-

- Starting a goat farming business requires low initial investment or capital.
- Goats don't require huge area for housing because their body size is comparatively smaller than other livestock animals.
- Usually goats are very friendly in nature and very lovable.
- Goats are good breeders and they reach sexual maturity within their 7-12 months of age and give birth of kids within a short time. And some goat breed produce numerous kids per kidding.
- Risks are less for goat farming (even in drought prone areas) than any other livestock farming business.
- Both male and female goats have almost equal value/price in the market.
- No religious taboo against goat farming and meat consumption.
- There is no need of a high end housing system for goats. Even they can easily share their living place with their owners or his/her other livestock animals.
- Goats are easily available, comparatively cheaper in price, easy to maintain environments or conditions. They can tolerate high and low temperature throughout the world. They also can tolerate hot climate more than other animals.
- According to the investment per unit they produce more than other domestic animals. And the ROI (return of investment) ratio is very good.
- Goat meat has a huge demand and high price in the local and international markets. Goats can be milked as often as required

- You can use the goat's manure as a high quality natural fertilizer in crop field.

Contribution of goats to national economy :-

Meat : The country is largest exporters of sheep and goat meat to the world. The country has exported 18425 MT. of sheep and goat meat to the world for worth of Rs 790.65 crores during year 2018 – 2019.

Milk : Goat contribute 2550 million kg of milk and about 3.3% of total milk production in india. Goat milk range from 90 to 300 kg per lactation. Ave. 150 kg per lactation of 180 days. Goat milk is easy to digest and disease resistance protein viz; Lactoperoxidase is only available in goat milk.

Manure : Annual manure production was reported to 85 million kg. On an ave. a goat produces 0.7 to 1 tones of manure per year. Goat manure contain 0.8 % nitrogen.

Pashmina and Mohair :

- Goat produce fine lustrous hairs are pashmina and mohair (Angora goat).
- Pashmina producing ranges from 100 to 450 g/ goat per year.
- Ave. pashmina production in year is 214 g/ goat per year.
- The annual pashmina production is more than 30 metric tons.
- Kashmiri, Changthangi, Chegu are the breeds which produce pashmina.
- Mohair is a fine goat hair which is obtained from Angora and which is used to make fine garments.

Skin : Goat industry contributes 0.129 million kg of fresh skin annually.

- The world famous glossy kid skin is available from Black Bengal goat.
- Karakul breed of Afghanistan is famous for Pelt production.

Employment :

- Now in a rural areas Goat farming plays a important role in livelihood securities and income round the year.
- Contribution of goat to the national economy through milk, meat, fiber, manure and skin is quite substantial and is about 2612 cores annually i.e. 5.4 % of GNP of agricultural sector.

Unique characteristics of sheep :-

1. Strong herd instincts of sheep make them excellent ranch animals as they keep together in tight and easily managed flocks and do not disperse widely all over the available land, which would make it difficult to protect them from predators and difficult to round up.
2. Excellent ability to survive over a prolonged period of drought and semi-starvation
3. Sheep have the ability to produce prime carcasses on roughage alone, thus they are well adapted to many areas unable to produce grain profitably.
4. The structure of their lips helps them to clean grains lost at harvest time, and thus convert waste feed into profitable products
5. Less prone to extreme weather conditions, ectoparasites as well as other diseases
6. Unique ever-growing fibre which allows ventilation and also protects the skin from the hot sun, rain and abrasions

7. Sheep can also constrict or relax blood vessels in the face, legs and ear for control of heat loss
8. Their visual sense is exceedingly well-developed they can discern movement far better than humans, but cannot distinguish shapes as well as man.
9. Sheep do not need expensive buildings to house them.
10. Sheep require less labour than other kinds of livestock

Contribution of Sheep to national economy :

- **Meat** : The country is largest exporters of sheep and goat meat to the world. The country has exported 18425 MT. of sheep and goat meat to the world for worth of Rs 790.65 crores during year 2018 – 2019.
- **Wool** : They produce 53.7 million kg annually. The ave. wool yield on greasy and clean basis is around 700 to 800 g per sheep respectively. The wool industry export contribution has reached to Rs. 5000 crores. Wool production in India 85% carpet grade wool, 10 % coarse grade, 5% apparel grade wool. Rajasthan 1st state in wool production in India. India is 7th largest producer of wool & contributes 1.8 % to total world production of wool. There are 718 woolen units in organizes sector, Ludhiana alone accounts 240 units. The central sheep & wool research institute located at Avitnagar malpura in Rajasthan by I.C.A.R. The world average for wool production is about 3.5 kg per sheep & in India average production 0.8 kg / sheep / year.
- **Manure** : The Annual yield per sheep is about 1.5 to 2 kg per day and 0.5 to 0.7 tons per year per sheep On an ave. 20 million tones of manure is produced annually.
- **Skin** : They produce 53.7 million kg of fresh skin per annum.
- **Dressing %** of ranges from 40 to 45 %.
- **Employment** : Sheep and goat play vital role to provide employment over 12 million population of small and marginal families and landless laborers

ROLE OF POULTRY IN INDIAN ECONOMY

- In India the total poultry has increased by 16.81% and the total poultry is 851.81 million during 2019.
- India is the third largest producer of eggs and third largest producer for poultry broiler in the world. In 2018, 95.2 million eggs were produced.
- The term "poultry" refers to domestic fowls which are reared for their flesh, eggs and feathers which include chickens, ducks, geese etc.
- The poultry is one of the important components of the farmer's economy. It provides additional income and job opportunities to a large number of rural populations in the shortest possible time. Poultry farming has assumed much importance due to the growing demand of poultry products especially in urban areas because of their high food value. It also involves small capital investment and provides useful employment to a large number of people.

- There has been also fourfold increase in the number of poultry birds and Andhra Pradesh has emerged as the largest producer of poultry birds followed by Tamil Nadu, Karnataka, Maharashtra, and West Bengal. Poultry farms on commercial scale have been developed around almost all important urban centers in the country.
- Currently our poultry industry contributes more than twenty thousand crores rupees to the GNP and supports the livelihood of about two million people. The poultry has also the highest rate of growth in agricultural sector in India with a growth rate of 8-10% in eggs and 15-20% in broilers over the last two decades. There are also more than one lakh poultry farms and about 500 hatcheries and Indian birds are specifically bred to suit hot climate.

Also as a result of government's efforts strains of birds with high egg productivity and meat type birds have been developed in the country and the dependence on imported grandparent stock has been minimized. Central poultry breeding farms established at Mumbai, Bhubaneswar, Hissasarghata and Chandigarh are engaged in scientific poultry breeding programme and have developed high egg production breed of fowl.

Poultry production is a full-fledged industry having a fastest growth in India. In a village still backyard poultry farming is popular in the farmers as they kept few numbers of birds for domestication to sale fresh eggs. Now registration is mandatory for poultry farm with more than 5000 poultry bird or capacity of hatching 500 eggs per cycle will require compulsory registration. There are more than 19000 established poultry farms in Maharashtra now require registration poultry farmers are prohibited from giving use of growth hormones in feed to increase body wt. of the birds especially in broilers. Restricted use of antibiotics and it should be stopped before one week to sale in market.

Now a day contract broiler farming is practices by the farmers . in this type company take full responsibility of providing day old chicks, feed, medicines, and technical advice to the farmers and marketing . the profit is given to the farmers after subtracting expenditure. The profit or loss is based on the body wt. & broilers at marketing age 5 to 6 weeks.

Characteristics of Poultry keeping :

1. Income generation :- Indian poultry risen from 729.2 million to 851.8 increase by 17 % egg production is growing at 5 to 6 % while broiler meat production rising at 7 to 8% . Egg production 95.2 billion and 4 billion unit & broilers contribution & backyard poultry is less than 40 % total production.
2. Employment opportunity.
3. Small capital to start.
4. It gives rapid return on investment.
5. Poultry farming is a continuous source of income.
6. Poultry farming require little water.
7. Poultry dropping are sources of fertilizer.
8. Poultry farm offer full or part time employment opportunity.
9. Poultry eggs and meat are highly nutritional value.

CHAPTER - 2

COMMON TERMINOLOGIES USED IN SHEEP, GOAT AND POULTRY PRODUCTION

Abomasum :- The fourth or true stomach of a ruminant where enzymatic digestion occurs.

Acute :- Any process occurring over a short period of time.

Anemia :- The lack of red blood cells in the body.

Anestrus Period :- The time when the female does not exhibit estrus (heat), the non-breeding season.

Antibody :- A protein produced by the body's immune system that recognizes and helps fight infections and other foreign substances in the body.

Artificial Insemination :- The injection of semen into the female's reproductive tract through the use of a French gun in order for animal to become pregnant.

Banding :- The process of applying rubber bands to the tail or scrotum for docking and castrating.

Browse :- Parts of woody plants, including twigs, shoots, and leaves.

Buck :- Adult male goat use for breeding.

Burdizzo :- Castration method that uses a large clamp to crush the blood vessels leading into the testicles.

Balance ration :- A ration containing nutrients in the correct proportion to nourish the animal for 24 hours.

Bale :- A packaged of wool in a standard wool pack for shipment. The common farm bale weighs between 200 and 450 pounds.

Belly wool :- The wool that grows on the belly of the sheep.

Blind test :- A nonfunctioning half of an udder (usually due to mastitis).

Bloat :- An excessive accumulation of gas in the rumen and reticulum, resulting in distension of the abdomen.

Breed :- A group of animals with similar characteristics (color markings, size etc.) that distinguishes it from other animals. The characteristics are passed from the parents to the offspring.

Breeding Season :- The period when goats or sheep will breed.

Castrate :- Removal of testicles or influence of testicles.

Cryptorchidism :- Failure of one or both testes to descend.

Colostrum :- First milk a ewe gives after birth. High in antibodies, this milk protects newborn lambs against diseases.

Combing :- The straightening or parallelizing of fibers using combs. Also includes the removal of short fibers and other impurities.

Concentrate :- Feed that is high in energy, low in fiber content, and highly digestible.

Conception :- In reproduction, the point at which a sperm fertilizes an egg.

Corpus Luteum (CL) :- The mass of cells that form once the egg has been released from the ovary. The corpus luteum produces progesterone. Also called "yellow body."

Crimp :- The natural waviness of the wool fiber.

Culling :- Removal of unproductive animal.

Creep feeding :- Creep feeding to provide supplemental feed to nursing lambs.

Creep grazing :- The practice of allowing young animals to graze areas their dams cannot access at the same time.

Cross breeding :- The mating of animals of different breeds.

Crutching :- The removal of wool from around the tail and between the rear legs of a sheep.

Dam :- A female parent like mother.

Diarrhea :- Increased frequency, fluidity, or volume of fecal excretion.

Docking :- The removal of the tail.

Doe :- A female parent of goat.

Doeling :- A young female.

Drenching :- Giving medication from the bottle.

Dressing percentage :- The dressing percentage is calculated by dividing the carcass weight divided by the live weight.

Dry period :- The time when the female is not producing milk.

Embryo :- An animal in the early stage of development before birth.

Embryo transfer (ET) :- Implantation of embryos or fertilized eggs into a surrogate mother.

Estragen :- Female sex hormone produced by the ovary. Responsible for the estrus cycle.

Estrus :- The period when the female is fertile and receptive to the male. Also called heat.

Estrus cycle :- The reproductive cycle of the female.

Ewe :- Adult female sheep.

Feed additive :- Anything added to a feed, including preservatives, growth promoters and medications.

Fetus :- An unborn offspring.

Fiber :- The portion of a feed that is indigestible or slowly digested by ruminants. It may be expressed as crude fiber, neutral detergent fiber, acid fiber or effective fiber.

Fleece :- The wool from one sheep.

Gestation :- The period in which the doe or ewe is pregnant or the length of pregnancy.

Gimmer :- Female sheep over one year of age.

Grade (n) :- Measure of quality. There are grades for live animals, meat, and wool.

Gummer :- A sheep so old that it has lost all of its teeth.

Hand mating :- A breeding scheme in which a female and the male are joined together in a confined area for breeding.

Heat (estrus) :- The period in which the doe or ewe is receptive to mating.

Hogget :- A British term for a yearling sheep that has not yet been shorn.

Immunity :- Protection from disease that comes as a result of the body's normal immune system response.

Inbreeding :- The mating of closely related individuals.

Internal Parasites :- Parasites located in the gastrointestinal system in animals.

Kid :- A goat less than one year old.

Lactation :- The secretion (production) of milk. When the ewe is giving milk.

Lamb :- A young sheep (n). To give birth to a lamb (v). The meat from an animal less than one year old (n).

Linebreeding :- The mating of individuals within a particular line.

Luteinizing hormone (LH) :- The hormone that normally triggers ovulation and stimulates the corpus luteum to secrete progesterone. In the male, it stimulates testosterone production.

Mastitis :- Inflammation of the mammary glands.

Maternal :- Pertaining to the mother or dam.

Meat-type :- A breed of goat or sheep that is primary used for meat production.

Micron :- One millionth of a meter. Measurement unit for wool fiber diameter.

Mutton :- The meat of sheep.

Nutrient Management :- Identifying how the major plant nutrients (nitrogen, phosphorous and potassium) are to be annually managed for expected crop production and for the protection of water quality.

Non-Protein Nitrogen (NPN) :- Feed ingredient that is not a protein, but contains nitrogen (urea).

Ova :- Female sex egg. Also called ovum, oocyte.

Ovulation :- The release of mature eggs from the ovary.

Oxytocin :- A naturally secreted hormone that is important in milk letdown and the contraction of the smooth uterine muscles during the birthing process.

Parasite :- An organism which lives on or in another living organism (host) at the expense of the latter.

Paternal :- Pertaining to the father or sire

pedigree :- A paper showing an animal's ancestors.

Pelt :- Fur coated skin called as pelt.

Progesterone :- A female hormone secreted by the ovary.

Produced in large quantities by the placenta during pregnancy.

Pollard :- Naturally homeless.

Prolific :- Tendency to produce many offspring.

Puberty :- When an animal becomes sexually mature.

Ram :- A adult male parent of sheep use for breeding.

Ration :- The total feed given to an animal during a 24 hour period.

Scrotum :- The sac or bag containing the testicles of a male animal.

Shearing :- Removing the wool from a sheep.

Shorn :- A sheep that has had its fleece removed by shearing.

Sire :- Male parent.

Staple :- Refers to the longer length wools within a grade.

Tapeworm :- Ribbon like flatworm that is parasitic in the intestines of vertebrates.

Teaser :- Vasectomized male used to detect the female in heat called as teaser.

Testosterone :- Hormone that promotes the development and maintenance of male sex characteristics.

Total Digestible Nutrients (TDN) :- Standard system for expressing the energy value of feeds.

Udder :- The milk secreting organ of a cow or sheep.

Upgrade :- To improve the next generation by breeding the female to a superior male.

Uterus :- The organ in the female in which the fetuses develop.

Vaccine :- Injection given to animals to prevent or cure diseases.

Wattle :- A small fleshy appendage attached on or near the throat area of the goat and which serve no function.

Wean :- To separate nursing offspring from their mothers so that they no longer receive milk.

Weaner :- An animal that has been weaned from its mother or has stopped suckling its mother.

Wether :- A male sheep or goat that as been castrated.

Yearling :- An animal between 1 and 2 years of age.

Albumen :- The white of an egg.

Amino acids :- The simpler building units of protein.

Axial Feather :- Also called as index feather. A short feather in the middle of wing, separating primary feathers from secondary ones.

Beak trimming :- The removal of the tip of the beak of poultry by specially designed equipment to prevent cannibalism and its associated vices.

Brooder :- An appliance to supply artificial heat to young ones of poultry from day-old to till warmth is required is known as brooder.

Brooding :- Rearing of baby chicks with careful management from day-old up to warmth is required.

Bantam :- A miniature chicken, about one-fourth the size of a regular chicken.

Brooding period :- The period from day-old to 6 week of age.

Broody hen :- A hen that wants to sit on eggs to hatch them and brood chicks.

Candling :- The visual examination of egg by holding it in between the eye and source of light to test internal quality and freshness of egg.

Cannibalism :- It is a vice (bad habit) which may occur in chicken of all ages. It includes feather plucking, vent, head, wing, intestine and toe picking.

Capon :- Castrated male of chicken usually under 8 months of age.

Clutch :- A term expressing sequence of egg laying, i.e. number of eggs laid on consecutive days without gap.

Chicken :- The domestic fowl (Gallus domesticus) usually reared as a farm bird kept for commercial purpose includes improved exotic breeds and desi fowls also.

Chick :- The young one upto 6 week is called as chick.

Cock :- It is a mature male of chicken.

Cockerel :- A young male fowl less than a-year-old.

Comb :- The fleshy, red-colored growth on top of a chicken's head.

Dead-in-shell :- Chicks that fail to hatch from the egg.

Debarking :- Removal of 1/2 to 1/3rd portion of upper mandible of beak and trimming of lower one in birds is called as debarking.

Dubbing :- The process of removal or trimming of comb and wattles is known as dubbing.

Down (Ruff) :- Initial hairy covering of baby chicks or poult, etc. is called down.

Egg :- The reproductive body produced by female of birds, more or less oval in shape, enclosed in hard calcareous shell within which embryo develops on fertilization, containing nutrients for development of embryo.

Flock :- A number of birds of the same origin (genotype), age and managed in the same way.

Floor eggs :- Eggs laid on the floor of the shed.

Fowl :- A live mature chicken, a term usually used for cocks, hens, cockerels and pullets.

Found :- Watering device for chicken.

Gizzard :- Growing bird of layer type chicken between age group of 7 to 15 weeks.

Gizzard :- Internal chicken organ that crushes food with the help of pebbles or grit.

Grower feed :- Commercially available feed formulated for adolescent, growing chickens.

Usually used from 9 to 20 weeks.

Hatch :- The young ones of poultry in incubator just hatched out of eggs or under broody hen.

Hen :- Mature female chicken usually more than 11 to 12 months.

Hatching :- The act of coming forth (out) young one from egg is known as hatching.

Incubation :- Warming of eggs at certain temperature with specified humidity, ventilation and turning is called as incubation.

Incubation Period :- The duration between setting of egg for incubation and hatching.

Layers :- Mature female chickens kept for egg production. Also known as laying hens.

Laying feed :-

Commercially available feed formulated for laying hens. Usually given to chickens beginning at 16 weeks of age.

Lighting (artificial) :- The use of controlled artificial light to regulate the day length under which the stock are kept.

Milking :- Collection of semen in poultry by applying external massage to testes.

Moulting :- The natural and normal physiological process of shedding of old feathers and growing new ones annually in poultry.

Mout :- The process whereby the bird sheds its feathers and ceases egg production.

Pullet :- A female chicken under one year of age.

Poultry :- The domesticated species of birds reared for eggs, meat, feathers, etc. includes chicken, ducks, turkey, quail, geese, guinea fowl, etc.

Primary Feathers :- Feathers of wings used for flying but not visible when bird is at rest or wings are closed.

Rooster :- A young chicken usually 3 to 5 months of age.

Roost (Perch) :- The perch on which fowls rest or sleep.

Wattles :- The fleshy, red-colored growths that hang from the side of a chicken's beak.

Gestation Periods, Meat, Chromosome numbers :-

Sr. No.	Animal	Genus and Species	(Gestation Periods)Days	Meat	Chromosome numbers	
					Haploid (n)	Diploid (2n)
1	Cow	<i>Bos aurus & Bos indicus</i>	280-282	Beef	30	60
	River Buffalo	<i>Bubalus bubalis</i> (Riverine type)	310	Buffen or Buff	25	50
2	Swamp Buffalo	<i>Bubalus bubalis</i> (Swamp type)	310	Buffen or Buff	24	48
3	Sheep	<i>Ovis aries</i>	150	Mutton	27	54
4	Goat	<i>Capra hircus</i>	150-151	Chevon	30	60
5	Pig	<i>Sus scrofa</i>	112 to 120	Pork	19	38
6	Hen	<i>Gallus domesticus</i>	78	Chicken	39	78

Common terminology used in Livestock :-

Details	Cattle	Buffalo	Sheep	Goat	Chicken	Pig
Species called as	<i>Bovine</i>	<i>Bovine or Bubaline</i>	<i>Aries</i>	<i>Hircus</i>	<i>Domesticus</i>	<i>Swine</i>
Groups of animals	Herd	Herd	Flock	Flock or band	Flock	Herd or drove or stock
Adult male	Bull	Buffalo bull	Ram	Buck	Cock	Boar
Adult female	Cow	She buffalo	Ewe	Doe	Hen	Sow
Young male	Bull calf	Buffalo bull	Ram lamb	Buckling	Cockerel	Boarling
Young female	Heifer	Buffalo Heifer	Ewe lamb	Goatling	Pullet	Gilt
Newborn	Calf	Buffalocalf	Lamb	Kid	Chick	Piglet
Castrated male	Butlock or steer	Buffalo bullock	Wedder or weather	Castrated	Capon	Hog or stag or barrow
Sterilized female	Spayed	Spayed	Spayed	Spayed	Spayed	Spayed
Act of parturition	Calving	Calving	Lambing	Kidding	Hatching	Farrowing
Act of mating	Serving	Serving	Tupping	Serving	Serving	Coupling

CHAPTER - 3 CLASSIFICATION AND STUDY OF INDIGENOUS AND EXOTIC SHEEP BREEDS

1 Classification and study of Indigenous sheep breeds

1. Zoological classification

Class : *Mammalia*
Order : *Ungulata*
Sub-order : *Artiodactyles*
Family : *Bovidae*
Genus : *Ovis*
Species : *Aries*

Classification Based on Agro-Ecological regions :

Sr. no	Northern temperate region :		North-western arid and semi - arid region :	
1	Breeds	Origin	Breeds	Origin
	Gaddi	Kashmir, H.P.	Bikaneri	Rajasthan
1.	Rampur-Bushair	U.P. H.P.	Marwari	Rajasthan
2.	Changthangi	Ladakh	Malpura	Rajasthan
3.	Kashmir Merino	Kashmir	Sonati	Rajasthan, Gujarat
4.	Bhakarwal	Kashmir	Hissardale	Haryana
5.	Karnah	Kashmir	Chokla	Rajasthan
6.	Poonchi	Kashmir	Nali	Rajasthan
7.			Jaisalmeri	Rajasthan
8.			Pugal	Rajasthan
9.			Padanwadi	Gujarat
10.			Panchali	Gujarat
11.			Magra	Rajasthan
12.			Jalumi	U.P.
13.			Muzaffarnagari	U.P.

Sr. no.	Southern region		Eastern region	
	Breeds	Origin	Breeds	Origin
1.	Deccani	M.H. & A.P.	Balagiri	Orissa
2.	Nellore	A.P.	Ganjam	Orissa
3.	Bannur	Karnataka	Chotanaguri	Bihar, W. Bengal
4.	Mandya	Karnataka	Shahabadi	Bihar
5.	Bellari	Karnataka	Bompala	Bihar
6.	Hassan	Karnataka	Tibetan sheep	A.P.
7.	Kenguri	Karnataka	Garole	West Bengal
8.	Mecheri	Tamilnadu	Kendrapada	Orissa

9.	Kilakarsal	Tamilnadu
10.	Vembur	Tamilnadu
11.	Rannad white	Tamilnadu
12.	Tiruchi black	Tamilnadu
13.	Nilgiri	Tamilnadu
14.	Chevaadu	Tamilnadu
15.	Coimbatore	Kerala

Source : NBAGR - National Bureau of Animal Genetic Resources, Karnal.

Classification Based on utility

Garment wool	Carpet wool	Meat & Carpet wool	Meat	Fur/Pelt
Kashmir merino Nilgiri Hissardale Karnah	Chokla, Nai, Pattanwadi, Gaddi Rampue- Bushair, Gurez Changhangsi	Deccani Bellary Ganjam Marwari Malpura Somadi	Nellore Mandya, H assan	Karakul

Classification based on quality of wool :

1 Superior carpet wool breeds	2 Apparel wool breeds
Chokla, Nai, Magra, Gaddi, Jaisalmiri, Pugal, Pattanwadi, Rampue-Bushair, Gurez, Changhangsi, Karnah, Poonchi, Boripala, Tibeian, Avikalin,	Kashmir merino, Nilgiri, Hissardale, Avivastri, Bharat-Merino (These are crossbreeds of native sheep with exotic fine wool merino breeds)
3 Coarse carpet wool breeds	4 Hairy meat breeds
Deccani, Bellary, Ganjam, Malpura, Somadi, Muzaffranagari, Jalauhi, Coimbatore, Chhotanagari, Balangiri, Bhakarwal, Shahabadi	Rannad white, Madras red, Vembur, Kilakarsal, Nellore, Hassan, Mecheri Tiruchi black Kenguri

Main Characteristics of some Important Indian Sheep Breeds

NORTHERN TEMPERATE REGION :

This region comprises J&K, HP, and hilly area or parts of UP. About 25% of the wool produced in this region is of 36 - 48s quality, suitable for carpets and the rest is the above 48s and is suitable for apparel and superior quality carpets. Around 1/3rd of sheep in J&K and about 15 - 20% in other parts of this region are crosses of native breeds with exotic fine wool breeds

1. GADDI (also known as Bhadarwah)

Origin & Distribution. : Kishtwar and Bhadarwah Tehsils in Jammu province of Jammu & Kashmir State; Hamirpur, Ramnagar, Udampur and Kulu and Kangra valleys of Himachal Pradesh; and Dehradun, Nainital, Tehrigarhwal and Chamoli districts of Uttar Pradesh.

Physical character :

- Medium-sized animals, usually white, although tan, brown and black and mixtures of these are also seen.
- Males are horned; 10 to 15% of females are horned. Tail is small and thin.
- The fleece is relatively fine and dense.
- Average fiber diameter and medullation were 27.7µ and 20.6 % respectively

Meat : body weight (kg)	
At birth	2.52 ± 0.05
At weaning	7.44 ± 0.20
Wool production and quality	
Average 6-monthly greasy fleece (kg)	0.78 ± 0.02
Staple length (cm)	5.70 ± 0.00
Average fibre diameter (µ)	28.52 ± 0.07
Medullation (%)	25.80 ± 0.33



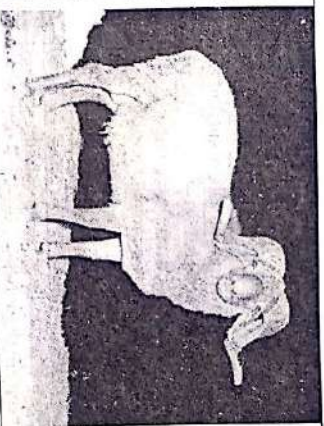
2. RAMPUR BUSHAIR

Origin & Distribution. :- Simla, Kinnaur, Nahan, Bilaspur, Solan and Lahaul and Spiti districts of Himachal Pradesh and Dehradun, Rishikesh, Chakrota and Nainital districts of Uttar Pradesh.

Physical characteristics.

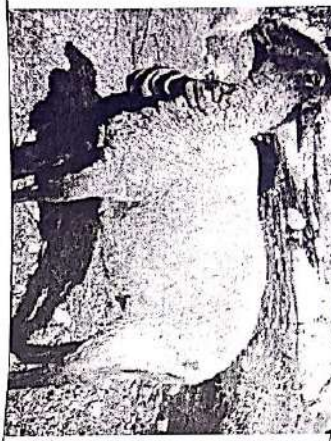
- Medium-sized animals. The fleece colour is predominantly white, with brown, black and tan also seen on the fleece in varying proportions.
- The ears are long and drooping. The face line is convex, giving a typical Roman nose.
- The males are horned; most females are polled.
- The fleece is of medium quality and dense. Legs, belly and face are devoid of wool.

Mortality: 0 to 6 months: 13.9%; adults: 19.86%	
Meat : body weight (kg)	
At birth	2.38 ± 0.04
12 months	17.84 ± 0.46
Wool production and quality	
Annual greasy fleece weight(kg)	1.17 ± 0.06
Staple length (cm)	7.70 ± 2.05
Average fibre diameter (µ)	34.35 ± 2.70
Medullation (%)	23.81 ± 1.30



3. BHAKARWAL

- The name of the breed is derived from the nomadic tribe which rears these sheep.
- Origin & Distribution.** No distinct home tract; sheep are entirely migratory.

<p>Physical characteristics</p> <p>Medium-sized animals, with a typical Roman nose.</p> <p>The animals are generally white, although coloured fleeces are occasionally observed. All animals are spotted fawn or grey. Rams are horned, ewes are polled. Ears are long and drooping.</p> <p>Tail is small and thin. Fleece is coarse and open.</p> <p>Economic character :-</p> <p>The sheep are shorn three times a year. The total annual wool produced, per animal, ranges from 1 to 1.5 kg.</p> <p>The wool quality is from 36s to 40s, with an average fibre diameter varying from 36 to 38 μ.</p>	
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4. POONCHI

Origin & Distribution. Poonch and part of Rajouri districts of Jammu province.

Physical characteristics :-

- Similar in appearance to Gaddi, but lighter.
 - Animals are predominantly white in colour, including the face, but spotted sheep are also seen, varying from brown to light black. Ears are medium long.
 - Tail is short and thin.
 - Legs are also short, giving a low-set conformation.
- Economic character :-**
- Wool is of medium to fine quality, mostly white in colour.
 - Sheep are shorn three times a year and produce between 0.9 to 1.3 kg of greasy wool each per year.
 - Fibre length ranges between 15 to 18 cm.
 - Average fibre diameter ranges between 22 and 30 μ .

5. KARNAH

Origin & Distribution. Distributed in Karnah, a mountainous tehsil in North Kashmir.

- Physical characteristics :-**
- Large animals. The rams have large curved horns and a prominent nose line.
- Breeding.** Cross-breeding with Merino has been introduced in Karnah.
- Economic character :-**
- Wool is generally white in colour. The sheep are shorn twice a year.
 - In spring and autumn, and produce between 1 to 1.5 kg of wool each per year.

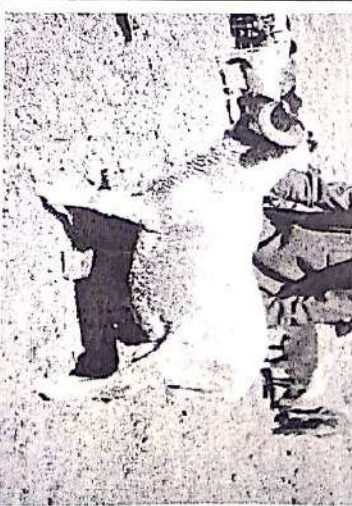


Staple length ranges from 12 to 15 cm

Average fibre diameter between 29 and 32 μ .

6. GUREZ

Origin & Distribution. Distributed in the Gurez area of Northern Kashmir.

<p>Physical characteristics</p> <p>Largest of the sheep breeds in Jammu & Kashmir. Generally white in colour, although some animals are brown or black or have brown or black spots.</p> <p>A small proportion of the animals have small, pointed horns.</p> <p>Tail is thin and short. Fleece is generally coarse and hairy.</p> <p>Ears are long, thin and pointed.</p> <p>Breeding. This breed is being crossed with Merino for improving apparel-wool production and quality</p> <p>Economic character :-</p> <p>The annual greasy-fleece weight varies from 0.5 to 1 kg per animal.</p>	
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7. KASHMIR MERINO

Origin :- Kashmir

- This breed originated from crosses of different Merino types with predominantly migratory native sheep breeds such as Gaddi, Bhakarwal and Poonchi.
 - The level of inheritance varies from very low to almost 100 per cent Merino, though a level from 50 to 75 per cent predominates.
 - The animals are highly variable because of the involvement of a number of native breeds.
- The annual greasy-fleece weight (kg) is 2.80 having average fibre diameter of 20.4 μ .

Economic character :-	
Meat :- Body wt. (kg.)	
At birth	3.37
At weaning (120 days)	21.8
Wool production and quality	
Average 6-monthly greasy fleece weight (kg)	1.2
Annual greasy fleece weight (kg)	2.8
Staple length (cm)	15.6
Average fibre diameter (μ)	20.4

8. CHANGTHANGI

Origin & Distribution :- Distributed in the Changthang region of Ladakh.

Physical characteristics :-

Strongly-built, large-framed animals with good fleece cover which has an extraordinarily long staple

Breeding. Some cross-breeding with Merinos has been initiated for improving greasy-wool production and quality for fine apparel-wool

Mortality. In lambs: from 20 to 35%, in adults: from 10 to 20%.

Economic character :-

Animals are usually shorn twice a year, generally in May/June and Sept/Oct, but in some cases shearing takes place only once a year, in July/ August.

Greasy-wool production ranges from 1 to 1.5 kg per animal per year. The wool is of a good carpet/medium apparel quality.



NORTH-WESTERN, CENTRAL ARID & SEMI ARID REGION :

The region comprises the states of Panjab, Haryana, Rajasthan, Gujarat and the plains of U.P. and M.P. The region is important in the country for carpet wool production.

1. CHOKLA

(also known as **Chapper and Shekhawati**)

Origin & Distribution :- Churu, Sikar and Bikaner, Jaipur and Nagaur districts of Rajasthan

Physical characteristics :-

- Light to medium-sized animals. The face, generally devoid of wool, is reddish brown or dark brown, and the colour may extend up to the middle of the neck; the skin is pink.
- The ears are small to medium in length and tubular.
- Both the sexes are polled. Tail is thin and of medium. Most famous for superior Carpet wool.
- The coat is dense and relatively fine, covering the entire body including the belly and the greater part of the legs. Wool is lustrous in nature.

Mortality. 0 to 3 months: 28.81% ; adults: 12.06%.

Body wt.:- Ram :- 34 kg, Ewe :- 24 kg.

Economic character

Milk: Very poor; not milked

Meat: body weight (kg)

At birth

At weaning

12 months

Wool production and quality

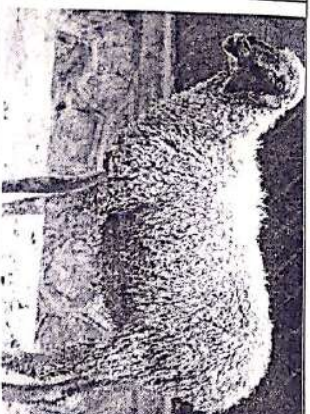
Staple length (cm)

Average fibre diameter (μ)

Medullation (%)

Fibre density (cm^3)

At birth	2.37
At weaning	11.13
12 months	17.89
Staple length (cm)	4.70 \pm 0.07
Average fibre diameter (μ)	28.22 \pm 0.20
Medullation (%)	24.01 \pm 0.62
Fibre density (cm^3)	1.008.7 \pm 46.5



2. NALI

Origin & Distribution.

Ganganagar, Churu districts of Rajasthan, southern part of Hissar and Rohtak districts of Haryana.

Physical characteristics :-

- Medium-sized animals. Face colour is light brown, skin colour is pink.
- Both sexes are polled. Ears are large and leafy. Tail is short to medium and thin.
- Fleece is white, coarse, dense and long-stapled.
- Forehead, belly and legs are covered with wool.

Mortality. 0 to 3 months: 24.42% ; adults: 10.64%

Economic character :-

Meat: body weight (kg)

At birth

At weaning

12 months

Wool production and quality

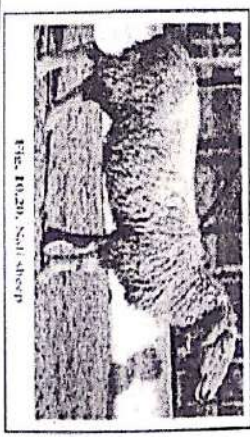
Staple length (cm)

Average fibre diameter (μ)

Medullation (%)

Fleece density (cm^3)

At birth	2.88 \pm 0.03
At weaning	10.19 \pm 0.14
12 months	17.74 \pm 0.31
Wool production and quality	
Staple length (cm)	8.31 \pm 0.14
Average fibre diameter (μ)	34.92 \pm 0.69
Medullation (%)	30.74 \pm 0.40
Fleece density (cm^3)	1.271.33 \pm 37.28



Both the clips, taken in March and Sept., are yellow, the Sept. clips being golden yellow.

3. MARWARI

Origin : The name originates from the home tract of the breed: Marwad.

Distribution. Jodhpur, Jalore, Nagaur, Peli and Barmer districts, extending up to Ajmer and Udaipur districts of Rajasthan and the Jeoria region of Gujarat.

Physical characteristics

Medium-sized animals. Black face, the colour extending to the lower part of neck.

Ears extremely small and tubular. Both sexes are polled.

Tail is short to medium and thin; Fleece is white and not very dense.

Mortality. 0 to 12 months: 26.0% ; adults: 3.43%

Economic character

Meat: body weight (kg)

At birth

At weaning

12 months

At birth	2.98 \pm 0.02
At weaning	8.16 \pm 0.84
12 months	21.06 \pm 0.04



• Wool production and quality

Staple length (cm)	6.56 ± 0.05
Average fibre diameter (μ)	36.93 ± 0.16
Medullation (%)	65.18 ± 1.66
Fibre density (cm ³)	1.714 ± 11

4. MAGRA (formerly known as Bikaneri; also known as Bikaneri Chokhia and Chakri)

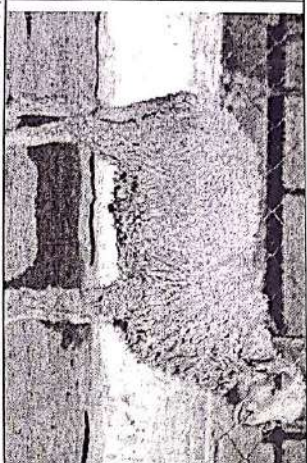
Origin & Distribution :

Although the breed is largely found in Bikaner, Nagaur, Jaisalmer and Churu districts of Rajasthan

Physical characteristics :

Medium to large animals. White face with light brown patches around the eyes, characteristic of this breed. Skin colour is pink. Ears are small to medium and tubular. Both sexes are polled. Tail is medium in length and thin. Fleece is of medium carpet quality, extremely white and lustrous and not very dense. Bikaneri chokla strains have extremely white and lustrous fleeces and are suitable for good quality carpets wool.

Mortality : 0-3 months: 29.0%; adults: 23.40%	
Body wt.:- Ram :- 28 kg, Ewe :- 24 kg	
Meat: body weight (kg)	2.98 ± 0.02
At birth	11.7 ± 0.13
At weaning (90 days)	27.99 ± 0.19
Wool production and quality	
Staple length (cm)	5.81 ± 0.02
Average fibre diameter (μ)	32.45 ± 0.35
Medullation (%)	48.29 ± 0.39
Dressing percentage on pre-slaughter live-weight basis : 44.75	



Shorn three times a year. February clip is white, July clip is tinged white and November clip is yellow. Most famous for superior carpet wool and more lustrous.

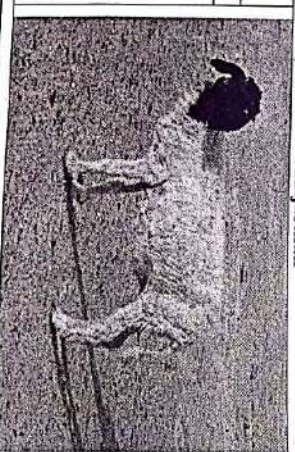
5. JAISALMERI

Origin : The name is derived from the home tract Jaisalmer, Rajasthan

Distribution: Jaisalmer, Barmer and Jodhpur districts of Rajasthan.

Breed characteristics

Tall, well-built animals. Black or dark brown face, the colour extending up to the neck. Typical Roman nose. Long drooping ears, generally with a cartilaginous appendage. Both sexes are polled. The tail is medium to long. The fleece colour is white and lustrous are



suitable for good quality carpets.	
Mortality. In adults: 8.20%.	
Breeding. Pure breeding. Rams are selected on the basis of fleece weight.	
Economic character	
Wool production and quality	
Staple length (cm)	6.46
Average fibre diameter (μ)	39.1 ± 2
Medullation (%)	64.1 ± 3.1

6. PUGAL

Origin : The name originates from the Pugal area of Bikaner district

Distribution : Bikaner and Jaisalmer districts of Rajasthan

Physical characteristics :

Fairly well-built animals. Black face, with small light brown stripes on either side above the eyes; lower jaw typically light brown. The black colour may extend to neck. Ears are short and tubular. Both sexes are polled. Tail is short to medium and thin; White fleece, of medium carpet quality, not very dense.

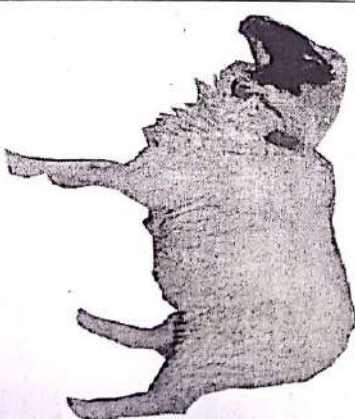
Breeding. Pure breeding. Rams, selected on the basis of fleece production

Body wt.:- Ram :- 32 kg, Ewe :- 27 kg.

Economic character

Wool production and quality

Staple length (cm)	5.71 ± 0.04
Average fibre diameter (μ)	35.13 ± 1.00
Medullation (%)	61.86 ± 0.62



7. MALPURA (also known as Desi)

Origin & Distribution :

Jaipur, Tonk, Swainadipour and adjacent areas of Armer, Bhiwara and Bundi districts in Rajasthan.

Physical characteristics :

- Fairly well-built animals, with long legs. Face light brown.
- Ears are short and tubular, with a small cartilaginous appendage on the upper side.
- Both sexes are polled. Tail is medium to long and thin.
- White fleece, extremely coarse and hairy. Belly and legs are devoid of wool.

Mortality : 0 to 3 months: 11.14%; adults: 10.29%.

Breeding. Mostly pure breeding; to a limited extent, cross-breeding with Corriedale and Merino or their half-bred lambs. These cross-breeds have a black face.

Economic character	
Milk: Lactation yield : 21.366 kg; length: 105 days.	
Meat: body weight (kg)	2.52 ± 0.01
At birth	9.14 ± 0.09
At weaning	20.63 ± 0.2
12 months	
Wool production and quality	
Staple length (cm)	5.60 ± 0.0001
Average fibre diameter (μ)	41.95 ± 0.37
Medullation (%)	71.84 ± 0.17
Fibre density (cm ³)	626.25 ± 28.4



8. SONADI

Origin & Distribution. Udaipur and Dungarpur districts and, to some extent, Chittorgarh district of Rajasthan; also extends to northern Gujarat.

Physical characteristics

Fairly well built, somewhat smaller than Malpura, with long legs. Light brown face with the colour extending to the middle of the neck. Ears are large, flat and drooping. Ears generally have a cartilaginous appendage. Tail is long and thin. Both sexes are polled. Udder is fairly well developed.

Mortality. 0 to 3 months : 13.24%; adults : 7.92%

Economic character

Milk: Lactation yield : 23.752 kg; length: 105 days.

Meat: body weight (kg)

At birth 2.40 ± 0.02

At weaning 9.29 ± 0.13

12 months 18.95 ± 0.26

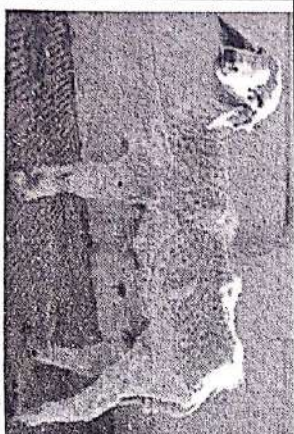
Wool production and quality

Staple length (cm) 4.58 ± 0.27

Average fibre diameter (μ) 52.65 ± 1.77

Medullation (%) 88.15 ± 2.1

Fibre density (cm³) 618.77 ± 50.33



Sonadi

9. PATANWADI (also called Desi, Kutchi, Kathiawari, Vadhivari and Charotari)

Origin & Distribution : The breed includes three distinct strains

i) **Non-migratory**, red-faced animals with small bodies, yielding relatively finer fleeces. These are typical Patanwadis and are located in northeastern Saurashtra;

ii) **Migratory type**, with larger body and long legs, typical Roman nose and long tubular ears. This variety, which has coarser fleeces, is observed in western and northeastern Gujarat;

iii) **Meat type**, with big body, low stature and coarse fleeces, observed in southeastern areas around Paltana.

Physical characteristics

Medium to large animals, with relatively long legs. Typical Roman nose. Face brown and spotted tan. Ears medium to large, tubular, with a hairy tuft. Tail thin and short. Both sexes are polled. White fleece is of medium carpet quality, not very dense.

Mortality. 0 to 3 months: 2%; adults: 2.2%.

Body wt. :- Ram :- 34 kg, Ewe :- 24 kg.

Economic character

Meat: body weight (kg)

At birth 2.99

At weaning 13.68

12 months 21.9

Wool production and quality

Staple length (cm) 8.51 ± 0.09

Fibre diameter (μ) 31.95 ± 0.26

Medullation (%) 29.88 ± 0.95

Fibre density (cm³) 957.8 ± 17.0



10. MUZZAFARNAGRI (also known as Bulandshahri)

Origin & Distribution :

• Muzaffarnagar, Bulandshaher, Sahranpur, Meerut, Bijnor, Dehradun districts of Uttar Pradesh and parts of Delhi and Haryana.

Physical characteristics :

- Medium to large animals. Face line slightly convex.
- Face and body white with occasional patches of brown or black.
- Ears and face occasionally black.
- Both sexes are polled. Males occasionally show rudimentary horns.
- Ears are long and drooping. Tail is extremely long and reaches fetlock.
- Fleece is white, coarse and open. Belly and legs are devoid of wool.

Mortality. In farmers' flocks: in young: 47.4%; in adults: 9.85%.

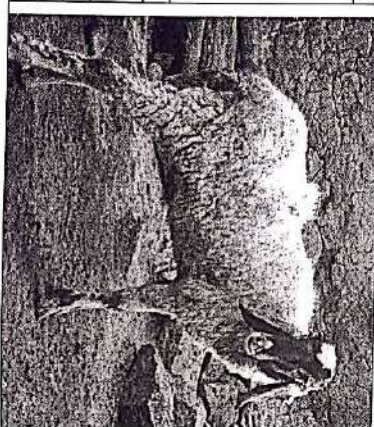
Economic character	
Milk. Ewes milked for 50 to 120 days, producing 100 to 500 g milk per day.	
Meat: body weight (kg)	
At birth	3.01 ± 0.63
At weaning	10.76 ± 0.39
12 months	25.01 ± 2.16
Wool production and quality	
Staple length (cm)	3.72 ± 0.05
Average fibre diameter (μ)	45.17 ± 0.37
Medullation (%)	69.92 ± 0.87
Fleece density (cm ³)	2.811 ± 74.2



11. JALAJUNI

Origin & Distribution : Jalaw, Jhansi and Lalitpur districts of Uttar Pradesh.

Physical characteristics	
Medium-sized animals, with straight nose line. Both sexes are polled.	
Ears are large, flat and drooping. Tail is thin and medium in length.	
Fleece is coarse, short-stapled and open, generally white.	
Belly and legs are devoid of wool	
Economic character	
Milk. Ewes are milked for 107 to 128 days & produce 300 to 350 g milk per day.	
Wool production and quality	
Average fibre diameter (μ)	41.1 ± 0.19
Medullation (%)	78



12. HISSARDALE

Origin & Distribution :

Hissardale originated in the earlier part of the century at the Government Livestock Farm, Hissar (Haryana), through crossing **Australian Merino** rams with **Bikaneri (Magra)** ewes; the exotic inheritance is stabilized at about 75%.

Physical characteristics :

- Small animals with short legs, giving a low-set appearance.
- Leaf-like, medium-sized ears.
- Most animals are polled. Colour is predominantly white, although some brown or black patches can be observed.

13. AVIKALIN

Origin :

This superior carpet wool strain has been evolved at the CSWRI Avikanagar through inter breeding and selection for greasy fleece weight from **Rambouillet** x **Mapura** half-bred base,

Economic character :	
Average 6-monthly greasy fleece weight (kg)	1.75
Staple length (cm)	4.75
Average fibre diameter (μ)	27
Medullation (%)	27
This breed is quite suitable as a dual purpose sheep for carpet wool and mutton production.	

14. BHARAT MERINO SHEEP

Origin : Kolar District of Karnataka and Erode District in Tamilnadu.

Bharat Merino sheep developed by crossbreeding indigenous **Chokla** and **Nali** sheep with **Rambouillet** and **Merino** rams and stabilized at 75% exotic inheritance has the potential as an import substitute for exotic fine wool inheritance. The annual greasy wool production is 2.5 kg with fibre diameter of **19-20 microns**, medullation less than one percent

15. AVYASTRA

Origin : This fine wool breed was involved at the CSWRI, Avikanagar through inter breeding and selection of **rambouillet** x **chokla** (halfbred based) Wool obtained is 2.3 kg, 21 – 22 micron dia. and 4.5 cm staple length.

SOUTHERN REGION :

This region (semi arid in central peninsular and hot humid along the coast) comprises of Maharashtra , Andra Pradesh, Karnataka, Tamil Nadu and Kerala . Majority of wool produced is below 36s (The exception being Nilgiri sheep which produce wool above 48s). About 50% of the population of sheep in this region does not produce any wool and the rest produce very coarse, hairy and coloured fleeces.

1. DECCANI

Origin & Distribution :

- The breed is spread over the greater part of the central peninsular region, comprising the semi-arid areas of Maharashtra, Andhra Pradesh and Karnataka.

Physical characteristics :

- Medium-sized animals, predominantly black or black with white markings; white and brown/fawn animals are also seen. Rams are horned but ewes are polled.
- Ears are medium long, flat and drooping. Tail is short and thin.
- Fleece is extremely coarse, hairy and open. Belly and legs are devoid of wool.

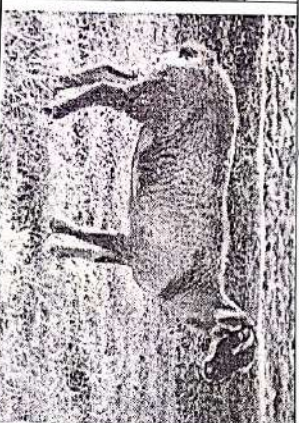
Body wt.:- Ram :- 38 kg, Ewe :- 29 kg.

Mortality : 0-3 months : 5.3%; adults : 2.8%.	
Economic character	
Meat : body weight (kg)	
At birth	2.82 ± 0.001
At weaning	13.56 ± 0.09
6 months	20.86 ± 0.33
Wool production and quality	
Staple length (cm)	8.58 ± 0.32
Average fibre diameter (μ)	52.42 ± 1.86
Medullation (%)	73.75 ± 2.54
Fibre density (cm ³)	734.46 ± 28.90
Annual greasy fleece weight: 0.74 ± 0.2 kg	
Dressing percentage on the basis of pre-slaughter live-weight: 49.6 ± 1.8	



2. BELLARY
Not very different from Deccani. Sheep found to the north of the Tungabhadra River are called "Deccani" and those to the south of it, "Bellary".

Origin :- Bellary district of Karnataka.	
Physical characteristics	
Medium-sized animals, with body colour ranging from white through various combinations of white and black to black. One third of the males are horned; females are generally polled. Ears are medium long, flat and drooping. Tail is short and thin. Fleece is extremely coarse, hairy and open; belly and legs are devoid of wool.	
Reproduction : lambing percentage: 80-85%; litter size: single.	
Mortality : Young: 20 to 25%; adults: 15%.	
Economic character	
Meat : body weight (kg)	
At birth	2.60 ± 0.02
At weaning	11.09 ± 0.15
12 months	18.68 ± 0.41
Wool production and quality	
Average fibre diam. (μ)	59.03 ± 1.06
Medullation (%)	43.43 ± 1.42
Fibre density (cm ³)	346 ± 9.27



3. NELLORE
Three varieties are distinguished, primarily on the basis of colour: "Palla", completely white or white with light brown spots on head, neck, back and legs; "Jodipi" (also called "Jodimpu"), white with black spots, particularly around the hips, eyes and lower jaw, but also on belly and legs; and "Dora", completely brown.

Body wt.:- Ram :- 37 kg, Ewe :- 30 kg

Origin & Distribution : Nellore district and Ongole districts of Andhra Pradesh.

Physical characteristics	
Relatively tall animals with little hair except at brisket, withers and breech. The rams are horned; the ewes are almost always polled. The ears are long and drooping. The tail is short and thin; 86% of the animals carry wattles.	
Mortality : 0 to 3 months: 14.36% ; adults: 13.40%.	
Economic character	
Meat : body weight (kg)	
At birth	2.74 ± 0.03
At weaning	11.98 ± 0.42
12 months	22.72 ± 1.00
Dressing percentage : on pre-slaughter live-weight basis: 47.00 . age at slaughter: 6 months.	



4. MANDYA (also known as Bannur and Baudur*)

Origin & Distribution : Mandya district and bordering Mysore district of Karnataka	
Physical characteristics	
Relatively small animals. Colour is white, but in some cases face is light brown, and this colour may extend to the neck. Compact body with a typical reversed U-shape conformation from the rear. Ears are long, leafy and drooping. Tail is short and thin. A large percentage of animals carry wattles. Slightly Roman nose. Both sexes are polled. Coat is extremely coarse and hairy.	
Mortality: 0 to 3 months: 5.33% ; adults: 20.07% .	
Economic character	
Meat : body weight (kg)	
At birth	2.09 ± 0.03
At weaning	9.71 ± 0.16
12 months	21.02 ± 1.52



Body wt.:- Ram :- 34 kg, Ewe :- 25 kg.

5. HASSAN

Origin : Hassan district of Karnataka.	
Physical characteristics	
Small animals. White body with light brown or black spots. Ears are medium-long and drooping; 39% of the males are horned; females are usually polled. Fleece is white, extremely coarse and open; legs and belly are generally devoid of wool.	
Reproduction: Lambing percentage: 85%; litter size: single.	
Mortality: Young: 10 to 20%; adults: 10 to 15%.	
Economic character : Average annual fleece weight: 300-400 g.	



6. MECHERI
(also known as Maipiambadi and Thuvaramchambai in Coimbatore district)

Origin : Salem district and Bhavani taluk of Coimbatore district of Tamil Nadu.	
Breed characteristics	
Medium-sized animals, light brown in colour. Ears are medium-sized. Both sexes are polled. Tail is short and thin.	
Body is covered with very short hairs which are not short.	
Reproduction: Age at first breeding: 15 months; lambing percentage: 80 to 85%.	
Mortality : 0 to 12 months: 9.29% ; adults: 7.49%.	
Economic character :	
Meat : body weight (kg)	
At birth	2.24 ± 0.01
At weaning	9.81 ± 0.04
12 months	18.96 ± 0.09
Dressing percentage : on the basis of pre-slaughter live-weight : 54.70%.	
The skin is of the highest quality of sheep breeds in India and is highly prized.	



7. KILAKARSAL
(also known as Keezhakkaraikal, Karuvai, Keezha Karuvai, Ramnad Karuvi and Adharasial)
Origin : Kannathapuram, Madurai, Thanjavur and Ramnad districts of Tamil Nadu.

Breed characteristics	
Medium-sized animals. Coat is dark tan, with black spots on head (particularly the eyelids and lower jaw), belly and legs. Ears are medium sized. Tail is small and thin. Males have thick twisted horns, 2 to 3 cm in length. Most animals have wattles.	
Reproduction :- Lambing percentage: 80%.	
Mortality: 0 to 12 months: 24.94% ; adults: 7.28%.	
Economic character :-	
Meat: body weight (kg)	
At birth	1.29 ± 0.01
At weaning	8.53 ± 0.05
12 months	27.26 ± 0.55



8. VEMBUR (also called Karandhai*)

Origin : Tirunelveli dist. of Tamil Nadu.	
Breed characteristics	
Tall animals. Colour is white, with irregular red and fawn patches all over the body. Ears are medium-sized and drooping. Tail is thin and short. Males are horned; ewes are polled. The body is covered with short hairs which are not short.	
Reproduction : Lambing percentage: 80%.	
Mortality : Young: 10 to 15% ; adults: 10%.	
Breeding : Rams are selected on the basis of body size.	
Economic character :	
Meat: body weight (kg)	
At birth	1.97 ± 0.04
At weaning	8.42 ± 0.10
12 months	16.50 ± 0.24



9. COIMBATORE (also called Kurumbai)

- Origin :** Coimbatore and Madurai districts of Tamil Nadu
- Physical characteristics :**
- Medium-sized animals, white with black or brown spots.
 - Ears are medium-sized and directed outward and backward.
 - Tail is small and thin.
 - 38% of the males are horned; females are polled.
 - Fleece is white, coarse, hairy and open.

Mortality : 0 to 3 months: 11.43% ; adults: 7.75%.	
Breeding : Pure breeding. There is little selection in the flocks.	
Economic character :	
Meat: body weight (kg)	
At birth	2.16 ± 0.02
At weaning	7.50 ± 0.13
12 months	14.77 ± 0.26
Wool production and quality	
Average 6-monthly greasy	0.365 ± 0.01
Fleece weight (kg)	5.79 ± 0.39
Staple length (cm)	41.05 ± 1.83
Fibre diameter (μ)	58.37 ± 3.05
Medullation (%)	376.0 ± 19.3
Fibre density (cm ⁻³)	
Dressing percentage on pre-slaughter live-weight basis at 6 months: 38.20%.	



10. NILGIRI

Origin: Nilgiri hills in Tamil Nadu.

Physical characteristics

Medium-sized animals. Body colour is white; exceptionally there are brown patches on face and body. Face line is convex, giving a typical **Roman nose**. Ears are broad, flat and drooping. Males have horn buds and scurs; females are polled. The tail is medium and thin. The fleece is fine and dense.

Mortality: 0 to 3 months: 17.40%; adults: 6.66%.

Breeding: Pure breeding. There is little selection in the flocks.

Economic character :

Meat: body weight (kg)

At birth 2.96 ± 0.04

At weaning 11.84 ± 0.20

12 months 19.77 ± 0.47

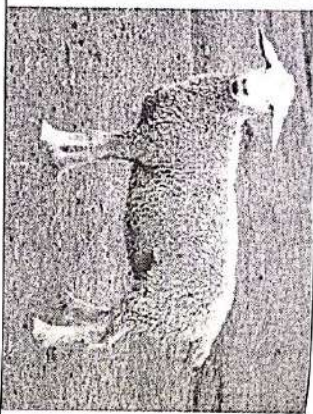
Wool production and quality

Average 6-monthly greasy fleece weight (kg) 0.615 ± 0.028

Average fibre diameter (μ) 27.34 ± 0.077

Medullation (%) 11.31

Fibre density (cm³) 2.199 ± 57



11. RAMNAD WHITE

Origin : Ramnad district and adjoining areas of Tirunelveli district of Tamil Nadu.

Physical characteristics :

- Medium-sized animals, predominantly white; some animals have fawn or black markings over the body.
- The ears are medium-sized and directed outward and downward.
- Males have twisted horns; females are polled. Tail is short and thin.

Reproduction : Lambing percentage: 72.55%.

Mortality : 0 to 3 months: 2.19% ; adults: 11.37%.

Breeding : Pure breeding. Rams are selected on the basis of size

Economic character :

Meat: body weight (kg)

At birth 1.68 ± 0.02

At weaning 7.31 ± 0.13

12 months 16.30 ± 0.09



12. MADRAS RED

Origin : Chingalpet and Madras districts of Tamil Nadu.

Physical characteristics :

- Medium-sized animals. Body colour is predominantly brown, the intensity varying from light tan to dark brown; some animals have white markings on the forehead, inside the thighs and on the lower abdomen. Ears are medium long and drooping.
- Tail is short and thin. Rams have strong corrugated and twisted horns; the ewes are polled.

- The body is covered with short hairs which are not shorn.

Reproduction : Lambing percentage: 92.83%.

Mortality: 0 to 4 months: 10.38% ; adults: 0.62%.

Breeding : Pure breeding. Primarily selection is based on body size.

Economic character :

Meat: body weight (kg)

At birth 2.61 ± 0.02

At weaning 13.50 ± 0.12

12 months 21.89 ± 0.21



13. TIRUCHY BLACK (also known as Tiruchy Karungumbai)

Origin : Tiruchy district, North Arcot district and Dharmapuri district of Tamil Nadu.

Physical characteristics

Small animals. Body is completely black. Males are horned; ewes are polled. Ears are short and directed downward and forward. Tail is short and thin. The fleece is extremely coarse, hairy and open.

Reproduction : Lambing percentage: 70 to 80%.

Mortality : In both young and adults: about 20%.

Economic character :

Meat: body weight (kg)

At birth 2.13 ± 0.04

At weaning 9.46 ± 0.28

12 months 16.8 ± 0.40

Wool : Average fleece yield: 0.400 kg.



14. KENGURI (also known as Tenguri)

Origin : Hilly tracts of Raichur district (particularly Lingasagar, Sethanur and Gangarai taluks) of Karnataka.

Physical characteristics :

- Medium-sized animals. Body colour is mostly dark brown, but colours ranging from white to black with spots of different shades are also to be observed.
- Males are horned; females are generally polled.

Reproduction : In farmers' flocks: lambing percentage: 80 to 85%.

Mortality: Young: 10 to 20%; adults: 10%.

EASTERN REGION

This region, which is predominantly hot and humid, includes Bihar, WB, Orissa, Assam and other eastern states. Sheep primarily produce wool of below 36s quality. Sheep of this region are primarily of meat type with the exception of Arunachal Pradesh which has a small number of better wool type sheep. The wool produce by the sheep of this region is extremely coarse, coloured and hairy quality.

1. CHOTTANAGPURI

Origin & Distribution : Chottanagpur, Ranchi, Palamanu, Hazaribagh, Singhbhum, Dhanbad and Santhal Parganas of Bihar, and Bankura district of West Bengal.

Physical character	Small, light-weight animals, light grey and brown in colour. Ears are small and parallel to the head; Tail is thin and short; Both sexes are polled. Fleece is coarse, hairy and open; it is generally not clipped.
Economic character :	The animals are shorn three times a year, in March/April, June/July and October/November and produce a yearly average of 0.184 kg of hairy wool with an average fibre diameter of 52.54 μ and a medullation percentage of 83.61%.



2. SHAHABADI (also known as "plain type sheep")

Origin & Distribution : Shahabad, Patna and Gaya districts of Bihar.

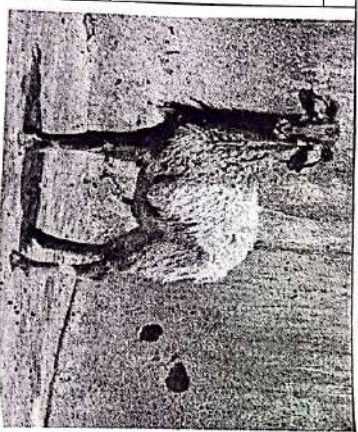
Physical character	Medium-sized, leggy animals. The fleece colour is mostly grey, sometimes with black spots. Ears are medium-sized and drooping. Tail is extremely long and thin. Both sexes are polled. Fleece is extremely coarse, hairy and open; legs and belly are devoid of wool.
Economic character :	
Wool production and quality	
Annual greasy fleece weight (kg)	0.240
Average fibre diameter (μ)	49.83 \pm 9.06
Medullation (%)	87.08 \pm 6.81



3. BALANGIR

Origin & Distribution : Northwestern districts of Orissa: Balangir, Sambalpur, Sundergarh.

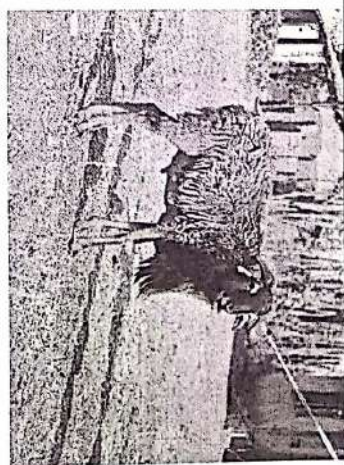
Physical character	Medium-sized animals, white or light brown or of mixed colours. A few animals are also black. The ears are small and stumpy. Males are horned; females are polled. Tail is medium long and thin. Fleece is extremely coarse, hairy and open. Legs and belly are devoid of wool.
Mortality :	In farmers' flocks: young: 8.0%; adults: 1.6%.
Body weight (Kg):-	
Adult males	23.60
Adult females	17.85



4. GANJAM

Origin & Distribution : Koraput, Phulbani and part of Puri district of Orissa.

Physical character	Medium-sized animals with coat colour ranging from brown to dark tan. Some have white spots on the face and body. Ears are medium-sized and drooping. Nose line is slightly convex. Tail is medium long and thin. Males are horned; females are polled. Fleece is hairy and short; it is not shorn.
Mortality :	In farmers' flocks: young: 19.6%; adults: 4.1%.
Breeding :	Pure breeding. Little selection is made in the flocks.
Body weight (kg)	24



5. TIBETAN

Origin & Distribution : Northern Sikkim and Kameng district of Arunachal Pradesh.

- Physical character :**
- Medium-sized animals, mostly white with black or brown face; brown and white spots are also observed on the body. Both sexes are horned.
 - The nose line is convex, giving a typical Roman nose.
 - The ears are small, broad and drooping. The fleece is relatively fine and dense.
 - The belly, legs and face are devoid of wool.
- Breeding :** The animals are pure-bred, except that recently some cross-breeding with Merino has been introduced in Kameng district to improve fleece production and quality.

Economic character :	
Body weight (kg)	26.50
Wool production and quality	
Greasy fleece weight per clip (g)	400 - 900
Average staple length (cm)	7.24 \pm 0.11
Medullation (%)	19.30 \pm 0.64
Average fibre diameter (μ)	13.22 \pm 1.25



6. BONPALA

Origin & Distribution : Southern Sikkim.

Physical character :

Tall, leggy, well-built animals. Fleece colour ranges from completely white to completely black with a number of intermediary tones. Ears are small and tubular. Both sexes are horned. Tail is thin and short; Fleece is coarse, hairy and open. Belly and legs are devoid of wool.

Economic character :

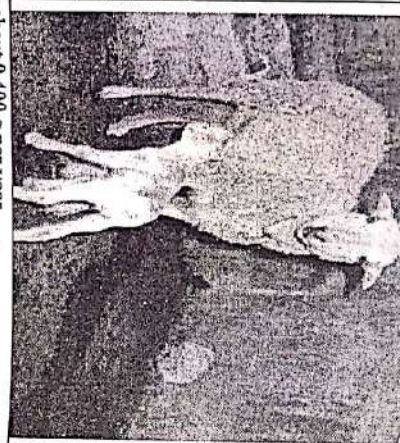
Wool production and quality

Average fibre diameter (μ) 66 ± 25

Average fibre length (cm) 9.63 ± 0.47

Medulation (%) 95 ± 1.4

The animals are shorn twice a year, producing about 0.400 g per year.



Classification and study of exotic sheep breeds

In order to evolved new breeds of superior quality, a few exotic breeds of sheep have been introduced in India. Purpose of increasing fine quality of wool, mutton, use of dual-purpose, pelt and improving / grading up indigenous sheep.

Dual purpose		Wool type		Fur / Pelt type
Mutton and medium type wool	Mutton and long type wool	Fine wool type		
Breeds	Origin	Breeds	Origin	Breed
Southdown	England	Lincoln	England	Karakul central and western Asia, Afghanistan, South-west Africa, Iran and Iraq
Hampshire	U.K	Leicester	England	
Cheviot	Scotland	Polworth	Victoria,	
Dorset-Horn	England	Corriedal	New Zealand	

EXOTIC BREEDS OF SHEEP

1. Fine wool breeds :

These produce fine and crimp wool. Their fleeces is heavy, dense and good quality. They have strong banding instinct and can graze on poor quality range. It contain a large amount of yolk. Range of the exotic fine wool breeds imported in India, Rambouillet & Soviet Merino have done well as purebreds. Their crosses with indigenous breeds have shown improvement in wool quality and also in production

Following fine wool breeds are popular in India

(i) MERINO:

Origin : Spain,

This most popular fine wool breed traces to the Spanish Merino type. Selection within the Merino group has resulted in a large variety of breeds and strains distributed throughout the world. In addition, Merino has been widely used in the development of many other crossbred wool breeds. Merino divided into three strains A,B and C. type A is heavily wrinkled all over body and type C has less wrinkles and more popular because wool blindness will not occur.

Physical character :

- Merinos in general have strong constitutions and are known for hardiness and longevity.
- They are good travelers able to walk long distance for food & water.
- Their face and legs are **white** and the skin is **pink**.
- Rams mostly have heavy spiral horns, whereas the ewes are polled.
- The head and legs are generally covered by wool.
- The Merino is a thin-tailed, fine-wooled breed that favours aridity of environment.
- They are good grazers and are able to forage over large areas of poor grasslands.
- Mature rams weigh about some 75 kg and the ewes 65 kg. Ram's height is about 70 cm and that of ewes 60 cm.

Economic character :

Fleece yield varies widely depending on environmental conditions and time of breeding but Averages 4 to 5 kg for rams and 3 to 4 kg for ewes. The staple length is 5 to 10 cm. The Merino, tends to be a seasonal breeder, and hence, has low prolificacy.

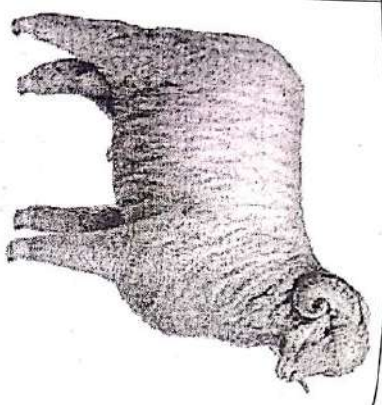


(ii) RAMBOUILLET:

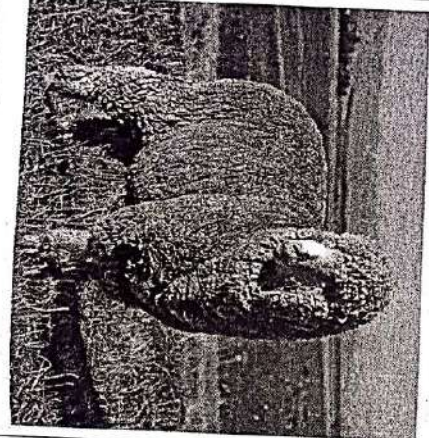
Origin : France

The Rambouillet is a descendant of the **old Spanish Merino**.

Largest & strongest of the fine wool sheep It was developed as a breed in France. It has divided into three strains A,B and C. type C has most popular due to open face and free from wool blindness.

<p>Physical character :</p> <p>Modern Ramboulllets are large, rugged, fast-growing sheep.</p> <p>Ramboulllets produces high quality, fine wool.</p> <p>The rams may have large spiral horns.</p> <p>The ewes are polled.</p> <p>They have large heads with white hair around the nose and ears.</p> <p>The face and legs are white, skin is pink.</p> <p>Mature rams in good condition with full fleece wt. from 100 to 125 kg & ewes from 60 to 90 kg.</p> <p>Ramboulllet is adaptable to different conditions and they considered to be a dual-purpose breed.</p>	
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(iii) POLWORTH :

<p>Origin : Victoria</p> <p>This breed was evolved by mating Lincoln Merino ewes with Merino rams.</p>	<p>Physical character :</p> <p>They have fairly level frame, clear eyes, soft face, pink rose body colour which is sometimes mottled.</p> <p>They may be horned or polled.</p> <p>Although the animals are bulky in appearance, yet they have symmetrical lines.</p> <p>Their fleece is of even quality and average staple length is not less than 10 cm.</p> <p>The value of the fleece runs very close to Merino.</p> <p>They produce mutton of almost desirable quality.</p>	
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2. Mutton Breeds

Specialised mutton breeds that mature fast, have high prolificacy, higher body weight gains, high feed conversions, and high carcass yield and produce good quality mutton. India has imported these mutton sheep breeds mostly from U.K. and other countries to improve mutton production in the indigenous breeds.

- Following mutton breeds are popular in India:
- (i) **SUFFOLK :**
- Origin :** Suffolk was developed in southeastern England.
- Physical character :**
- This breed easily identifies by long clean head, big ears and small boned legs, jet black in colour.
 - Their face, ears and legs are very black in colour.
 - The head and ears are entirely free from wool and black hair extends to a line on back of the base of the ears. The breed is also known for its alertness and activity.
 - Both rams and ewes are polled. The fleece is moderately short, dense and fine.

<p>Economic character :</p> <p>The greasy wool yield is 2.75 to 3.25 kg annually. Medium type wool</p> <p>This breed is the first and the foremost mutton breed.</p> <p>The mature rams in good condition weigh from 100 to 135 kg and ewes from 70 to 100 kg.</p> <p>The ewes are very prolific and excellent milkers.</p>	
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- (ii) **DORSET :**
- Origin :** The breed is native to southern England. Dorset means excellent ability to reproduce.

<p>Physical character :</p> <p>The ram horns grow in complete spiral. Ewe horns grow only about half spiral.</p> <p>The face, ears and legs are white in colour and practically free from wool.</p> <p>The ears are of medium size, thin, silky and carried well forward.</p> <p>The nostrils, lips and skin are pink. The hooves are white.</p> <p>They produce a carcass of medium weight, and superior quality meat.</p>	
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Economic character :

- The weight of fleece is 2.75 to 3.25 kg, and the wool is short, close, and fine in texture.
- A mature ram in good condition weighs 80 to 110-kg and ewe from 50 to 80 kg.
- The lambs weigh about 18 to 22 kg at 9 months of age.
- The breed is prolific, hard and is capable of doing well under most conditions.

(iii) SOUTH DOWN :

Origin : This is one of the oldest breed of sheep. England

Physical character:

These breeds have excellent mutton conformation. The animals are low set, compact, wide and deep with legs set wide apart, and have broad head with a wool cap that comes just below the eyes.

The face, ears and legs are light brown and the skin is bright pink in colour.

The breed is polled although scars are sometimes found on rams.

The eyes are large, bright and prominent, and the ears are of medium size and covered with short wool. The ewes are not too prolific and are only average milkers.

The fleece is short, close, fairly dense and of fine quality.



Economic character :

- The annual greasy fleece weight is around 2.25 to 3.25 kg. The breed is early maturing.
- Mature rams in good condition weigh about 15 kg at 3 months, 22 kg at 6 months and 27 kg at 9 months age.

3. Dual-purpose Breeds

The dual purpose breeds of good quality meat and wool.

CORRIEDALE :

Origin :

The Corriedale breed was developed in New Zealand. Lincoln and Leicester rams were crossed with Merino ewes and by interbreeding and careful selection. Corriedale was established that produced a good balance of mutton and wool.

Physical character:

The face, ears and legs of these animals are covered with white hair, although black spots are sometimes present. Both sexes are polled, although rams sometimes have horns.

The ewes are fair in prolificacy and milking ability. The corriedale foot is compact and resistant to foot rot and adaptable to marshy land.



Economic character :

- Mature rams in good condition weigh 80 to 110 kg and ewes from 55 to 85 kg. On an average, they produce 4.5 to 5.5 kg of greasy wool annually. Fiber length is 4 to 6 inches.
- The wool is generally noted for exceptional length, brightness, softness and for a very distinct crimp.
- In India Corriedale have mostly been imported from Australia.

4. Pelt Breeds (Fur coated)

Economic performance :

Pelt sheep are maintained for their lamb pelts which are used for garments. They are generally of poor mutton quality and the fleece from the mature animals are of coarse carpet type and thus of relatively lower value. Karakul is the chief pelt type breed in India.

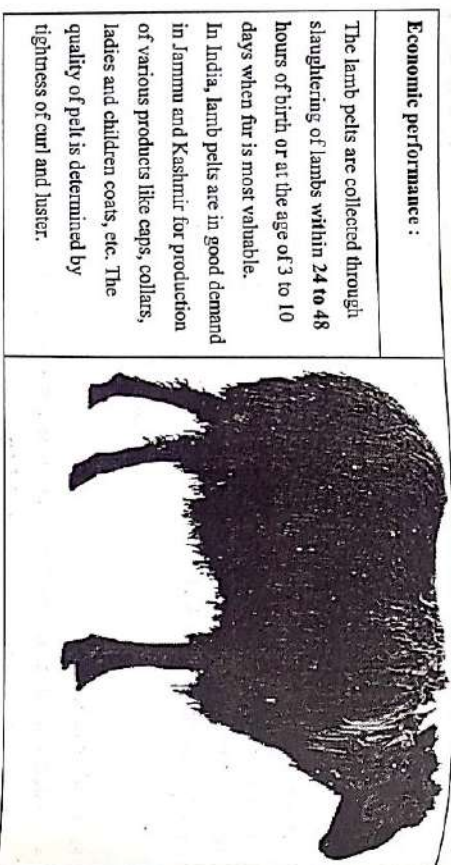
KARAKUL :

Origin : central and western Asia, Afghanistan, South-west Africa, Iran and Iraq.

The Karakuls were first imported in 1975 by India. Their performance was studied under the hot-arid conditions at Bikaner (Rajasthan) and cold-arid conditions at other parts of Jammu and Kashmir. It is very well adapted to extreme climate conditions and sparse vegetation resources. The best grade lamb skins come from Bokhara country where sheep is fat tail.

Physical character :

- The mature Karakul animals are angular, upstanding and of very poor mutton type conformation.
- The rams have horns, but the ewes are polled.
- Rams weigh about 90 kg and ewes about 65 kg on an average.
- The face, ears and legs are black or brown. The ears are drooping.



Economic performance :

The lamb pelts are collected through slaughtering of lambs within 24 to 48 hours of birth or at the age of 3 to 10 days when fur is most valuable. In India, lamb pelts are in good demand in Jammu and Kashmir for production of various products like caps, collars, ladies and children coats, etc. The quality of pelt is determined by tightness of curl and luster.

Sr. No.	Name of Breed	Origin	Physical character	Economic performance
1	Lincoln	England	Body: Large size Rams : wt. 152 kg	Dual purpose Coarse wool yield - 4.5 to 5 kg / year
2	Leicester	England	Body: Moderate size Ewes: wt. 85 kg Rams : wt. 100 kg	Dual purpose Coarse wool yield - 3 to 4 kg / year
3	Cheviot	Scotland	Body: Large size Ears : Erect, clean white face Colour : White Body wt. : Rams-80 kg Ewes - 55 kg	Fine wool Annual yield - 2.5 to 3 kg

CHAPTER - 4

CLASSIFICATION AND STUDY OF INDIGENOUS AND EXOTIC GOAT BREEDS

1 Classification and study of Indigenous goat breeds

Classification of Indigenous goat breeds :

1. Zoological classification

- Phylum : Cordata (Back bone)
- Class : Mammalia (Milk bone)
- Order : Ungulata (Hoofed animal)
- Sub-order : Artiodactyls (Even toed)
- Sub-division : Pecora (True ruminants)
- Family : Bovidae (Hollow horned)
- Sub-family : Caprinae
- Genus : Capra
- Species : Hircus

Classification of goats based on agro-ecological regions :

Sr. No.	Northern temperate region	North-western arid and semi arid region	Southern region	Eastern region
1.	Kashmir/ Pushmina	Sirohi - Raj. Guj.	Sangamneri - MH.	Black Bengal - West Bengal, Ganjam - Orissa
2.	Gaddi - H.P. & U.P.	Marwar - Raj., Guj.	Osmantabad - MH.	
3.	Changhangal - Ladak	Kohmi - Gujarat	Koken kamyal - MH.	Teresa - Andaman & Nicobar
4.	Chegu - H.P. & U.P.	Jhakarana - Raj.	Berari - MH.	Sunni-Ne - Nagaland
5.	Bhakarwali - J.&K.	Beeral - Punjab, Haryana	Kanni-Adu - T.N.	Assam Hill - Assam
6.	Panja - U.P.	Barbari - U.P., Raj.	Kodi Adu - T.N.	
7.	Rohilkhandi - U.P.	Jamunapuri - U.P.	Salem Black - T.N.	
8.		Mehsana - Gujarat	Malabari - Kerala	
9.		Gohilwadi - Gujarat	Bidi - Karnataka	
10.		Zalawadi - Gujarat	Nandidurga - Karnataka	

11.		Surti - Gujarat	
12.		Kutchi - Gujarat	

Source : NBAGR - National Bureau of Animal Genetic Resources Karnal.

Classification of Goats Based on Utility :

Sl.No.	Milch purpose	Meat purpose	Dual purpose	Fine hair / Fleece
1	Indian breeds	Exotic breeds		
1	Jamunapuri	Saanen	Black Bengal	Osmarabadi
2	Mehsana	Alpine	Red Bengal	Sangamneri
3	Sirohi	Anglo-arubian	Gaujan	Bectal
4	Zalawadi	Toggenberg	Osmarabadi	Barbari
5	Surti		Malbari	Marwari
6			Chegu	Kutchi
7			Black Bengal	

NORTHERN TEMPERATE REGION

1. KASHMIRI

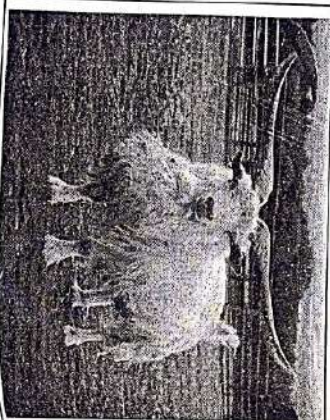
Origin : Kashmir and Tibet

Physical character :

- Body cover with fine silky long hair .
- Colour of this breed is white and black.
- Ears are long and drooping downwards type.
- Horned are curved and upright.

Economic character :

- The breed is also called as Pashmina . The outer coat used for prod of Blankets.
- Fine shawls are manufactured from Pashmina.
- The yield of 2 Kg per year



2. GADDI (also known as White Himalayan)

Origin : Chamba, Kangra, Kulu, Bilaspur, Simla, Kinnaur and Lahaul and Spiti in Himachal Pradesh and Dehradun, Nainital, Tehnagarwal and Chamoli hill districts in Uttar Pradesh.

Physical characters :

- Medium-sized animals. Coat colour is mostly white, but black and brown and combinations of these are also seen. Both sexes have large horns, directed upward and

backward and occasionally twisted. Ears are medium long and drooping. The nose line is convex.

- The udder is small and rounded, with small teats placed laterally. The hair is white, lustrous and long.

Reproduction :

Essentially single; twinning occurs in only 15 to 20% of births.

Economic character :

Wool production and quality

Average fleece yield per clip (g)	300
Average fibre diameter (μ)	74.48
Medulation (%)	73.4



3. CHANGTHANGI

Origin : Changthang region of Ladakh, at altitudes above 4000 m.

Physical characters :

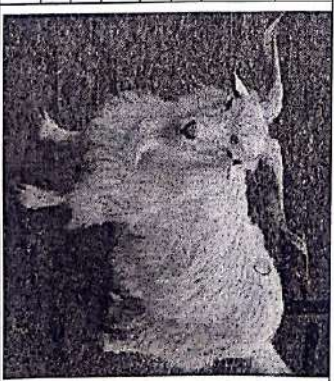
- Medium-sized animals. Half of the animals are white, the remainder black, grey or brown.
- Both sexes have horns, turning outward, upward and inward to form a semi-circle, but a wide variation exists in both shape and size.
- They produce softest and warmest animal fibre used for high quality fabrics.

Reproduction : Kidding percentage: from 80 to 90%.

Economic character :

Meat: body weight (kg)

At birth	2.18 \pm 0.01
12 months	11.80 \pm 0.11
Pashmina production and quality	
Average fibre length (cm)	4.95 \pm 0.11
Scouring yield (%)	65.28 \pm 2.08
Average fibre diameter (μ)	13.86 \pm 0.07



- The pashmina is harvested once a year, generally in June/July, either by shearing or by combing. Average production is 214 g.
- Used for making Kashmir "Rug or Shwal" of high quality.

4. CHEGU

Origin : H.P. and U.P.

Physical characters :

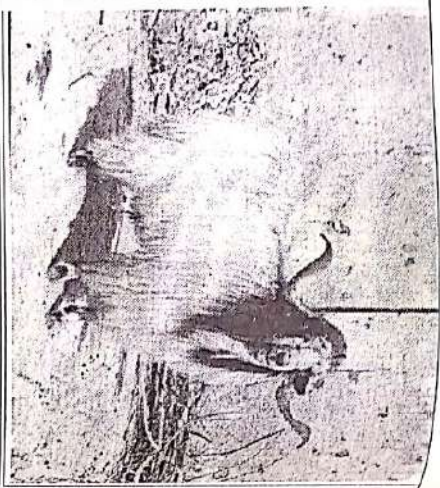
- Medium-sized animals. The coat is usually white, mixed with greyish red.
- Both sexes have horns, directed upward, backward and outward, with one or more twists.
- These goats are not very different in conformation from Changhangli.

Reproduction.

Kidding percentage : 65.4%; litter size : singles: 99.2%; twins: 0.8%.

Economic character :

Meat: body weight (kg)	-
At birth	2.10 ± 0.02
At weaning	8.41 ± 0.19
12 months	18.46 ± 0.47
Pashmina production and quality	
Average production (g)	120.51
Average fibre length (cm)	5.9
Average fibre diameter (μ)	11.77



THE NORTHWESTERN ARID AND SEMI-ARID REGION

1. JAMUNAPARI

Origin : The Jamunapari breed is native to the north-west arid and semi-arid regions of Etawah district in Uttar Pradesh.

Physical character :

- They are white with tan or black markings on the neck and ears.
- They are beard is present in both bucks and does with a tuft of long hair on the hind legs.
- They are considered the largest, Tallest and most elegant of the long legged goats of India.
- It has pronounced Roman nose having a tuft of hair which result in a parrot mouth appearance.
- They have long and pendulous ears, tubular with the opening towards the front.
- The horns are short and flat, horizontal and twisting backwards.

Kidding occurs once a year resulting mostly in single births and at times twins

Economic performance : The Jamunapari breed is a dual purpose breed with good meat and skin.

The milk yield is 280 kgs in a lactation period averaging 274 days

The highest recorded is 4 kg a day with a lactation yield of 575 kg.

The fat content of milk ranges from 3 to 3.5 percent.

Ave. Body wt.(kg) Adult Male - 43 to 46, Adult female 38 kg.



2. SIROHI

Origin : Sirohi district of Rajasthan. The breed also extends to Palanpur in Gujarat.

Physical characters :

- Compact, medium-sized animals. Coat colour is brown, white and admixture of colours in typical light or dark brown patches.
- Ears are flat and leaf-like, medium-sized and drooping.
- Both sexes have small horns, curved upward and backward.
- Tail is medium in length and curved upward. Udder is small and round, with small teats placed laterally.

Economic character :

Reproduction :

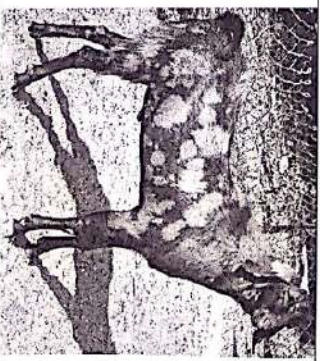
Kidding percentage: 89.3%. Litter size: singles: 91.5% twins: 8.5%.

- Mortality : 0 to 3 months: 1.9%; adults: 2.5%

- Milk. Average lactation yield 71 kg in 175 days

Meat :- Body wt. kg

At birth	2.82
At weaning	9.92
12 Months	21.27



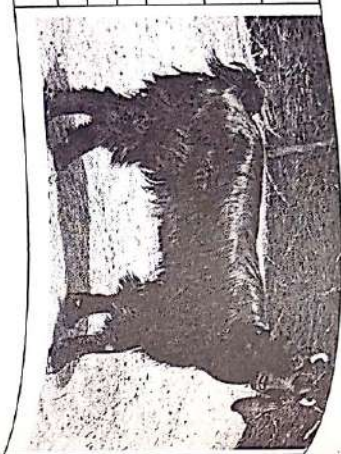
3. MARWARI

Origin : Marwar region of Rajasthan.

Physical characters :

- Medium-sized animals. Predominantly black with long shaggy hair coat.
- Beard is present in both sexes. Ears are flat, medium in length and drooping.
- Both sexes have short, pointed horns, directed upward and backward; horn length.
- Tail is small and thin. Udder is small and round, with small teats placed laterally.

Reproduction : Kidding percentage: 52.5 ; litter size: single.	
Mortality : Young: 23.1 ± 3.2%; adults: 9.6 ± 1.5.	
Economic character :	
:- Meat body weight (kg)	
At birth	2.29 ± 0.05
At weaning	6.00 ± 0.85
12 months	16.25 ± 2.79
Hair production: 302.9 ± 15.4 g per year	



4. BEETAL

Origin : Throughout the States of Punjab

Physical characters :

- Large animals. The coat colour, predominantly black or brown with white spots of differing sizes. The coat is short and lustrous. The face line is convex, with typical **Roman nose** but not as prominent as in Jamnapari. Ears are long and flat, curled and drooping.
- Both sexes have thick, medium-sized horns, carried horizontally with a slight twist directed backward and upward.
- Tail is small and thin. The udder is large and well developed, with large conical teats.

Reproduction.

litter size : singles: 40.66 %; twins: 52.6 %; triplets: 6.52 %; quadruplets: 0.22

Mortality. Pre-weaning : 25.4 % ; adults : 13.2 %

Performance Meat: body weight (kg)	
At birth	2.80 ± 0.01
At weaning	9.26 ± 0.09
12 months	21.83 ± 0.83
Age at slaughter: 9 months; dressing percentage on pre-slaughter live-weight basis : 49.68%.	



5. JHAKRANA

Origin : Jhakrana and a few surrounding villages near Behror, in the Alwar district of Rajasthan.

Physical characters :

Large animals. The colour of this breed black with white spots on ears and muzzle, is short and lustrous. Face line is straight. Forehead is narrow and slightly bulging. The breed is quite similar to Beetal, the major difference being that Jhakrana is longer. Ear are medium ; Udder is large, with large conical teats.



- Reproduction.** Litter size: singles: 57 %; twins: 41 %; triplets: 2 %.
- Mortality.** Young : 3.4 % ; adults : 0.17%.
- #### 6. BARBARI
- Origin :** Etah, Agra and Aligarh districts of Uttar Pradesh, and Bharatpur district of Rajasthan.

Physical characters :

Dwarf animals, with compact body is highly suitable for stall feedin. The eyes appear bulging. The colour of this breed white with light brown patches is the most typical. Ears are short, tubular, opening in front, erect, directed upward and outward. Both sexes have twisted horns, medium in length and directed upward and backward. Bucks have a large thick beard. They are prolific breeders usually kid twice in 12 to 15 months & well suited for stall feeding.



Body Wt. (kg) :- Buck – 36 , Doe – 27

Production.

- Milk : 750 ml to 1000 ml / day, Ave. lactation may be 130 to 200 kg in 150 days with 5% fat
- Meat: body weight (kg)

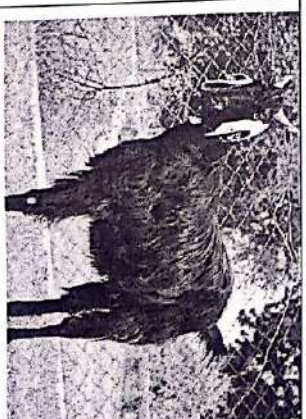
At birth	1.739 ± 0.018
At weaning	6.661 ± 0.095
12 months	14.517 ± 0.765

7. MEHSANA

Origin : Mehsana, Gandhi Nagar and Ahmadabad districts of Gujarat.

Physical characters :

Large animals. The coat is black, with white spots at the base of the ear. Nose line is straight. The hair coat is long and shaggy. Ears are white, leaf-like and drooping. Both sexes have slightly twisted horns, curved upward and backward. The udder is well developed; the teats are large and conical.

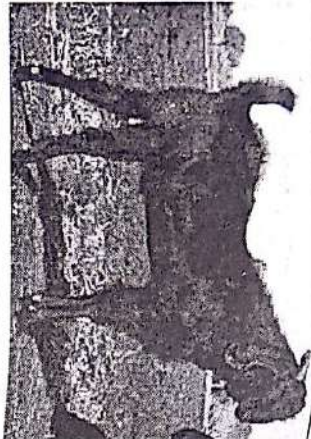


Performance

- Milk. Average daily yield: 1.323 kg in 197 days.
- Hair. Average yield per year: 210.2 ± 20.4 g.

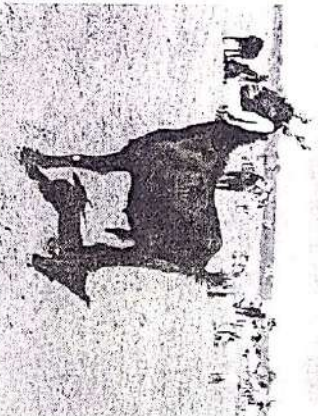
8. GOHLWADI

Origin : Bhavnagar, Amreli and Junagadh districts of Gujarat

Physical characters :	
Large animals. The coat is black and covered with coarse long hairs.	
Nose line is slightly convex. Ears are tubular and drooping. Both sexes have slightly twisted horns, turned backward	
Hair: Average yield per year: 317.1 ± 22.g.	


9. ZALAWADI

Origin : Surendranagar and Rajkot districts in Gujarat.

Physical characters :	
Large animals. Coat is black and long coarse hair. Ears are long, wide, leaf-like and drooping. Both sexes have long twisted horns, pointed upward. The udder is well developed, with large conical teats.	
Performance:	
Milk: Ave. daily yield: 2 ; lactation length: 197 days.	
Hair: Average annual yield: 245.3 ± 3.28.4.g.	

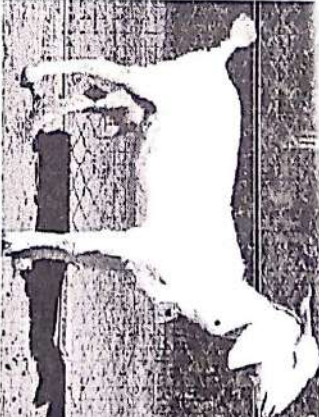
10. KUTCHI

Origin : Kutch district in Gujarat

Physical characters :	
Large animals. The coat is predominantly black, but a few white, brown and spotted animals are also found. The hair is coarse and long. The nose is slightly Roman.	
The ears are long, broad and drooping. Both sexes have short, thick horns, pointed upward. The udder is reasonably well developed; teats are conical	
Performance:	
Milk : Average yield: 1.84 ; average lactation length: 117 days.	
Hair: Average yield per clip: 229 g.	

11. SURTI

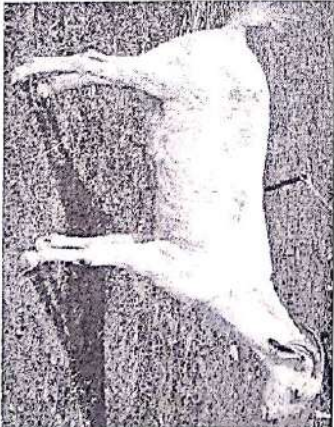
Origin : Surat and Baroda.

Physical characters :	
Medium-sized animals, generally white in body colour, with very well developed udder and large conical teats. Ears are medium-sized. Short legs; Both sexes have small horns directed backward.	
Performance.	
Generally kept as one or two animals. The does are good milkers, yielding 2.5 kg per day, on average	

SOUTHERN REGION

1. SANGAMNERI

Origin : The semi arid region of Maharashtra comprising of Nasik, Ahmednagar and Pune districts forms the native habitat of the Sangamneri goat breed.

Physical character :	
<ul style="list-style-type: none"> • They are medium-sized animals. Ears are long and drooping. • The coat is completely white with mixtures of black and brown. • Both sexes have horns directed backward and upward. • The litter size is mainly single however 15 – 20% goats show twinning whereas triplets are rare 	
Economic performance	
The average daily milk yield varies between 0.5 to 1.0 kg with an average lactation length of about 160 days. Although this breed is reared mainly for meat, some animals show a good milch potential. Dressing percentage is about 41% at 6 months, 45% at 9 months and 46% at 12 months of age. Average Body weight (kg) Adult Male - 39 to 42 Adult female 32 to 34 kg	

2. OSMANABADI

Origin : Osmanabadi goats are native to the Latur, Tuljapur and Udga taluks of Osmanabad district of Maharashtra, from where they derive their name.

Physical character :

The goats are large in size. The colour of the coat varies, but is mostly black (73%), with the rest being white, brown or spotted. Ninety per cent males are horned, females may be horned or polled.

Economic performance :

The breed is considered useful both for meat and milk. Average daily milk yield varies from 0.5 to 1.5 kg for a lactation length of about 4 months.

In favourable conditions they breed regularly twice a year and twinning is common.

Average Body weight (kg) Adult Male - 31 to 36, Adult female 32 to 33 kg.



3. KANNAL-ADU (also known as Pullaiadu and Karapadu)

Origin : Ramnathapuram and Tirunelveli districts in Tamil Nadu

Physical character :

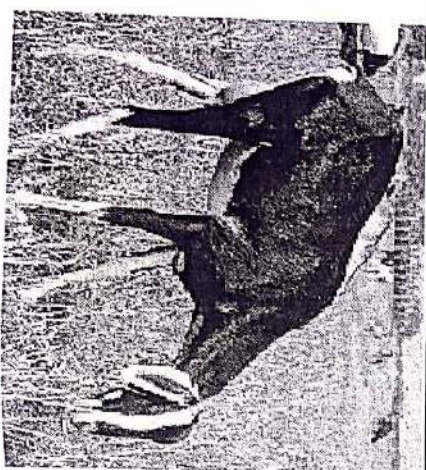
Tall animals, predominantly black or black with white spots.

Ears are medium-long. Males are horned, females are polled.

Tail is medium-sized and thin; Udder is small and round, with small teats placed laterally

Reproduction: Kidding percentage: 80 to 85%; litter size: singles: 90%; twins: 10%.

Performance. Animals are maintained primarily for meat and are not milked.



4. MALABARI

Origin : Malabari also known as Tellicherry or Cutch are native to Kerala.

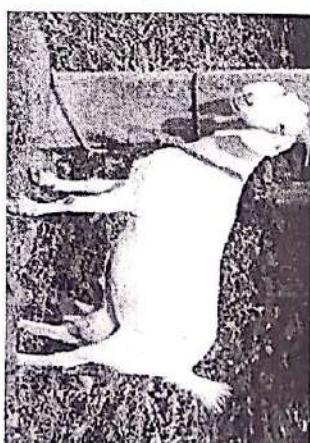
Physical character :

Malabari goats are reared for milk and meat and their skin is popular in the tanning industry. The animals are medium in size. They have no uniform colour and the coat varies from completely white to black.

All males and a small number of females are bearded. They have a medium sized head with a flat and occasionally a **Roman nose** with medium sized ears directed outward and downward. Malabari goats are reared under a semi-intensive management system, with 4 to 6 hours of grazing supplemented with stall feeding in the evening.

Economic performance :

The breed is quite prolific and has a 50% twinning, 25% triplets and 5% quadruplets kidding percentage. The milk yield ranges from 0.5 to 1.5 litres a day with an average of 90 kg in a lactation period of 178 days. Ave. Body wt (kg) Adult Male - 43 to 46, Adult Female - 34 kg.



5. KONKAN KANYAL

Origin : They are native to the Konkan region of Maharashtra, and are reared mostly by the Dhangar and Maratha communities for meat. **This breed adapted to high rainfall and hot & humid climate.**

Physical character :

- These goats are mainly black with a white marking in a specific pattern—the ventral surface of the body is white and the legs have white 'stockings'. Konkani Kanyal goats have **Typical bilateral white strips on black face from nostrils to ears; a flat and broad forehead; flat, long drooping ears; backward, straight, pointed, cylindrical horns.**

- White muzzle and long legs, laterally black, medially white from knee to the fetlock joint.

Economic performance :

The body weight of adult bucks and does averages 35 and 30 kg respectively. Konkani Kanyal goats are regular breeders and breed round the year, with a twinning percentage of about 66%.



6. BERARI

Origin :- Nagpur & Wardha

Physical Character :- Meat type breed, body colour is brown, light to dark strips on lateral sides from horn base to nostrils and face. Black hair lining of vertebral column.

EASTERN REGION

1. GANJAM (also known as Dalua)

Origin :- Southern districts of Orissa: Ganjam and Koraput.

Physical character :-

Tall, leggy animals. The coat may be black, white, brown or spotted, but black predominates. Hairs are short and lustrous. Ears are medium sized; ear length. Both sexes have long, straight horns, directed upward. Tail is medium-long.

Reproduction.	
Kidding percentage: 82; litter size: singles: 98.4%; twins: 1.6%.	
Performance	
Milk : Average daily yield: 319 g; average lactation length: 141 days.	
Meat: body weight (kg)	
At birth	2.31 ± 0.02
6 months	9.52 ± 0.11
12 months	11.69 ± 0.16



2. BLACK BENGAL

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

Physical character :-

- Small animals. The predominant coat colour is black; brown, grey and white are also found, the former two sometimes with black markings along the back and on the belly and extremities.
- The hair coat is short and lustrous. The nose line is slightly depressed.
- Both sexes have small to medium horns, directed upward and sometimes backward.
- Beard is observed in both sexes. The ears are short, flat and carried horizontally.

Reproduction. Litter size : singles: 44.6%; twins: 51.3%; triplets: 4.1%.	
Performance	
Meat: body weight (kg)	
At birth	1.31 ± 0.01
At weaning	6.09 ± 0.10
12 months	12.60 ± 0.63
Dressing percentage : 45.7%. Skins are of excellent quality and are highly prized.	
Milk : Average lactation yield 58.00 kg; Average lactation length 118.9 days. Most prolific goat breed.	



EXOTIC GOAT BREEDS

The principal exotic dairy breeds of goats are Sannen, Alpine, Anglo-Nubian, Toggenberg. They are all noted for their higher milk yield and most of these breeds were imported to India to improve milk yield of our local breeds and to upgrade our non-descript goats.

1. TOGGENBERG :

Origin :- Toggenberg valley in north Switzerland.

Physical character :-

Medium sized body with light brown to tan in colour, white spots on belly, tail & legs. Skin is very soft and pliable. Usually both male and female are hornless. The adult doe weighs 65 kg or more and the bucks more than 80 kg.

Economic character :-

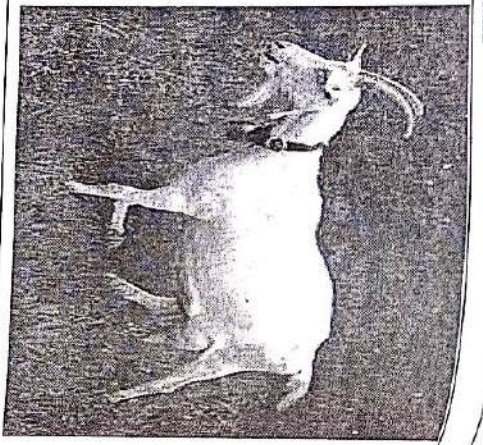
Average milk production is 5.5 kg per day. The butterfat content of its milk is 3.4 per cent. The male usually has longer hair than the female.



2. SANNEN:

Origin : It is a native of Sannen valley of Switzerland

Physical character :
Is noted for its consistency and high production of milk. Does weigh 65 kg and the bucks 95 kg. Colour is white or light cream. The face may be slightly dishd and the ears point upward and forward. Both sexes are normally polled but sometimes horns do appear.
Economic character :
Ave. milk yield is 2.5 kg per day during a lactation period of 8-10 months. Milk fat is 3-5%. Sannen is known as Queen of Milk of the world.



3. NUBIAN:

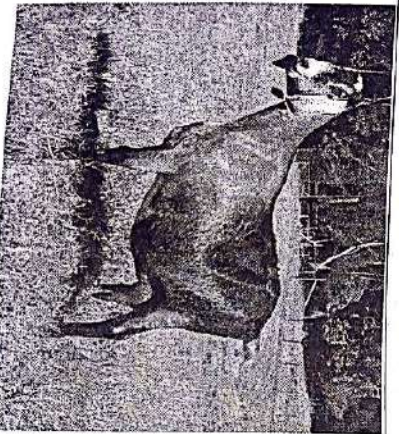
Origin : Nubia of north-eastern Africa. Also found in Ethiopia and Egypt.

4. ANGLO NUBIAN:

Origin : England.

The breed along with Jamnapari of India and Nubian buck of Egypt produced Anglo-Nubian developed in England.

Physical character :
It is a big animal with a fine skin and glossy coat, long and pendulous ears and Roman nose. It is a long legged and hardy animal. Udder is large and pendulous with bigger teats. Colour of this breed is white to black or tan to red, combination of colour is seen. Bucks weigh 65-80 kg and does from 50-60 kg.
Economic character :
Average milk yield is 3-4 kg/day with butterfat of 4.5%.
Anglo Nubian is known as the Jersey cow of the goat world



5. ALPINE:

Origin : This breed was originated in Alps mountains (Europe).

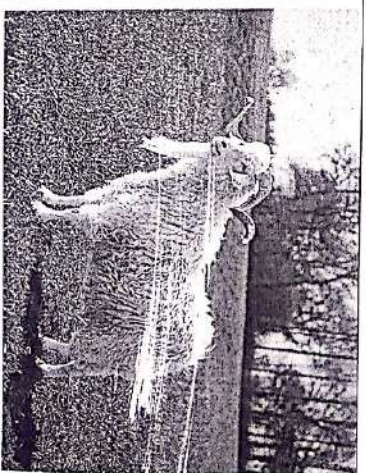
Physical character :
It was derived from French, Swiss and Rock Alpine breeds. Does weigh 50 to 60 kg and the bucks 65 to 80 kg. They are horned and have no distinct colour.
Economic character :
Average milk yield is 2-3 kg per day with butterfat of 3-4%



6. ANGORA:

Origin : Turkey or Asia minor.

Physical character :
The angora is small in size with shorter legs. Horns are grey, spirally twisted and inclined backward and outward. Tail is short and erect. It produces a superior quality fibre, called mohair. The soft silky hairs cover the white body. If not shorn during spring the fleece drops off naturally as summer approaches.
Economic character :
Average fleece yield is 1.2 kg. Good animals yields even up to 6 kg.



CHAPTER - 5 CLASSIFICATION AND STUDY OF INDIGENOUS AND EXOTIC POULTRY BREEDS

1. Zoological classification of Fowl

Kingdom	: Animalia
Phylum	: Chordate (Back bone)
Sub-Phylum	: Vertebrata
Class	: Aves (Feathered, warm-blooded vertebrata with 4 – chambered heart)
Sub-Class	: Neornithes (Without teeth)
Order	: Galliforms (Birds with short wings and legs, toes for scratching and running) Sub –
Order	: Gallii
Family	: Phasianinae
Genus	: Gallus
Species	: gallus (Jungle fowl) & domesticus (domesticated)

Introduction

Commercially speaking, chickens are classified into two production types:

Egg type – For commercial egg production.

Meat type – For commercial meat production.

Four species of wild or jungle fowl are *Gallus gallus* (Red jungle fowl), *Gallus lageyarii* (Ceylon jungle fowl), *Gallus sonneratii* (Grey jungle fowl) and *Gallus varius* (Javan jungle fowl). The relative contribution of these few species to the formation of modern domestic breeds still remains controversial. While some believe that all the present day domestic breeds of poultry have originated from red jungle fowl (*Gallus gallus*). Others are of the opinion that two or more of the four existing wild species of fowl are responsible for the same.

- The term 'class' is used to designate groups of breeds, which have been developed in certain regions.
- A breed refers to a group of domestic fowls with a common ancestry, and having similarity in shape, conformation, growth, temperament and shell colour of egg.
- Variety is a subdivision of breed distinguished either by colour pattern or shape of comb or type of feather pattern.

Common type comb : Single, Pea, Rose.

Classification of poultry breeds

A. On the basis of origin : Poultry breeds are classified as American, Asiatic, English and Mediterranean on the basis of origin

Based on Origin	
Sr. No.	Indian Poultry Breeds (NBAGR Poultry Breeds)
1.	Ankleshwar
2.	Ascel
3.	Busta Or Busta.
	Uttar Pradesh
	Gujarat & Maharashtra

4.	Chitragong	Meghalaya & Tripura
5.	Danki	Andhra Pradesh
6.	Daohleir	Assam
7.	Glugus	Andhra Pradesh
8.	Harringhata Black	West Bengal
9.	Kadaknath	Madhya Pradesh
10.	Kalasthi	Andhra Pradesh
11.	Kashmir Favorolla	Jammu & Kashmir
12.	Miri	Assam
13.	Nicobari	Andaman & Nicobar
14.	Punjab Brown	Punjab & Haryana
15.	Tellichery	Kerala
16.	Mewari	Rajasthan
17.	Kaunayen	Manipur
18.	Hansli	Odisha
19.	Utrara	Uttarakhand

Central Avian Research Institute Izatnagar (U.P.) New Verities of Chicken				
Sr. No.	Breed	Egg Prod./Year	Sr. No.	Breed
1.	Cari Sonali	280 – 283	12.	Grampriya
2.	Cari Devondera	190 – 200	13.	Vauraja
3.	Cari Nibheek	198	14.	Giriraja
4.	Cari Shyama	210	15.	Krishitayer
5.	Cari Lpkari	220	16.	Sindhi
6.	Cari Hicari	200	17.	Pratapphan
7.	Cari Kadanbari	100 – 120	18.	Kannurpa
8.	Cari Sweetsambari	100 – 115		Broiler Breed
9.	Cari Chittambari	100 – 120	1.	Cartro Vishal
10.	Cari Priya	298 – 301	2.	Cartro Dhanurja
11.	Cari Gold	298	3.	Cartro Mityunjay
			4.	Cari Rainbro

Exotic group					
American		Asian		English	
Breeds	Origin	Breeds	Origin	Breeds	Origin
Jersey	New York	Brahma	India	Australorp	Australia
Giant	New York	Cochin	U.S.	Sussex	England
Rhode Island Red	New England				Ancona Italy
New Hampshire	New England	Langshan	china	Cornish	England.
Plymouth rock	U.S.			Orpington	England
					Andalusian Spain

Table 1 : Difference between indigenous and foreign breeds of fowl.

Sr. No.	Character	Indigenous breeds	Foreign breeds
1	Egg production	Less (60 – 90 eggs/yr.)	More (> 200 eggs/yr.)
2	Egg size	Small	Large
3	Size of bird	Small	Large
4	Foraging	Excellent	Not as good
5	Disease resistance	More	Less
6	Broodiness	Maximum	Little

B) On the basis of Utility / Purpose : Fowls are often classified based on the purpose for which they are developed such as egg type, meat type and dual purpose (for both egg and meat).

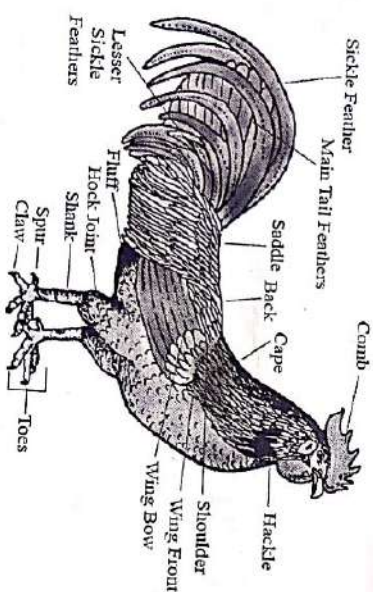
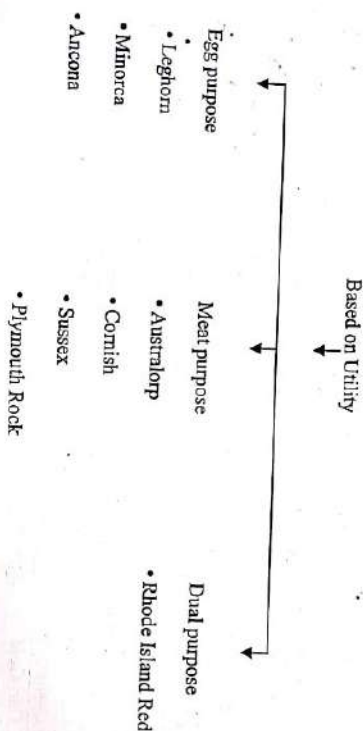


Fig. 1 External body parts of Fowl

AMERICAN CLASS

- All breeds of chickens in this class are bred for both egg and meat production.
 - The five breeds presented here have similar characteristics such as yellow skin and shanks, red ear lobes, and non-feathered shanks.
 - All American class breeds lay brown-shelled eggs.
- The following breeds are from the American class.

1. JERSEY GIANT

Origin : New York

Characteristics :

- The Jersey Giant is the largest of the American breeds.
- They should be rugged, with an angular shape, single comb.
- There are two varieties of Jersey Giants: Jersey Black Giants and Jersey White Giants.
- Both varieties exhibit similar characteristics of yellow skin and single comb.
- However, they differ in plumage color and pigmentation in the beak and shanks.
- Jersey Black Giants have black beaks and nearly black shanks.
- Jersey White Giants have yellow streaked beaks and dark willow-colored shanks.

Standard wt.	(Kg)	
Cock	5-6	
Hen	4.5	
Cockerel	5	
Pullet	3.5	
Skin colour :	Yellow	
Eggshell colour :	Brown	



Use : A very heavy meat type of fowl for heavy rooster and capon production. Fairly good layer.


2. NEW HAMPSHIRE

Origin : New England states

Characteristics :

- New Hampshire Originally developed from the Rhode Island Red.
- The body is less rectangular as compared to the Rhode Island Red and grow feather very rapidly.
- The colour of the plumage is deep chestnut red and is generally less uniform.
- New Hampshires have red ear lobes and a single comb
- They are good layers and the eggs are large brown-shelled.
- With almost identical characteristics as its ancestor, the New Hampshire breed is slightly meatier.
- The average weight of the cock is 3.5 kg. and that of the hen is 2.5 kg. Because of its hardy nature, it is gaining much popularity in recent years.

Standard wt.	(Kg.)
Cock	3.5
Hen	2.5
Cockerel	3
Pullet	2.5
Skin colour : Yellow	Eggshell colour : Brown



Use : This breed selected more for meat production than egg production.


3. PLYMOUTH ROCK

Origin : U.S. Considered the oldest and most popular of the American breeds,

Characteristics :

- Plymouth Rocks have long bodies of good depth; they are fairly broad-breasted and single comb of moderate size. They are docile and normally will show broodiness.
- Their feathers are fairly loosely held but not so long as to easily tangle.
- Also note the wide and straight back, this is a definite breed characteristic and should be mentioned. Common faults include shallow breast, high tail, narrow bodies and small size.
- The Plymouth Rock exhibits excellent meat properties and laying capabilities.
- Present-day broilers have descended from Plymouth Rocks and the Cornish breed.
- Varieties of Plymouth Rocks, each distinguished by plumage color, are available.
- White and barred varieties are most popular; both have single combs.
- Varieties : Barred, Buff, Blue, White, Columbian, Silver pencilled, Partridge,

Standard wt.	(Kg.)
Cock	4.5
Hen	3.5
Cockerel	3.5 - 4
Pullet	2.5 - 3
Skin colour : Yellow	Eggshell colour : Brown



Use : Dual purpose breed like Meat and Egg production

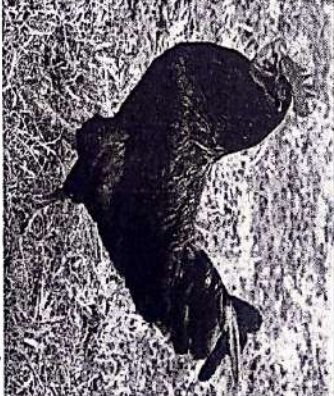
4. RHODE ISLAND RED

Origin : New England states

Characteristics :

- First developed for utility purposes and later becoming a fancier's breed.
- The Rhode Island Red is rangier looking than the Plymouth Rock
- With a wide and deep rectangular, relatively long bodies, typically dark red in colour.
- This breed has yellow skin and shanks, bright red plumage, and red ear lobes.
- The breed is considered a meat-type, but it is also known as the best egg layer.
- Rhode Island Red is slightly smaller than a Plymouth Rock,
- Varieties : Rose Comb & Single Comb.

Standard wt.	(Kg.)
Cock	4
Hen	3
Cockerel	3.5
Pullet	2.5
Skin & shank colour : Yellow	Eggshell colour : Brown



Use : Dual purpose breed like Meat and Egg production

ASIATIC CLASS BREEDS

- The Asiatic class were used to develop breeds of American and English classes.
- However, they are not as popular as purebreds today.
- Asiatic breeds are characterized by large bodies, heavy bones, and feathered shanks.
- Three breeds of economic importance are Brahma, Cochins, and Langshan.
- Each has yellow skin, red ear lobes, and lays brown-shelled eggs.

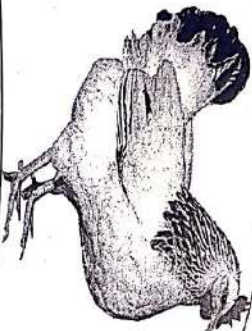
1. BRAHMA

Origin : The Brahma breed originated in India

Characteristics :

- Three varieties of Brahmas were developed. Their feather colors vary from Light to Buff to Dark.
- All varieties of Brahmas are massive in appearance, well-feathered, and well-proportioned.
- The Brahma is characterized by a pea-comb.
- The Light Brahma variety is most popular because of its plumage color; its body is white, the hackle feathers are black with white edging, and the tail feathers are black.

Varieties : Light, Buff, Dark.

Standard wt.	(Kg.)	
Cock	5 kg	
Hen	4 kg	
Cockerel	4.5 kg	
Pullet	3.5 kg	
Skin colour : Yellow ;		
Eggshell colour : Brown		
Use : Dual purpose breed like Meat and fairly Egg production		


2. COCHIN

Origin : The Cochin breed was imported into the United States about 1847.

Characteristics :

- The Cochin was bred for loose feathering with little attention given to egg production.
- Its feathering is extremely long and abundant.
- A Cochin appears massive in size because of loose feathering and feathered shanks.
- Cochins have a low-carried breast and a single comb.

Varieties : Four varieties within the breed are Black, Buff, Partridge, and White

Standard wt.	(Kg.)	
Cock	5	
Hen	3.85	
Cockerel	4	
Pullet	3	
Skin colour : Yellow		Eggshell colour : Brown
Use : Mainly an ornamental fowl and Egg production		

3. LANGSHAN


Origin : Originated in China and considered one of the oldest breed.

Characteristics :

- The Langshan is smaller in body size than other Asiatic breeds and has longer legs with moderately feathered shanks. Body feathering is moderately tight.
- Tail feathers are long and are carried high.
- Two varieties are similar in characteristics, except for color.

- A Black Langshan has a greenish-black surface color with a dark horn beak and bluish-black shanks and toes.
- The White Langshan is white throughout with a light blue shaded beak and slate blue shanks and toes.

Varieties : Two varieties within the breed are Black and White

Standard wt	(Kg.)	
Cock	4.30	
Hen	3.5	
Cockerel	3.5	
Pullet	3	
Skin colour : White		Eggshell colour : Brown
Use : Dual purpose breed like Meat and Egg production		

ENGLISH CLASS BREEDS

- English Class Breeds Bred and produced largely for their meat qualities.
- Seven breeds of the English class are known for their size and fleshing properties.
- Only three breeds (Australorp, Cornish, and Orpington) are of economic importance in the United States.

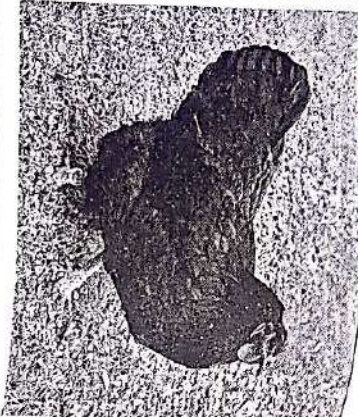
- All English breeds have white skin except the Cornish, which has yellow skin.
- The three breeds lay brown-shelled eggs.

1. AUSTRALORP

Origin : The Australorp breed was developed in Australia from the Black Orpington.

Characteristics :

- The Australorp have black birds, dark eyes, long, deep-bodied and very active, but is smaller than the Orpington.
- Other breed characteristics include dark slate shanks and toes, a black beak, red ear lobes, and a single comb, plumage is lustrous greenish black in all the sections.
- The "Austro White" a hybrid cross between the Australorp male and the White leghorn female, has prove to be an excellent layer with good vigour and maintained in large flocks in commercial egg farm in India.
- Varieties : Black

Standard wt.	(Kg)	
Cock	1.60	
Hen	1.36	
Cockerel	1.60	
Pullet	1.15	
Skin colour : White	Eggshell colour : Brown	

Use : Dual purpose breed like Meat and Egg production

2. CORNISH


Origin : This breed were developed in the country of Cornwall " England".

Characteristics :

- Cornish crosses are quite popular for broiler production.
 - The breed is noted for its broad, deep breast and its compact, heavily- meat body.
 - The legs are of large and widely spaced, the deep set eyes and strong, slightly curve beak.
 - The feathers are short and held closely to the body and may show exposed area of skin.
 - All varieties of Cornish have small pea-combs. As a purebred, a Cornish is a **poor** egg producer.
- Several varieties of the Cornish breed have been produced with the Dark and White varieties being most popular.

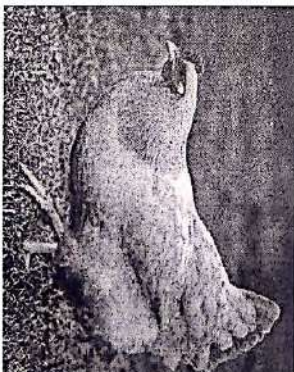
- The White Cornish has pure white plumage.
- The Dark Cornish's plumage color varies from greenish-black to a reddish-mahogany.

Varieties : Buff, Dark, White and White Laced Red

Standard wt.	(Kg)	
Cock	4.75	
Hen	3.60	
Cockerel	3.85	
Pullet	3	
Skin :- White	Eggshell colour : Light Brown	
Beak & shank colour : Yellow		

Use : Meat purpose breed.

- ## 3. ORPINGTON
- Origin :** This breed were developed in Kent in England.
- The Orpington breed's popularity has decreased because of the broiler industry's development of crossbreeds with yellow skin.
- Characteristics :**
- The Orpington is slightly larger than the Plymouth Rock.
 - They are long, deep, broad and well rounded with a full breast and a broad back.
 - Loose feathering and white skin has hindered the Orpington's prominence.
 - Differing only in color, the four varieties of Orpingtons include Buff, Black, White, and Blue.
 - Buff is the most popular variety. All varieties have single combs and white skin.
- Varieties :** Buff, Dark, White and Blue

Standard wt.	(Kg)	
Cock	4.5	
Hen	3.5	
Cockerel	4	
Pullet	3.15	
Skin colour : White	Eggshell colour : Brown & dark brown	


Use : Dual purpose breed like Egg and Meat production

4. SUSSEX

Origin : England

Characteristics :

- It has a long body, shoulder are broad with a good depth, alert and attractive.
- This breed general has excellent fleshing quality.
- Males of this breed have a single comb and coloured beak, shanks and toes.
- Light Sussex ; The plumage is quite similar to that the Columbian Plymouth rock.
- Red Sussex : The plumage is deep rich red in both sexes
- **Varieties :** Light, Red and Speckled

Standard wt.	(Kg.)	
Cock	4	
Hen	3.15	
Cockerel	3.5	
Pullet	2.75	
Skin colour : White	Eggshell colour : Brown & dark brown	

Use : Dual purpose breed like Egg and Meat production

MEDITERRANEAN CLASS

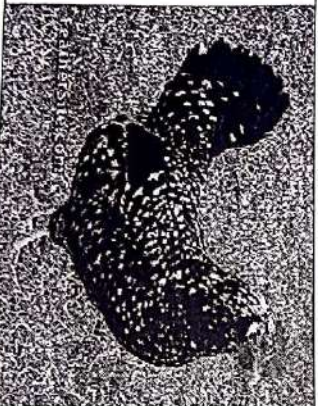
- Breeds in the Mediterranean class are smaller in size than the previous three classes discussed. All birds in this class are characterized by white ear lobes, large combs, and clean (non-feathered) legs.
- Mediterranean breeds are early-maturing and lay white-shelled eggs.
- They are non-broody, but exhibit a nervous disposition.
- Mediterranean breeds are raised primarily for egg production.
- Several breeds in the Mediterranean class have gained wide public favor; however, only three breeds are considered to be popular today – Ancona, Leghorn, and Minorca.

1. ANCONA

Origin : Italy

Characteristics :

- The Ancona resembles the Leghorn in body conformation, they are small, active, alert and black.
- The Ancona's plumage is greenish-black and some feathers are white tipped, which gives the bird a speckled appearance.
- A mature Ancona weighs from 4 1/2 to 6 pounds.
- The two varieties of Ancona are identical except for type of comb. Single comb and Rose comb.

Standard wt.	(Kg.)	
Cock	2.5 – 2.8	
Hen	1.8 – 2.1	
Beak :- Yellow with black shreds		
Skin colour : Yellow	Eggshell colour : White	


Use : They were used for Egg production but today are mainly kept as an Ornamental Fowl.

2. LEGHORN

Origin : Leghorn take their name from the city of Leghorn, Italy.

Characteristics :

- Hybrid Leghorns make up most of the egg production market.
- The Leghorn's reputation for being the number one egg layer makes it one of the most popular of all breeds in America. It's world number one egg producer breed.
- The breed is small, active and reputed of various parts.
- It has relatively long back, prominent breast and comparatively long shanks.
- Known for its stylish carriage.
- Several (12) varieties of the Leghorn breed only three have been most popular.
- Single comb white, Single comb buff and Single comb light brown.
- The shape of comb is important to leghorn fanciers.
- The varieties of Leghorns differ in plumage color – White, Buff, and Brown.
- Leghorns have yellow colored beaks and yellow skin and shanks.
- Leghorns are either single comb or rose comb.
- Varieties : Rose Comb ; Black, Buff, Dark Brown, Light Brown, Silver White
- Single Comb : Black, Black Tailed Red, Buff, Columbian, Dark Brown, Golden Light Brown, Red, Silver, White

Standard wt.	(Kg.)	
Cock	2.75	
Hen	2.5	
Cockerel	2.25	
Pullet	1.80	
Skin, Beak & shank colour : Yellow	Eggshell colour : White	
Use : Egg production		

3. MINORCA

Origin : They take their name from an island off the coast of Spain.

Characteristics :


- The Minorca is the largest of the Mediterranean breeds.
- The Minorca is a long-bodied bird with its back sloped downward from the shoulders to the base of the tail.

- In comparison, the Minorca's tail is carried lower than the Leghorn's tail.
- Mainly plumage color and type of comb distinguish five varieties of Minorcas.
- The Single-Comb White is raised in the largest numbers.
- Skin color is white on all varieties of Minorcas.

Varities : Rose Comb ; Black & White.

Single Comb ; Black , Buff & White.

Standard wt.	(Kg.)
Cock	4.1
Hen	3
Cockerel	3.4
Pullet	1.25
Skin colour : Black & White	Eggshell colour : White
Use : Egg production	



4. ANDALUSIAN


Origin : Spain.

Characteristics :

- They are small, active, closely feathered birds, that tend to noisy and rarely go broody.
- They typical example of the unstable Blue colour we see the poultry industry.

Varities: Blue.

Standard wt.	(Kg.)
Cock	3.15
Hen	2.50
Cockerel	2.72
Pullet	2
Skin colour : Whitish Blue	Eggshell colour : White
Use : Egg production & Ornamental fowl.	



TYPES OF INDIAN PURE BREDS

1 ASEEL


Aseel, which means real or true, is the name given to an indigenous breed of fowl known for its noble qualities of fighting.

Habitat: The best specimens of the breed although rare, are encountered in parts of Andhra Pradesh, Uttar Pradesh and Rajasthan.

Prominent Characteristics:

- The most popular varieties are Brown (Teekar), Red (Peeia), White (Nure), Black (Jara), Black and Red (Yakub).
- Aseel is well known for its pugnacity, high stamina, majestic gait and dogged fighting qualities.
- They possess small and firmly set pen comb. In both the sexes comb and wattles are bright red.
- Head is short but broad and deep. The beak is stout and strong.
- The face is long and slender and not covered with feathers.
- The eyes are compact, well set and present bold looks.
- The neck is long, uniformly thick but not fleshy.
- The body is round and short with a broad breast, straight back and close set strong tail root.
- Wings are small in size carried close to the body.
- The legs are strong, straight and well apart.

Egg shell colour :- Is light brown.	
Standard wt.	(Kg.)
Cock	4 - 5
Hen	3 - 4
Cockerel	3.5 - 4.5
Pullet	2.5 - 3.5
Economic importance:	
The breed is well known for its quality meat. Hen is a good siter and efficient mother.	



2. GHAGUS : found in Andhra Pradesh and Karnataka.

- It is a pure Indian breed having feathers on the legs. It is a big and hardy breed.
- This is a good table bird. The hen is a fair layer, good siter and a real mother.

3. CHITAGONG : It is also known as Malay.

Origin: This is a native bird of Malay Peninsula and breed in Chitagong district of Bangladesh.

Characteristics:

- Pea comb, red ear lobes, over-hanging prominent eyebrows, feather-less shank.
- This bird grows faster and is ideal for table purposes. Its flesh is excellent in taste.
- The popular varieties : are buff, white, black, dark brown and grey.
- Skin colour : white with splash of golden markings on the wing.
- Use : Dual-purpose bird.

4. **BUSTRA OR BUSRA:** Gujarat & MH.
Medium sized bird, deep bodied, light feathered and alert in nature.
• Poor layer.
• Wide variation in body colour

5. KADAKNATH

Kadaknath is also known as "Kalamasi", meaning the fowl is having black flesh. Flesh of Kadaknath is black in colour due to deposition of black pigment, melanin

Habitat: Kadaknath is a native bird of Jabhua and Dhar districts of Western Madhya Pradesh reared by the tribal.

Prominent Characteristics

- The commonly available varieties of Kadaknath are Jet-black, penciled and golden.
- The adult plumage varies from silver and gold spangled to bluish black without any spangling.
- The skin, peak, shank, toes and soles of feet are slate like.
- The comb, wattles and tongue are purple.
- Intense black coloration is also seen in most of the internal organs, skeleton, muscle, tendons, nerves and blood.
- **Standard weights (Kg):**- Cock : 1.5 Kg, Hen : 1.0 kg

Economic importance :-

this fowl is useful as backyard poultry. The overall production potential of Kadaknath is much higher than any other native birds of the country. Flesh is having distinct delicious taste and also medicinal value. The endangered unique germ plasma of country needs to be conserved for future exploitation. Meat of Kadaknath is known for its high protein (25 %) and low fat (0.73 – 1.03 %) content



CHAPTER - 6 BREEDING SEASONS, MATING SYSTEMS, REARING METHODS AND HOUSING SYSTEMS OF SHEEP AND GOAT

Age of maturity :-

Sheep normally attain full growth at age of 2 years, however this may varies from 18 months to 3 years with different breeds and localities. Ewes of age 18-24 months are generally used for mating. The rams are matured at 1 year of age but it is desirable to use rams for mating from age 2 ½ years till 7 years of age

Mating season and oestrous cycle :-

Sheep is seasonally polyestrous having gestation period of 147 days.

In India, there are three mating seasons viz. March to April or summer, June to July or autumn, September to October or post monsoon.

Fertility is found to be high during autumn season in the plains whereas in hilly region, it is summer season.

After every 16 days on an average (Actual range 14-20 days) the ewe shows heat except during pregnancy or any pathological or other days function condition. The average length of heat period is 30 hours.

Conception is best when breeding occurs late in heat period.

A. SHEEP

Age at mating : Sheep normally attain good growth at about 24 months (range 18-36) of age. Breeding too young ewes results in more weaklings and higher lamb losses. It is desirable to use rams for mating from the age of 2 years till the age of 7 years.

Mating season and estrus cycle : Sheep are seasonally polyestrous. In India, there are three main breeding seasons viz. summer (Mar-Apr), autumn (Jun-Jul) and post-monsoon (Sep-Oct). In general, higher fertility is observed in autumn season in the plains and in summer season in the hilly areas. The ewes usually come in heat about 2 months after lambing. The duration of the estrus cycle is 17 days (range 14-19) and heat period lasts for 27 hours (2-60). Ovulation occurs about 12 hours before the end of heat period.

Preparations for breeding :-

1. **Flushing :** Feeding extra grain or lush pasture 2-3 weeks prior to the breeding season for the purpose of increasing the number of ova shed from the ovary and increase the incidence of twinning. Feeding about 250 gms grains daily to each ewe results in an increase in the lamb crop by about 10-20 per cent.
2. **Tagging :** This refers to the shearing the locks of wool and dirt from the tail of the ewes, thus facilitating mating by the ram.
3. **Eyeing :** This refers to the clipping of excess wool around the eyes to prevent wool blindness in some breeds.
4. **Ringling :** This refers to shearing of wool from the body of the ram, especially in the neck, belly and sheath region prior to the breeding season.

Detection of estrus : As sheep in heat show few external indications of estrus other than standing to be mounted, heat is generally detected with the help of a teaser. Wet paint (dye mixed in grease or linseed oil) can be smeared on the brisket of the teaser ram to spot the ewes in estrus. The colour of

the dye should be changed every 16-18 days so that the repeaters can be discovered. Other indications of estrus are vulvar swelling, frequent urination, restlessness and reduced appetite.

Mating : As far as possible, rams should be kept away from the ewes and the two should be brought together only for breeding. Natural breeding is done either by flock mating, pen mating or hand mating.

- In flock mating, breeding rams are usually turned out in the flock during the mating season at the rate of 2-3 per cent of the ewes all through day and night.

- In semi-flock breeding or pen mating, rams are turned out for service with the flock in the pen during night, and confined and stall-fed or grazed separately during the day time in order to conserve their energy and give them rest.

- Hand mating is practiced when exotic purebred sires are used, or when it is considered desirable to extend the services of the ram over much larger flocks.

B. GOATS

- **Age at mating :** Does may be mated at 12-15 months age so that they kid at the age of 17-20 months. The average gestation period is 151±3 days. Bucks of 18-24 months of age may be used to serve 25-30 does; and when they attain full maturity at the age of 2-2½ years, may be allowed to serve 50-60 does in a breeding season.

- **Mating season and estrus cycle :** The does are more or less continuous breeders. It is better to breed the female once a year. Some goats can be made to kid twice in 18 months. Most does come in heat in September and March. The buck is sexually more active in winter and spring. The duration of the estrus cycle varies from 18-21 days. Duration of estrus is about 36 hours. The best time of mating/seminalization is 10-12 hours after the onset of heat and a second service again after 10 hours if heat continues.

- **Detection of estrus :** The signs of heat in the doe usually are uneasiness, restlessness and swelling of the vulva, frequent wagging of the tail, loss of appetite and reduced feed intake, frequent urination, frequent bleating, moaning by other does, sudden drop in milk yield and mucous discharge from the vulva.

• Detection of Oestrous :-

1. **Symptoms :** Vulvar swelling, frequent urination, restlessness, reduced appetite.

2. **Use of teaser ram :**

Teaser is nothing but vasectomised male use for detection of heat in ewes. This is used after applying wet paint on the brisket of teaser to spot ewes in oestrous, which carry colour mark on the back due to mounting.

This is helpful into better farm record keeping

Preparation of ewes for mating :-

❖ Flushing :

It is practice of feeding of extra grain or lush green pasture, two or three weeks prior to the breeding season.

It increases the number of ova shed from the ovary. Feeding about 250 gms grains daily to each ewe result into increase in lamb crop of 10-20 % and higher twinning is reported in flushing practices

❖ Synchronization of heat :

Synchronization of heat is the practice of bringing all the ewes of flock coming in heat within 2-3 days period.

This can be achieved by various methods but common practice is insertion of pessary containing a

synthetic hormone called 'Cronolone' into the vagina of each ewe using special equipment. This hormone is then gradually absorbed through the lining of vagina into the blood stream. This hormone prevents ovulation.

The pessary is removed after 15-17 days by pulling string attached to it. Most of ewes come in heat within few days after removal of pessary from vagina and then simultaneous breeding can be practiced.

❖ Advantages :

1. Owner may plan the lambing time in such a way, when the climate is most suitable for raising the healthy lambs with least effort.
2. It saves labour charges as servicing and lambing takes place within same short period.
3. Breeding by natural process or by A.I. becomes easier and economic.
4. Flock management is effective as all ewes are in same stage of pregnancy.
5. Owner may plan breeding as per future market demand.

- ❖ **Tagging :** It is shearing or clipping of the locks of wool and dirt from dock. Sometimes ewes are not bred because wool or tag prevent ram from making satisfactory connections thus tagging makes service by the ram more certain.

❖ Preparation of ram before breeding :-

- ❖ **Ringling :** Before the breeding season starts the wool should be completely removed from all over the body of ram.

He should at least be clipped from the neck and from the belly particularly at the region of the penis. The process is referred as ringling.

The process makes it easier for the ram to have proper mating.

Marking the ram : For identification purpose of ewes, which are bred by rams, it is essential that rams have on their brisket, which at the time of mating will mark ewe at rump.

For point either lamblack or Venetian red is mixed up with linsed oil to make paste, which is then applied in the brisket area at least once a week.

During course of breeding ewe get marked on the rump.

❖ Systems of mating :-

There are four systems of mating. They are as follows

1. Flock System:

It is common method adapted by commercial flock owners.

This system includes mating of ram with two ewes for day and night during mating season at the rate of 35-40 ewes per ram. In no cases for any ram number of ewes per ram should not exceed more than 50

2. Pen System :

In this system in a given number of selected ewes a selected ram is put in a pen for service during night and withdrawn in the morning

This practice is repeated daily when the animals return after grazing.

Rams are either grazed separately and are stall-fed.

Pen mating is the most favored practice at sheep farms.

3. Hand Service :

In this method ewes in oestrous are separately by using teaser ram and mated with proven sire in breeding pens.

The system is extremely useful for any experimental farmers but has got values in commercial farms.

4. Artificial Insemination (AI) :

0.2 ml of freshly collected semen having 120-150 million minimum active spermatozoa is deposited at the head of cervix by using specially designed catheter with spirally shaped nozzle.

AI in sheep cannot be adapted so easily as that of cattle and buffalo because dilution factor of ram semen is low and its preserv ability is very poor.

By adopting good breeding practices in sheep, we will be in a position to increase the production, which will ultimately help to improve the Indian economy.

❖ Housing of sheep and goats :-

General considerations for sheep and goat housing :

- Provision of simple shed with low cost housing materials is enough for sheep and goat for its optimum production efficiency.
- Sheds with mud floor are suitable for most of parts of the country except where high rainfall is observed.
- The sheds should be constructed in an elevated area to prevent water stagnation.
- Fodder trees can be grown around the shed, which acts as a source of feed for the growing goats.
- Clean drinking water should be available for goats.
- Sheds should be constructed with proper ventilation.
- Walls of the shed should be free from cracks or holes while constructing.
- Floors of the shed should be firm and should have the capacity to absorb water. The floors should be constructed in such a way, so that it should be easily cleaned.
- Types of sheds depend on the system of rearing.
- Open type housing with a covered area and run space is generally enough.
- The run space should be covered by chain links.
- The covered area is used for shelter of animals during night and adverse climatic conditions.
- For a comfortable house east-west orientation with generous provision for ventilation /air movement to dry the floor will be suitable.
- Attached roof is best suited one due to cheaper cost and durability.
- However corrugated asbestos sheets can also be used for organized farms to minimize the recurring costs and to have longer durability.
- Gable roofing is generally preferred.
- For small sheds lean to type roofing is advisable.
- When the animals are taken for grazing during the day time and sheltered only during night, the covered space will be enough.
- When the animals are housed intensively, the pen and run system of housing is suitable.
- There is no restriction for the length of the shelter, however breadth of shed should not exceed 12 meter and optimum breadth of shelter is 8 meter.
- Height of ewe should be 2.5 meter and height at ridge should be 3.5 meter.
- The height of chain link used for open space should be 4 feet. The length of the overhang should be 75cm – 1 meter.
- Separate feeders and water troughs should be placed for concentrate feeds, green fodders and water.

Types of Housing : Loose Housing system and Conventional Housing system :-

❖ Loose Housing :

Is more advantageous as compared to conventional / stall-fed sheds because of it is suitable for semi arid region and large sized flocks. In involved less expenditure, It provides more comfort to the animal. It is less labour – intensive and it provides freedom of movement and gives the benefit of exercise.

❖ Stilted housing is common in heavy rainfall areas.

❖ Conventional Housing system :

In conventional housing, the animals are confined together on a platform and secured at neck by stanchions or neck chain. The animals are fed as well as milked in the same barn. These barn 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. There are different types of shed depending upon different categories of animal as follows

❖ Floor space requirements

Recommended floor space requirements for Indian conditions

Age groups	Covered space(sq.m)	Open space (sq.m)
Up to 3 months	0.2-0.25	0.4-0.5
3 months to 6 months	0.5-0.75	1.0-1.5
6 months to 12 months	0.75-1.0	1.5-2.0
Adult animal	1.5	3.0
Male, Pregnant or lactating ewe/ doe	1.5-2.0	3.0-4.0

Floor space requirement per animal (BIS standard)

Types of animals	Minimum floor space per animal (Sq.m)
Ram or buck in groups	1.8
Ram or buck – individual	3.2
Lamb or kids - in group	0.4
Weaners in groups	0.8
Yearling or goatlings	0.9
Ewe or doe in groups	1.0
Ewe with lamb	1.5

Feeding and watering space requirement

Type of animal	Space per animal (cm)	Width of manger/ water trough(cm)	Depth of manger/ water trough (cm)	Height of inner wall of manger/ water trough (cm)
Sheep and goat	40 – 50	50	30	35
Kid/lamb	30 – 35	50	20	25

❖ Sheds

Different sheds in an organized sheep and goat farm :-

The sheds of the following types are required for housing the animals.

- General flock shed (Ewe / Doe shed)
- Ram or buck shed
- Lambing or kidding shed
- Lamb or kid shed
- Sick animal shed
- Shearing and storeroom
- Attendant's room

1. General flock shed (Ewe / Doe shed) :-

- The flock shed shall be used for housing ewes or does kept for breeding purpose.
- The shed shall be 15m (l) x 4m (w) x 3 m (h) and can accommodate not more than 60 ewes or does.
- The shed should be three metre high and should have brick-on-edge floor.
- In low lying and heavy rainfall areas, the floors should preferably be elevated and in temperate regions they may be made of strong wood.

2. Ram / buck shed :-

- Rams or bucks kept for breeding purpose are housed individually in these sheds. Alternatively, wooden partitions can be raised in bigger shed to partition in to stalls.

- The dimension is of 4m (l) x 2.5m (w) x 3m (h) and can accommodate about 3 rams/ bucks.
- The shed shall be partitioned lengthwise to form three equal compartments.
- The partition between each shed should not exceed one metre.
- The partitions may be either of wooden planks or half-cut balls.
- The partition shall be not more than one metre high from the floor.

3. Lambing / kidding shed :-

- These sheds shall be used as maternity rooms for pregnant ewe or doe and are housed individually in these sheds.
- The shed shall be 1.5m(l) x 1.2m(w) x 3.0m(h), a manger for holding feed and hay and a bucket for keeping water shall be provided in the shed.
- These sheds shall be made draught free.
- In cold climates some warming device, like a room heater shall be fixed in maternity pens, so that new borns are protected from cold during winter.

4. Lamb/ kid shed :-

- Lambs or kids from weaning up to attaining maturity are housed in these sheds at the rate of about 25 animals per shed.
- By making suitable partitions in a larger shed, unweaned, weaned but immature and nearly maturity lambs can be housed separately.
- On larger farms however, three separate sheds may be constructed to house three categories of kids or lambs.
- The shed shall be with a dimension of 7.5m (l) x 4m (w) x 3m (h) to accommodate not more than 75 animals.
- The shed shall be partitioned breadth wise dividing into two compartments. The compartments having dimension of 5m (l) x 4m (w) x 3m (h) shall be used to keep the unweaned animals and other compartment with dimension of 2.5m(l) x 4m(w) x 3m(h) shall be used for keeping the weaned animals.

5. Sick animal shed :-

- These shall be a sick animal shed for segregating ailing and disabled animals.
- Away from the other sheds one or more sick animal sheds may be constructed with a dimension of 3m (l) x 2m (w) x 3 m (h).
- The lower half of the door may be made of wooden planks and the upper half of wire-netting.
- There may also be a window of 0.7 m broad and 1.2 m high with a wire net covering.

6. Shearing and storeroom :-

- The shearing and storeroom consist of two compartments with a dividing wall.
- One room may be exclusively meant for storing wool and shearing equipment and the other for keeping feed and medicines.
- The other room used for shearing may be 6m (l) x 2.5m (w) x 3m (h).
- The door leaf may be made of wooden battens. It may also have two windows, one on each side of the long sides of the room.
- This room should have clean smooth floors and walls lined with glazed tiles up to a height of one and half meter.
- The room should be made damp and dust proof.
- There shall be three windows on three sides.

7. Attendant's room :-

- The shepherd's house meant for caretaker shall be located at a convenient place in the yard.
- The house may be 6m (l) x 4m (w) x 3 m (h). There shall be a door of one metre wide and two metres high on the long side of the shed facing the passage of the yard.
- The door leaf may be of wooden planks. There may be four windows, one of these facing the passage of the yard and the other three facing outside.
- Each window may be 0.7 m broad and 1.2 m high and covered with wire netting.

Dimensions of different sheds in a sheep and goat farm

Name of the shed	l x w x h (m)	No. of animals housed	Remarks
Ewe/ doe shed	15 x 4 x 3	60	
Ram/ Buck shed	4 x 2.5 x 3	8	
Lamb/ kid shed	7.5 x 4 x 3	75	Make partition length wise
Lambing/ kidding shed	1.5 x 1.2 x 3	1	Make partition width wise
Isolation / sick animal shed	3 x 2 x 3	1	Provide manger and waterer
Shearing shed	6 x 2.5 x 3	1	Provide proper ventilation and bedding materials
Shepherd house	6 x 4 x 3	-	Make arrangement for storage of wool
Milch doe shed	1.2 x 0.8 x 3	1	It should be located nearer to flock

Units

Constructional details of different units

Floor :-

- The flooring may be either of moorum or of strong wooden battens and, where the rainfall is quite heavy, the latter type of flooring may be preferred.
- In the case of wooden-batten flooring, the width of each plank shall vary from 7.5 to 10.0 cm and the thickness between 2.5 cm and 4.0 cm.
- The sides of the planks shall be well rounded and the clearance between two planks shall range between 1.0 cm and 1.5 cm to facilitate the disposal of dung and urine.
- The wooden-batten flooring shall be constructed at a height of at least one metre above the ground level.
- In this case, a suitable ramp or steps of wooden planks shall be provided.
- In the case of moorum flooring, a plinth wall between 15 cm and 30 cm in height shall be provided.
- For the shearing and store room and shepherd's house, the flooring may be of moorum or brick in cement mortar, and the floor shall be levelled properly.

Roof :-

- The roof may be made gabled.
- The roofing material may be either plain or corrugated galvanized steel sheets or asbestos cement sheets and where the rainfall is not heavy, it may be of thatch.

Gate :-

- Each shed may be provided with one or more gates either on the long or broad sides of the sheds depending upon the dimensions of the shed.
- The dimensions of each gate may be 0.8 m broad and one meter high.
- The gate leaf and frame may be made of wooden battens. It shall fit the entrance closely.

Manger :-

- The manger may be either of cement concrete or of wood with two compartments for providing feed and hay.

- A separate hay rack may also be provided by fixing at level or slightly below the heads of the animals.
- With the help of clamps, the manger may be raised within the height ranging between 4.50 and 6.00 mm from the ground.
- The water trough may be of cement concrete or galvanized steel pails or buckets and may be fixed or hung from a hook fixed to the walls.
- The manger may also be of portable type. The number of mangers and water troughs in each shed may vary according to the number of animals.

Dipping Tank :-

- To protect the animals from ecto - parasite a dipping tank may be made either of galvanized steel sheets or constructed of stone or brick in cement mortar, whichever is likely to prove economical, according to local conditions.

Footbath :-

- footbath made of galvanized steel sheets or brick in cement mortar shall be provided at the entrance to the yard to protect the animals from foot-rot disease.
- These baths may be embedded in the soil suitably.

Rearing

Different systems of Sheep and Goat rearing :-

1. Extensive System or Open range of grazing or Rotational grazing system :-

- Grazing the sheep and goat in the entire pasture and leaving them 8 – 9 hrs during day time and housed in pens in night. In this method feed cost is very much reduced.
 - It is not conducive to make the best use of the whole grasses.
- So we can preferably practice the rotational grazing method.

Advantages :

- Rotational grazing should be practiced under which the pasture land should be divided by temporary fences into several sections.
- The animals are then moved from one section to another section and animal get sufficient exercise.
- Parasitic infestations can be controlled to a great extent.
- Further, it helps to provide quality fodder for most part of the year.
- Under this system, it is advisable to graze the lambs first on a section and then bring in ewes to finish up the feed left by the lambs.

Disadvantages :

- Animals are exposed to adverse climatic condition.
- Loss of energy through movements and reduced production.
- Land requirement is more.
- There is considerable loss of manure in the grazing fields.
- Proper breeding record are not maintained.
- Maximum chances are animals worm and infestations, If animal grazing area are contaminated of any disease.

2. Intensive system-(zero grazing-system or stall feeding) :-

It is a system in which sheep goats are continuously kept under housing and are not allowed to go outside grazing in confinement with limited access in which they are stall fed.

Advantages :

Disadvantages :

- Animals are protected against adverse climatic condition.
- Animals are save energy for production.
- However, this has the advantage of close supervision and control over the animals.
- In this method, the dung is collected in one place and used as a good fertilizer.
- Less space is sufficient for more number of animals.
- Intensive operation of medium sized herd of 50 to 250 heads or more oriented towards commercial milk production goes well with this system particularly of dairy goats.

- This system of management requires more labour and high cash input.
- Initial expenditure is high.
- Animals do not get sufficient exercise.
- provides more feed for animal.

3. Semi-intensive system :-

- Semi-intensive system of sheep / goat production is an intermediate compromise between extensive and intensive system followed in some flocks having limited grazing.
- It involves extensive management but usually with controlled grazing of fenced pasture.
- It consists of provision of stall feeding, shelter at night under shed and 3 to 5 hour daily grazing and browsing on pasture and range.
- In this method, the feed cost is somewhat increased.

Advantages :

- Meeting the nutrient requirement both from grazing and stall feeding.
- Managing medium to large flock of 50 to 350 heads and above.
- Utilizing cultivated forage during lean period.
- Harvesting good crop of kids both for meat and milk.
- Making a profitable gain due to less labour input.

Disadvantages :

- This system of management requires more labour and high cash input.
- Land requirement is more.
- Maximum chances are animals worm and infestations, If animal grazing area are contaminated of any disease.

Tethering :-

- In this method is specially used for goats when raised in a single or numbers.
- In this method animals are tied with a long rope to pivot or long wire fixed to facilitate the animal to graze in a limited area. The location should be changed on every alternate day.

Advantages :

- Animal can be grazed in field while the laborers work at field.
- Less expensive method.
- Rotational or open range grazing can be provided.

Disadvantages :

- This method useful for only single or few animals.
- Loss of manure during grazing.
- Animals are exposed to adverse climatic condition.

Rearing in mud floor :-

- In this method, once in a year 1-2 inches of mud surface should be removed.
- Application of lime powder once in a month will reduce the disease occurrence in the shed.
- The shed should be constructed in elevated area to prevent water stagnation.

CHAPTER - 7

DIGESTIVE SYSTEM AND DIGESTION ABSORPTION OF NUTRIENTS IN FOWL

An understanding of the avian digestive system is essential for developing an effective and economical feeding program for poultry flock because the metabolism of carbohydrate, fat and protein is closely linked to the digestive system.

The digestive system of any animal is important because it converts the food that animal eats into the nutrients for growth, maintenance, and production (such as egg production). An animal's body breaks down food through both mechanical and chemical means. In many animals, the mechanical action involves chewing; however, because birds do not have teeth, their bodies use other mechanical action. The chemical action includes the release of digestive enzymes and fluids from various parts of the digestive system. After being released from food during digestion, nutrients are absorbed and distributed throughout the animal's body.

The digestive system in the domestic fowl is very simple but efficient when compared to many other species, such as cattle. The digestive system of fowl consists of mouth, oesophagus, stomach small intestine, large intestine, cloaca and associated glands viz. liver and pancreas.

2. Alimentary Canal

1. **Mouth** : Generally mouth in birds is characterized by absence of cheeks, lips and teeth. It is triangular in shape closed by upper and lower jaw forming the beak. The shape of tongue is like the barbed head of an arrow. Mouth is directly continuous with the pharynx. The mouth has two major Functions:

1. To pick up the food particles.
2. To direct the food into the oesophagus – as part of the bird's eating behavior.

2. **Oesophagus** : It is thin walled elastic tube. It begins at pharynx and terminates at proventriculus. It is a passage for food. The wall of the oesophagus is composed of four layers of tissue, the innermost layer is a mucous membrane which act as barrier for microbes also it produces a lubricant that aids the passage for the food along the alimentary canal.

3. **Crop** : It is an enlargement of the oesophagus. It is simple, oval, musculo-membranous pouch. It stores food material. It also secretes mucus which lubricates and softens food material. Swallowed feed and water are stored in the crop until they are passed to the rest of the digestive tract. It sends food to the proventriculus.

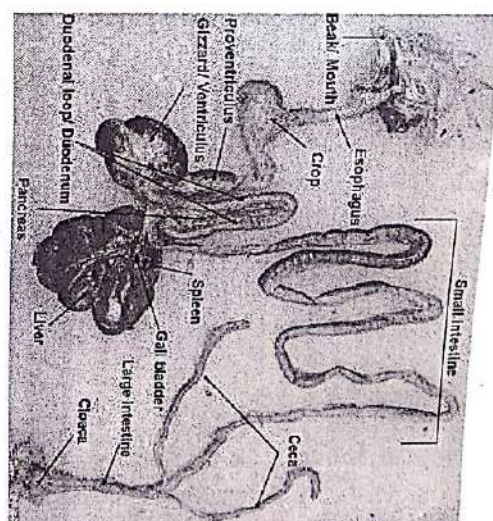


Fig. 1. Digestive system of fowl

When the crop is empty or nearly empty, it sends hunger signals to the brain so that the chicken will eat more. Although the digestive enzymes secreted in the mouth began the digestion process, very little digestion takes place in the crop—it is simply a temporary storage pouch.

4. **Stomach** : It consists of two parts viz. proventriculus and gizzard.

a. **Proventriculus** : It is also called as *glandular stomach* (also known as the true stomach) digestion primarily begins. It is located 2-3" beyond the crop. It is an oval thick walled tube. It passes food from the crop to gizzard. It secretes gastric juice and some acids. It helps in further softening of the food material.



Fig. 2. Proventriculus and gizzard from the digestive system of fowl

b. **Gizzard** : Gizzard is the largest single organ of the body. It is also called as *muscular stomach* (*Mechanical stomach*). It is located just behind the proventriculus. It is larger than proventriculus. It is reddish green in colour. It is composed of two thick, powerful muscles. Its main function is crushing or grinding of ingested food. It acts as a filter for food material. The glands of the gizzard produce a liquid which is a keratinised material that passes to the surface of the horny lining where it hardens to replace tissue worn away by the grinding action of the organ.

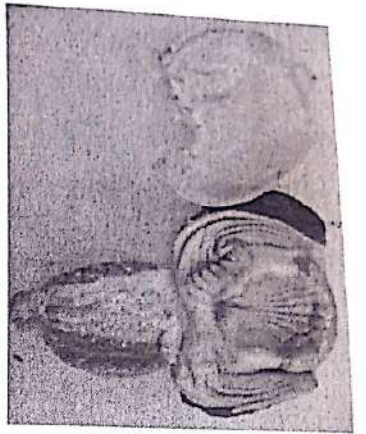


Fig. 3. Chicken gizzard with internal lining removed

5. Small Intestine : It extends from the gizzard to the caeca and about $2\frac{1}{2}$ ft long in mature bird. It consists of three parts namely duodenum, jejunum and ileum. The duodenum begins from gizzard and forms a loop. The bile and pancreatic ducts open near each other at the termination of duodenum. The jejunum-ileum is arranged in the form of coils. Gastric digestion together with some pancreatic digestion takes place in duodenum. It secretes intestinal juice which helps in digestion of food material. It acts as an organ for absorption of the digested food material.

6. Large Intestine : It extends from ileo-caecal junction to cloaca and consists of two caeca and a colon. Caecae are two blind sacs about 5 - 7" in length and are present at the junction of small and large intestine. They help in digestion of fibre. They act as temporary storage organs for faecal material. The absorption of some digested food material may take place in caeca. *Colon* is a small straight tube which lies between the caeca and the cloaca. It helps in absorption of water.

7. Cloaca : It is a tubular common cavity for digestive, urinary and genital tracts. The *vent* is an external opening of cloaca. The faecal material and urine are mixed and excreted through vent.

b. Associated Glands

1. Pancreas : It lies between the folds of the duodenum. It is a thin, narrow and lobulated gland. It is pale yellow or reddish in colour. Two *pancreatic ducts* carry pancreatic juice from pancreas to duodenum. It secretes *pancreatic juice* which contains digestive enzymes viz. trypsin, amylase and steapsin.

2. Liver : It lies on the floor of the abdominal cavity. It is dark red in colour. It consists of two lobes i.e. right and left. A sac is situated on visceral surface of the right lobe of liver called as *gall bladder* which stores bile. There are two *bile ducts* which carry *bile* from liver to the duodenum. It secretes the bile which helps in digestion of fats. It helps in protein, carbohydrate and fat metabolism. Liver is the largest gland in the body.

3. Salivary Gland : It secretes saliva in very small amount which helps in lubrication of food.

The basic function of the digestive system:

- The beak moistens food with Saliva. Food is not chewed.
- The oesophagus takes the food down to the crop to be stored. After a chicken has eaten, the crop will feel full and bulge.
- Food from the crop slowly passes down to the proventriculus.
- The proventriculus mixes the food with acids and digestive enzymes.
- Food is then passed through to the gizzard where insoluble (fibre) grit has accumulated.
- Food is ground down by strong muscular action in the gizzard.
- From the gizzard, food is passed through to the small intestine and is reduced further with enzymes from the pancreas.
- Bile produced by the liver and stored in the gall bladder helps to break down fat.
- The intestines digest the food, taking nutrients from it.
- Water and the remaining undigested food is absorbed in the large intestine.
- The caeca are a pair of tubes that allow fermentation of undigested food to take place. This is emptied every 24 hours or so and is a light brown (mustard colour) froth. This can often be confused as diarrhoea by the novice.
- The cloaca / vent passes a combination of faeces and urine, together with eggs from the oviduct.

Digestion of various nutrients in poultry

Introduction

Poultry broilers and layers require proper nutrition for maximum production. Breeding poultry require correct nutrition to reproduce. Laying flocks require correct nutrition to be productive. Poultry require the correct balance of five classes of nutrients (proteins, carbohydrates, fats and oils, vitamins, minerals, and water) for optimum growth, maintenance, finishing, work, reproduction, and production. Nutrients can be either dietary essential or non-dietary essential. Poultry feeds must supply the dietary essential nutrients because the body cannot produce them on its own. The body can synthesize the non-dietary essential nutrients for growth and maintenance. Hence, Poultry diets must supply daily nutrient requirements from the five classes of nutrients.

Nutrition is one of the key factors for successful poultry production because it alone costs about 70% of the total cost of production.

Classes of Nutrients

Protein :

Proteins are complex organic macromolecules containing carbon, hydrogen, oxygen,

nitrogen, and usually sulfur. They consist of one or more chains of amino acids. Proteins are fundamental components of all body cells and include many biochemicals (such as enzymes, hormones, and antibodies) necessary for proper body functions. They are essential in the animal's diet for growth and repair of tissue and can be obtained from many feedstuffs such as meat and fish meals, cereal grains and legume byproducts such as soybean meal.

Proteins consist of one or more chains of amino acids that are required by the body.

The breakdown of protein during digestion releases the amino acids. Blood carries the amino acids to all body parts. Single stomach, or monogastric, animals require 22 amino acids in their body. Those animals can manufacture 12 of the 22 nondietary essential amino acids, but cannot store the amino acids in their bodies. As a result, they must get a daily dose of protein containing the other 10 dietary essential amino acids. Proteins can come from both plant and animal feedstuffs. Plant proteins come directly, such as corn, or indirectly from plants as byproducts. Examples of byproducts include soybean meal, cottonseed meal, peanut meal and canola meal. Note these high protein meals are byproducts of edible oil extraction from the "oil seeds". Perhaps you have seen canola and peanut oils in the grocery store. Animal protein sources are usually byproducts of meat processing and include blood meal, feather meal, fishmeal, meat and bone meal, and poultry byproduct meal.

Protein or amino acid digestibility can vary depending on the specific ingredient. In general, animal byproduct proteins are easier to digest than plant proteins. For example, poultry digestibility of cottonseed meal can be as low as 60% for certain amino acids or as high as 90% for other ingredients such as dehulled soybean meal and meat products like poultry byproduct meal. The protein content of an ingredient or complete diet is usually described as "Crude Protein". Crude protein is based on the nitrogen content of the feedstuffs; proteins contain an average of 16% nitrogen. Crude protein thus can contain not only "pure protein" but other non-protein substances such as nucleic acids (from DNA) or urea which is a nitrogenous waste product excreted by the kidneys. National Research Council (NRC) nutrient requirements for poultry assume an average of approximately 85% ingredient bioavailability.

Carbohydrates:

Carbohydrates are organic compounds that include sugars, starches, celluloses, and gums. Carbohydrates are produced by photosynthetic plants and contain only carbon, hydrogen, and oxygen, usually in the ratio 1:2:1. Unlike proteins, carbohydrates do not contain any nitrogen atoms. Feed grains are high in carbohydrates and serve as the major energy source for animals. Sugars and starches are highly digestible and make up almost

75% of an animal's diet. Excess carbohydrates produce fat in an animal. Based on digestibility, the two groups of carbohydrates are nitrogen-free extract and crude fiber. Nitrogen-free extract is highly digestible and considered the more soluble form of carbohydrates. On the other hand, crude fiber contains carbohydrates like cellulose and gums that cannot be easily digested by poultry.

Fats and Oils:

Fats and oils provide energy like carbohydrates. Fats and oils are the densest forms of energy and derived from plants and animals. At room temperature, fats are solids and oils are liquids. They both provide 2.25 times more energy than carbohydrates (9 kilocalories per gram versus 4 kilocalories per gram for digestible carbohydrates and protein). Poultry require only small amounts of fats and oils. They are very important nutrients in the diet.

Minerals:

Minerals are naturally occurring inorganic solids important for life and good health. Many are essential components of bodily substances, such as the calcium and phosphorus in bones and the iron in hemoglobin. Others help regulate many metabolic activities. Based on availability and needs, minerals are divided into three groups – macro minerals, electrolytes and trace (micro) minerals. Minerals provide the inorganic elements critical to life. For example, calcium carbonate (limestone) is a mineral form of calcium. Macro minerals are required in fairly high concentrations compared with the trace minerals. These macro minerals are critical to skeletal formation but can serve other non-structural functions as well. For example, calcium is necessary for heartbeat regulation, blood clotting, and muscle contractions in addition to bone and teeth maintenance. Magnesium (Mg) is necessary for utilizing energy in the body and for bone growth. Almost all biochemical reactions require phosphorus. The calcium to phosphorus ratio is very important in poultry diets; 2 to 1 with respect of dietary calcium to available phosphorus.

Electrolytes are elements that have either a positive (sodium and potassium) or negative (chloride) electrical charge in solution. Sodium (Na) and chlorine (Cl) are usually found together as the mineral sodium chloride (NaCl, or common salt). Salt serves to maintain acidity levels in body fluids and proper osmotic pressure in body cells. The hydrochloric acid produced in the stomach contains the element chlorine. Potassium (K) also serves to maintain proper acid levels in body fluids and osmotic pressure in body cells. It is also required in some enzymatic reactions in carbohydrate metabolism and protein synthesis. (Mo) Animals need very small amounts of trace minerals, usually ranging from 0.05% to 0.25%. However, this small percentage is critical for performing essential body functions

associated with life, such as: Growth of bones and soft tissues Digestion Blood and body fluid processes Body tissue repair Vitamin utilization Release of body heat for energy needs Regulation of chemical processes Muscle activity Reproduction Internal organ functioning.

Vitamins :

Vitamins are essential organic (carbon based) compounds needed in small amounts by the body. They are absolutely critical to all life processes such as growth, maintenance, reproduction. Vitamins do not directly build body tissue as do macro minerals like calcium and phosphorus. They assist many of the enzymes controlling the metabolic processes of life and are often referred to as co-enzymes. Vitamins are either fat-soluble or water soluble. They are obtained naturally from plant and animal feedstuffs. Vitamin B12 originates from bacteria. The body stores fat-soluble vitamins. Large amounts of fat-soluble vitamins can be deadly to an animal. This is not true for water-soluble vitamins, which cannot be stored in the body. Regular intake of adequate amounts of water-soluble vitamins is important.

Fat Soluble vitamin : Vitamin A, D, E, K

The water-soluble vitamins : Thymine (Vitamin B1), Riboflavin (Vitamin B2), Pyridoxine (Vitamin B6), Vitamin B12, Folic acid, Niacin, Pantothenic acid and Cholin

Water :

All animals require water for body functions. Water is necessary for digestion and absorption of nutrients, removal of waste, production of milk, shaping of cells, and regulation of body temperature. Water is perhaps the single most important factor for life.

Water is the largest component of bodies and constitutes approximately 50% of body mass. The animal's feeding habits directly affect the amount of water consumed. Chickens usually consume approximately two times (2X) as much water as they consume feed.

Principles of poultry feeding :

1. Following factors should be considered, while computing ration and feeding of birds.
2. Birds have no lips or teeth, hence require a more concentrated ration.
3. Digestive tract of bird is comparatively short, digestion is quite rapid, so their requirements are more precise and specific.
4. Due to higher rate of metabolism, birds require more exact ration as per recommended standards.
5. Birds are non-ruminants and hence feed should not contain more than 6 to 8 % crude fibre.
6. Feed must be palatable and free from aflatoxins.
7. Feed must have all essential nutrients in balanced form.

7. Clean, fresh and cool water must be made available at all times.

Classification of poultry feedstuffs :

The poultry feed ingredients are classified into following major groups.

1. Carbohydrates or energy rich feeds
2. Protein rich feeds
3. Fat sources
4. Feed supplements
5. Feed additives

Classification of Poultry Feed stuffs

Energy rich feeds	Protein rich feeds	Fat sources	Feed supplements	Feed additives
a) Cereal grains <ul style="list-style-type: none"> • Maize • Sorghum • Wheat • Barley • Oat b) Cereal by products <ul style="list-style-type: none"> • Rice • Rice polish • Deoiled rice • Wheat polish • Bran • Molasses 	a) Vegetable source <ul style="list-style-type: none"> • Soybean meal • Groundnut cake • Sunflower cake • Coconut meal • Sesame cake b) Animal source <ul style="list-style-type: none"> • Fish meal • Meat meal • Blood meal • Liver residue 	<ul style="list-style-type: none"> • Vegetable oil • Lard • Tallow 	<ul style="list-style-type: none"> • Vitamins • Minerals 	<ul style="list-style-type: none"> • Antioxidants • Antibiotics • Coccidiostats • Anthelmintics • Toxin binders • Enzymes • Flavouring agents • Growth promoters

CHAPTER - 8

PRINCIPLES AND PRACTICES OF SHEEP AND GOAT FEEDING, FLUSHING OF EWES AND DOES

Introduction

Sheep and Goat belong to a group of animals called ruminants. Ruminants are animals that can utilize effectively roughages for maintenance and production. They have a stomach that consists of four chambers. The most prominent of the four chambers is called the rumen. In the rumen are micro-organisms (bacteria and protozoa) that can digest the cell walls of roughages.

Principles of feeding :-

The practices of feeding goats and other animals are the results of the application of nutritional principles. Nutritional principles suggest that feed ingredients should be put together in order to provide protein, energy, minerals and vitamins for the maintenance, and the production and productivity of the animal. Hater should also be provided. In the case of ruminants some of these nutrients are initially utilized by the rumen micro-organisms in order to facilitate the digestion of the cellulose in the roughage cell walls, or for them to grow and multiply. The nutritional principles are compiled into what are called feeding standards. Feeding standards are generally summarized as tables showing for each species of livestock the daily requirement for different nutrients by different classes of that species for maintenance, growth and production. The nutrient requirements for goats as compiled by the National Research Council of the United States of America.

Goat Feeding :-

Goats generally produce more milk than a cow from the same quantity of nutrients. The nutrient conversion efficiency for the production of milk in goats is 45.71 per cent, whereas a dairy cow averages 38 per cent. It has been observed that goats are 4.04 per cent superior to sheep, 7.90 per cent superior to buffaloes, and 8.60 per cent superior to cows in crude fibre utilization. The goat uses more useless feeds for its maintenance than a cow.

The secret of successful feeding is in devising a cheap and efficient ration. While preparing a ration for goats, factors like bulk, palatability, availability, price and digestibility should be considered along with the nutritive quality of the feed. Abundant clean, fresh water, changed every morning and evening should be made available to goats at all times. Some of the most serious diseases of goats result from the drinking of dirty water from shallow pools. Water troughs should be thoroughly washed at least twice a month. Goats in milk require more water than dry goats and should be watered regularly at least three times a day.

Feeding habits of goat :-

Goats are sensitive animals with peculiar feeding habits. By the means of their mobile upper lips and very prehensile tongue, goats are able to graze on very short grass and to browse on foliage not normally eaten by other domestic livestock. Unlike sheep, goats relish eating aromatic plants in areas of scarce food supply and hence can penetrate deep into deserts. They are fastidious about cleanliness and like frequent change in the feed. Feeds given must be clean and fresh, since goats eat nothing that is dirty or foul-smelling. They dislike wet, stale or trampled fodder. For this reason, it is advisable to feed them in hay-racks or hang the feed in bundles from a peg in the wall or from a branch of a tree. Double-sided portable hay-racks are the most suitable and convenient for stall feeding. It is preferable to serve them small quantities at a time, when served in large quantities at a time, they waste a lot of it by trampling.

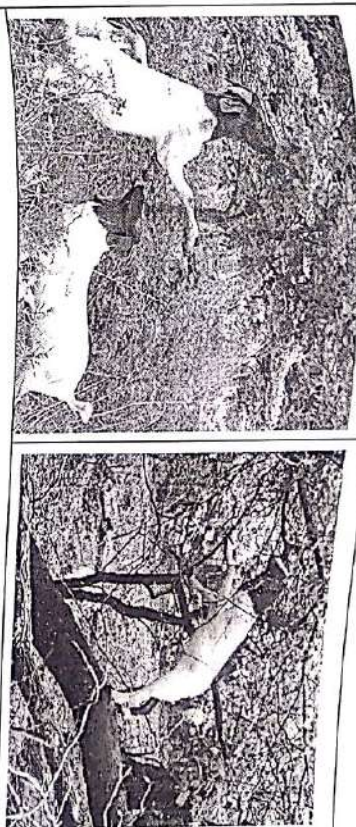


Fig no. 1. Browsing or Stall feeding of goat.

Goats are very fond of leguminous fodders. They do not relish fodder like sorghum/maize silage or straw. Goats do not relish hay prepared from forest grasses, even if cut in early stages, but very much relish hay prepared from leguminous crops. Some of the common green roughages liked by goats are : lucerne, berseem, napier grass, green arhar, cowpea, soyabean, cabbage and cauliflower leaves, shafial, scrub, methi, shrubs and weeds of different kinds; and leaves of trees such as babul, neem, ber, tamarind and pipal. The common dry fodders liked by goats are straws of arhar, urid, mung, gram, dry leaves of trees, and lucerne/berseem hays (which are the main forage crops for milch goats).

Nutrients required : The nutrients needed may be divided into maintenance, production and pregnancy requirements:-

a) **Maintenance ration :** As goats have a higher BMR than cattle, their maintenance requirements are higher. The maintenance requirement is 0.09 per cent DCP and 0.09 per cent TDN. For its size, a goat can consume substantially more feed than cattle or sheep, viz. 6.5-11 per cent of its body weight in dry matter when compared with 2.5-3 per cent for cattle or sheep. This means that the goat can satisfy its maintenance requirement and produce milk from forage alone.

b) **Production ration :** Requirements for the production of 1 litre of milk with 3 % and 4.5 % fat is 43 gm of DCP and 200 gm of starch equivalent (SE), and 60 gm of DCP and 285 gm of SE, respectively. The nutritional requirement of a goat weighing 50 kg and yielding 2 litres of milk with 4% fat may be met by feeding 400gm of concentrate mixture and 5 kg of berseem or lucerne. The ration should have 12-15 % protein content.

The following concentrate mixtures may be used to feed the goat : (i) 1 part of wheat bran, 2 parts of maize grain, and 1 part of linseed cake, or (ii) 2 parts of maize grain, 1 part of barley, 2 parts of mustard-cake, and 2 parts of gram husk, or (iii) 1 part of wheat bran 2 parts of barley grain, and 1 part of groundnut cake, or (iv) 2 parts of gram grain and 1 part of wheat bran. The above mixtures should also contain 2 % each of mineral mixture and salt.

c) **Pregnancy ration :** The foetal growth in the last 2 months of pregnancy is rapid and the metabolic rate of the goat rises rapidly. During this period, the content of ration should be increased to the level of production ration. A week before she kids, the doe should be provided with more succulent type of food. For three or four days after kidding, the level of diet should be lowered and made more fibrous. This is necessary to minimize the shock to the goat's udder. After this period, the feeding should be done at a normal rate.

d) **Feeding of young stock :** Performance of the adult stock depends on how they are reared when young. Feeding schedule for kids should be such that a weekly growth rate of 0.6 kg is obtained. The kids should be fed 56-112 gm of colostrum 4-5 times a day, depending on its birth weight, for three days. From the fourth day onwards, they may be fed the following ration schedule:-

e) **Mineral mixture :** the requirements of calcium and phosphorous for maintenance are 6.5 and 3.5 gm, respectively, per 50 kg body weight. Goats require slightly larger quantities of calcium than sheep. The mineral mixture may be included in the concentrate ration at the rate of 2 per cent.

f) **Salt :** Salt licks or lumps of rock salt of fairly good size should be hung up in some suitable place where the goats can easily get them. This is important as goats secrete a good amount of sodium and chloride ions in the milk.

g) **Vitamins and antibiotics :** Goats particularly need vitamins A, D and E. Vitamin A can be supplied by feeding green forage and yellow maize; 1 kg of lush-green fodder will provide 1500 IU. Vitamin D can be obtained by exposure to sunlight. Vitamin E is present in adequate amounts in most normal rations. Synthetic vitamins A and D may be supplemented in the ration of growing kids. Feeding of aureomycin or terramycin increases the growth rate of young kids, reduced the incidence of scours and other infectious diseases and improves the general appearance of the kids

Feeding habit of sheep :-

The feeding and grazing conditions vary from place to place. The most favourable grazing time is soon after the onset of monsoon till the onset of winter. Grazing resources become extremely poor during summer months. During this period supplementary feeding should be done. Sheep generally thrive well on pasture. Attention should be paid on pasture improvement and management. Rotational grazing should be followed to avoid worm infection and unthriftiness, and to ensure availability of good pasture all the time. The fodder should be conserved in the form of hay and silage for the lean period. Fodder trees should be planted in the pasture to provide shade and fodder during the lean period to the grazing flocks. Supplementary feeding of concentrate should be done depending upon the physiological status and availability of grazing resource in the pasture.

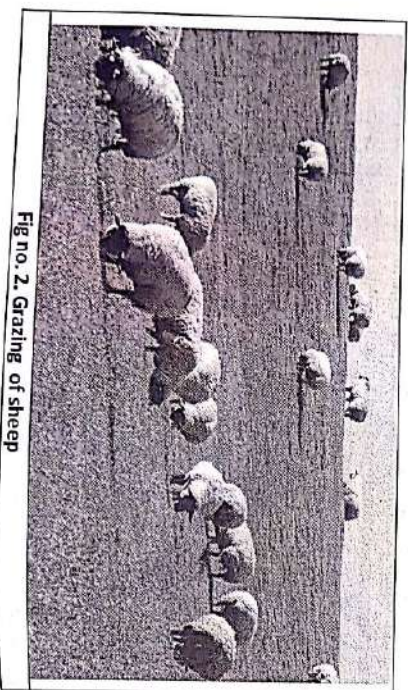


Fig no. 2. Grazing of sheep

Water : Water requirement of sheep very depending upon its physiological status and ambient temperature in different seasons. The sheep should be watered at least once a day at the rate of 2-3 litres per head per day. The requirement of water for crossbreeds during summer months will be slightly more and may range between 5-6 litres. The younger ones may require 1-2 litres of water every day. Sheep breeds in arid regions have good adaptation to water restriction up to 48 hrs.

Watering should be done in metallic troughs or cement channels. The flock should be weighed at least once in a week to the extent of at least 10% prior to being turned out for grazing. This work may be distributed over the week.

1) **Feeding lambs up to two weeks :** There is no feed equal to the ewe's milk for putting rapid gains on young lamb because dam's milk yield is closely related to early growth of lamb. Lambs depend entirely on dam's milk upto 2 weeks. Colostrum is rich in fat, protein, vitamins etc. and contains antibodies to protect the lamb from infections. If the ewes are fed good ration during the last six weeks of gestation, it enhances milk production.

2) **Feeding suckling ewes :** During suckling period, ewes should be fed good milk producing ration. She should be fed good legume hay or oat hay with little or no grain for a week. After she's milking freely and her bowels are functioning normally with no sign of constipation, the amount of grains may be increased. If pasture is available, hay is not needed. The following rations can be used :-

3) **Feeding adult sheep :** Roughage part may be taken care by grazing, but 150 gm of concentrate (as for suckling ewes) with mineral mixture and salt must be fed. The nutritional requirements of various categories of sheep are as under :-

Note : Daily requirement of common salt is 2-8 gm, and carotene is 2-8 mg.

4) **Feeding breeding rams :** Good quality green fodders like maize, cowpea, oat, doob grass, lucerne, berseem etc. would meet all requirements of breeding rams. If forages fed are of poor quality like straw or sorghum hay, then 150-200 gm concentrate should be fed daily.

❖ Flushing :

Ewes which are to be bred should be underfed for about 45 days prior to breeding in order to prevent fat accumulation which reduces fertility. Two weeks prior to breeding, the ewes should be fed about 150-200 gm concentrate mixture daily along with good quality forages (cowpea, oat, doob grass, berseem). It conditions the animal and induces maturation of more number of follicles, and thus improves conception and twinning rate.

OR

❖ It refers to extra grains or nutritious pastures two or three weeks prior to breeding. A season for purpose of increasing number of ova shed from the ovary for yielding twins. Feeding 250 gm grain mixture daily to each ewe, results in an increase of 10 to 20 % in lamb crops.

❖ Flushing rations :

Flushing rations for ewes may consists of :

1. A good mixed pasture of legumes and grasses
2. A grass pasture plus 150 g of wheat bran per head per day.
3. Grass pasture plus 250 g of grains and 450 g of oilcakes. About two weeks before the rams are turn in with the ewes the
4. Legume hay full fed plus 100 g of wheat bran and 150 to 200 g of grain.
5. Green fodder at the rate of 10 per cent of body weight and 100 g of oilcakes per head per day.

CHAPTER - 9

CARE AND MANAGEMENT OF PREGNANT EWES/DOES, LAMBS/KIDS AND RAMS/BUCKS

Care and management of pregnant ewes/does :-

- ❖ Identifying pregnant ewes :- Identification of pregnant ewes is essential for the re-breeding of empty ewes and efficient management of pregnant ewes. Pregnancy can be diagnosed by observing for cessation of estrus cycle, abdominal ballotment (from third month onwards) and by means of a chemical test.
- ❖ Procedure :- Mix 5 ml of urine sample and 5 ml of 1% Barium chloride solution. Turbidity indicates pregnancy whereas clear solution indicates non-pregnant condition.

Care of pregnant ewes :-

- ❖ Careful management of pregnant ewes will have a marked influence on the percentage of lambs dropped.
- ❖ Do not handle the pregnant animals too frequently.
- ❖ House the pregnant ewes in separate enclosures well ventilated and protect from inclement weather and to avoid high temperature.
- ❖ Crutching is done 7-10 days prior to lambing to avoid lambs sucking dung.
- ❖ Separate the advanced pregnant animals from the main flock and take effective care in their feeding and management.
- ❖ Extra feed during the later part of pregnancy (3-4 weeks before parturition) will be beneficial for the condition of pre-parturient ewes, provide enough protein, energy, water and minerals.
- ❖ Thus improving milk production of ewes, and birth weight and growth of lambs. Inadequate and poor nutrition may result in pregnancy toxemia, abortions and premature births of weak lambs.
- ❖ Bring lambing ewes into lambing corrals 4-6 days before parturition and provide soft, clean bedding, individual lambing pens and maximum comfort.
- ❖ Provide enough clean and safe drinking water.
- ❖ Keep them parasite free.
- ❖ Watch gestation length which ranges from 142-150 (avg. 147) days.

Care and management of Pregnant does :-

- 1) Diagnose pregnancy.
- 2) About 6-8 weeks before kidding doe should be dried off. Provide adequate nutrition, easily digestible and laxative diet along with 450 g concentrates daily.
- 3) Avoid overfeeding and under feeding to prevent metabolic disorders.
- 4) Avoid sudden changes in.
- 5) Provide ration with enough protein and minerals as per requirements, according to body weight and stage of pregnancy.
- 6) Water be made available free of choice.
- 7) Keep pregnant animals separated from others.
- 8) Make provision of clean, soft bedding material in maternity pen.

Care and management of ewes and does :-

- Care and management of does :-
- Goat is a animal which is for multiple objects i.e, meat, milk, manure and goat hair.

- Following points are may be considered for proper management of goats.

1. **Handling of goats :-** Goats are easy for handling. They dislike being held by horn and ear and care should be taken not to disturb the nostrils. For an ideal handling, it is preferable to hold them with, neck and hand collars.

2. **Feeding :-** Nutrition is the basis of health. Even when female are dry, they must be provided with sufficient grains and concentrates. A well fed ewes and does remain healthy and has efficient breeding status.

3. **Flushing :-** Ewes which are to be bred should be underfed for about 45 days prior to breeding in order to prevent fat accumulation which reduces fertility. Two weeks prior to breeding, the ewes should be fed about 150-200 gm concentrate mixture daily along with good quality forages (cowpea, oat, doob grass, berseem). It conditions the animal and induces maturation of more number of follicles, and thus improves conception and twinning rate.

OR

It refers to extra grains or nutritious pastures two or three weeks prior to breeding. A season for purpose of increasing number of ova shed from the ovary for yielding twins. Feeding 250 gm grain mixture daily to each ewe, results in an increase of 10 to 20 % in lamb crops.

4. **Castration :-** It is done at the age 2 to 4 weeks although castration at latter stage is successful. Castration has mainly advantages (a) Palatability of meat is increase (b) They body weight increase at rapid rate (c) The quality of skin is superior.

5. **Dehorning :-** It is practiced within one weeks of kids birth by using caustic potash. To burn the horn button of that chemical.

6. **Exercise paddock for stall fed goat :-** The goats should be allowed to roam about the enclosed area for some fixed period to have 1 sufficient fresh air and exercise.

7. **Housing :-** Under village condition goats have not special housing. They should, however, be protected against bad weather and wild animals. Under farm and city condition. It is economical to provide a special housing for goat :- Under village condition goats not have special housing. They should, however, be protected against bad weather and wild animals. Under farm and city condition, It is economical to provide special housing for goat. Each enough pen may be 5 in length, 2.5' width and 6' high. This enough for one pair of goats. The house should have plenty of air, sunshine and well drained, house is, prepared from bamboo, wood etc.

- Care and Management of ewes round the year :-
For the sake of efficient management of sheep all the year round at various regions, all care must be taken to have the recommended managerial practices suited to various climatic conditions

Round the year :-

- Winter season (Dec - Jan to Feb)
- Spring season (March to April)
- Hot season (May to June)

1. Care of pregnant ewes 2. Steaming up 3. Marking 4. Castration

Care and management of lambs and kids :-

- ❖ **Care of lambs and kids :-**
The lamb and kid should be taken care of the maximum extent during starting stage or period of life. This will also ensure better survival. The following steps may be taken for ensuring better growth and survival.
- ❖ **Removing of mucus :-** Immediately after birth of lamb and kids it should be cleaned with rough gunny piece and remove the mucus from their ; nostrils and mouth cavity and all over the body must be removed. The mother cleans the newly born kid lamb by licking it.
- ❖ **Cutting of naval cord :-** Cut the naval cord by leaving 2.5 cm distances from the body by using clean and sterilized blade or scissor. Dip the cut end in tincture iodine to check the infection and avoid through naval cord infection
- ❖ **Feeding of colostrums :-**
The lamb/kid is kept with the mother in separate shed for first four days and thereafter it is transferred to lamb/kid shed. Note the birth wt. and sex of young on give colostrum to the lambs and kids within 2-3 hours after birth @ 10% of the body wt. for three to four days.
- ❖ **Feeding of milk :-**
The lamb/kid, separated from the mother is given milk at rate of 10% of its body weight. This is fed in a day divided in three time by bottle and nipple. The milk fed from outside must be boiled and then cooled to 100° F. The use of bottle and nipple must be sterilized. Milk feeding is done for 2 to 3 weeks. In case of kids, the milk feeding bottles are generally kept tilted at a height in nipple facing ground. The kids suckle at the nipples.
- ❖ **Feeding of milk starter :-**
Give milk starter to the lamb in the beginning after 2nd week and milk is slowly replaced by milk starter
 - ❖ The milk starter has following composition.
 - ❖ Wheat bran 15 parts.
 - ❖ Rice polishing 20 parts.
 - ❖ Yellow maize 45 parts.
 - ❖ Groundnut cake 10 parts.
 - ❖ Dried milk powder 8 parts.
 - ❖ Mineral mixture 2 parts.
 - ❖ Vitamin A 20 gms/ton
 - ❖ Vitamin D 6 gms/ton
 - ❖ Antibiotic feed supplement 8 gms/ton.
- ❖ **Replacing milk by starter ensures good growth of lambs and kids.** Leguminous hay is kept kid/lamb shed right from 1st week. The lambs and kids nibble the hay and learn to take fodder. (The lamb/kid is W age of 3 to 4 months when it attains 15 kg weight. At this age the lamb/kid is reared only on fodder. Ad-lib water provided in lamb/kid pens. The salt licks are also kept in pens to give easy access to young ones

Disbudding :-

- ❖ Disbudding in lamb and kids after 5 day old is carried out by three methods.
- ❖ Chemical method in this method horn buds are cauterized by either application of caustic potash silver-nitrate.
- ❖ Hot iron method the horn buds are burnt by hot iron
- ❖ Electrical method in this method instead of hot iron, electrical deliverer is used to burn out the horn buds (Temp. 540°C).
- iv) Disbudding is use full for retard horns to grow.
- v) This saves the injuries from the attack of these animals.

Identification :-

- ❖ The process of identifying sheep and goat has to be established soon after its birth.
- ❖ They divided in various methods.
- ❖ Ear Tagging, Neck Tags, (this is the temporary method)
- ❖ Tattooing, Ear Notching (this is permanent method)
- ❖ Docking :- Removing of tail or cut at its 2nd to 3rd week of age. This operation is known as 'Docking'. This practice include in Sheep.
- ❖ This avoids maggot infection and injuries at tail in adult stage.
- ❖ Rubber band or emasculator is fixed at base of tail to cut off the blood supply to the tail and the tail is cut by a knife.
- ❖ **Castration :-** It is done at the age 2 to 4 weeks although castration at latter stage is successful. Castration has mainly advantages (a) Palatability of meat is increase (b) They body weight increase at rapid rate (c) The quality of skin is superior
- ❖ **Hoof trimming :-**
When the lamb / kids allowed to go out for grazing regular hoof trimming is to be carried out by using a bone cutter.
- ❖ **Selection :-** At the age of 10 to 12 weeks, selection of animals fit for the herd is carried out. The weaklings, males that are not useful for breeding and also the defective lamb/kids are culled.
- ❖ In case of milk breeds females with abnormal udder and teats are culled.
- ❖ These culled lambs/kids are generally sold at its one year age, when they attain 35 kg weight. This ensures good profit. The animals to be retained at farm are transferred to adult class when they are one year old.

Care and management of rams and bucks.

Generally one ram per fifty females is for breeding purpose. In order to avoid inbreeding farm males are not used for breeding unless controlled and planned breeding is possible

- **Housing :-** The rams/bucks are provided in separate boxes for housing. This avoids fighting among each other.
Their sheds must be clean and well ventilated. Sufficient sunlight must be available. An adult ram/buck requires floor space of 2 to 3 square meters. Sufficient exercise is given to the rams/bucks by providing a run of attached to its pen. In some farms exercise is given to bucks employing them to pull light carts. Ample clean and fresh water is made available in the pens.

- **Feeding :-** The buck/ ram can be sent out for grazing but this creates nuisance to other animals, especially during breeding season. A if the males are allowed to graze with females, it becomes difficult to control breeding. It is also not allow to keeping proper breeding records.

A buck/ram on grazing needs about 1 to 2 kg of greens and about 200 gms of concentrate mixture at the shelter.

A buck/ ram are stall fed to be provided with 7 to 8 kg of fodder and 450 gm of concentrate mixture. During the breeding season the concentrates are increased up to 900 gms to 1 kg per day.

- **Isolation :-** Bucks have musk glands at the base of their horns. The secretion of these musk glands produces the typical goatly odour. If a doe in location is in vicinity of a buck there is a goatly odour to her milk. To avoid the goatly odour of milk, bucks are not allowed to mix with females. They are kept at least 30 meters away from the females sheds.

- **Hoof trimming :-** When the ram and buck allowed to go out for grazing regular hoof trimming is to be carried out by using a bone cutter or hoof trimmer.

- **Breeding management practices :-**

- Care should be taken to keep the ram/buck clean and healthy.

- **Eyeing :-** "Removing of excess wool around eyes in some breeds of sheep to avoid the wool blindness is called as eyeing". Or : This refers to the clipping of excess wool around the eyes to prevent wool blindness in some breeds.

- **Ringling :-** "Removing of wool complete] ram all over the bad i.e. around the neck and around the region of penis is practiced at breeding season. In ram is called as ringling." or This refers to shearing of wool from the body of the ram, especially in the neck, belly and sheath region prior to the breeding season.

- This will make easier for the ram to make proper contact with the ewes during act of mating.
- **Shearing :-** "Shearing is nothing but clipping of wool and mohair from the sheep and goat respectively quickly, completely, easily and with minimum discomfort to the animal and operator". It is therefore, a practice to carry out shearing of rams before the breeding season. Because of Rams are observed to be active after shearing.

- **Painting of rams :-** To obtain the visual picture of the progress of mating, the rams may be marked by the painting their breast with thick paste, which at the time of mating will mark the particular ewe. The ewes that accept the ram is marked by a smear on the rump.

- **Care at breeding :-**

To change the ram or buck from the flock every 3rd yr. is necessary to avoid inbreeding. Take care of genital organ at the time of mating to avoid genital organ injury.

The females being free from communicable and sex transmitted diseases.

When natural service is given, a male should not be used for more than 2 to 3 females per day. There must be sufficient gap between two services.

In a breeding season to provide extra ration is 900 gm to 1000 gm given to ram and buck

CHAPTER - 10

METHODS OF REARING, FEEDING AND MANAGEMENT OF CHICKS, PULLETS, LAYERS, BROILERS

Methods of rearing

POULTRY HOUSING

Under modern conditions, the hen is required to lay many eggs throughout the year, and this object can best be achieved if a comfortable housing is provided for them. Housing provides comfort and protects them from sun, rain, wind, predators. The poultry house should be well ventilated, reasonably cool in summer, warm during winter and free from drafts. In our country open sided poultry houses are very popular except in very cold areas. In conclusion, we can say that poultry is housed for comfort, protection, efficient production and convenience of the poultry farmer.

Essentials of good housing

1. **Comfort:** The best egg production is secured from birds that are comfortable and happy. The house must provide adequate accommodation, sufficient fresh air and remains always dry.
2. **Protection :** House should protect the birds from extreme weather conditions. It should safeguard against theft and attack from natural enemies.
3. **Convenience :** The house should be located at a convenient place and the equipments to allow cleaning and other operations easily.

Principles of housing

In planning a poultry house the following principles should be taken in to consideration.

1. **Location of house:** The house should be located on a infertile, well drained ground, safe from flood water and should have easy access from the road.
2. **Long axis of the house:** In hot parts of the country, the long axis of the house should run from East to West and in cold parts it should be North to South.
3. **Relation to other building:** The distance between the two houses for the birds of the same age group should be at least 20 m to allow proper ventilation. The houses of young stock should be at least 50 to 100 m away from adult stock house. This helps to prevent disease transmission. The brooder house should be at least 50 – 100 m away from adult stock.
4. **Width of house:** The width in open sided houses should not be more than 9 m.
5. **The height of house:** It is ordinarily 2.5 to 3.3 m. from the foundation to the roof line. However, the height of the roof depends on the temperature of the place. A high ceiling keeps the inside temperature low.
6. **Floor of house:** The floor should be moisture proof, free from cracks, easy to clean and rat proof.
7. **Shade and protection:** The climatic conditions and age group of birds will determine the extent of side opening. In open side houses half to two third of the area of the side walls is kept open and fitted with wire mesh for proper ventilation where temperature is continuously high. An overhang of 1 m will prevent the rain water splashing inside the

house. In brooder house half the area is left open, in grower and layer houses two thirds and in cage houses the maximum.

Durability and cost: A poultry house should be cheap, durable, comfortable and safe.

Construction of house

The poultry houses are designed and constructed for protection of birds from extreme weather, infective organisms, parasites, predators and thieves. It is necessary to know, identify and select proper material for construction of poultry house.

1. **Foundation:** It should have enough hold on the ground for supporting the building and hence permanent poultry house should have concrete foundation. Foundation should be at least one feet above the ground level.
2. **The floor:** The floor of house should be smooth, free from dampness, without cracks, easy to clean and disinfect, rat proof and durable.

- i. **Concrete floor:** A well laid concrete floor is the safest way to meet these requirements and is recommended in preference to any other kind of floor.
- ii. **Wire mesh floor:** Wire mesh floor or preferably mesh of expanded metal is the best for portable houses. The expanded metal although more expensive, is stronger, more durable and does not sag like the wire mesh.

3. **Walls:** The wall should be water tight, wind proof, and finished with interior surfaces that are easy to clean and disinfect. The lower portion of the side walls up to height of 1 - 1.5 feet is built with solid bricks. The upper portion of the wall is made up of chicken wire mesh supported by bricks and pillars.

4. **Doors:** The door of the house must be on the south or north and made up of an angle iron frame covered with half inch mesh. The size of the door should be always large enough to allow a man to conveniently get through.

5. **Water tank:** Water tank should be constructed near by shed according to farm capacity.

Space requirement

The weight of a day old chick is about 30 - 40 grams and it attains a weight of about 2000 grams in period of 42 days meat type birds. So as the chicks grow in age and size, they require increased space depending on age, flock strength, housing design, climate and management practices. If there is insufficient space, chicks do not get fresh air, enough feed and water. Insufficient space leads to overcrowding of birds resulting in to poor production performance.

Table 1 : Space requirement for different age groups of birds.

Type of bird	Age (weeks)	Floor space (Sq. ft.)	Feeder space		Waterer space	
			(inch)	(cm)	(inch)	(cm)
A. Deep litter system						

Layer	0 - 4							
	4 - 6	1.00	1.00	2.50	0.50	1.25		
i) Chicks	7-15	1.50	2.00	5.00	0.50	1.25		
ii) Grower	16-20	2.00	3.50	8.00	0.75	2.00		
iii) Layer	16-72	2.50	5.00	12.00	0.75	2.00		
Broiler	0-4	2.50	6.00	15.00	1.00	2.50		
	4 onwards	0.50	2.00	5.00	0.50	1.25		
		1.00	3.50	8.00	1.00	2.50		
Cage system								
Layer	0-6	0.24	1.00	2.50	0.50	1.25		
i) Chicks	7-15	0.48	2.00	5.00	0.75	2.00		
ii) Grower	16-72	0.72	3.00	7.50	1.00	2.50		
iii) Layer	0-4	0.24	1.00	2.50	0.50	1.25		
Broiler	4 onwards	0.48	2.00	5.00	0.75	2.00		

Systems of poultry keeping

The type of housing adopted depends to a large extent on the availability of land, type of bird and the capital. There are three systems of housing generally followed by the poultry farmers.

1. Free range system
2. Semi intensive system
3. Intensive system: A. Deep litter system B. Cage system

Free range system

Method is the oldest of all and has been used for centuries by general farmers, where there is no shortage of land. This system allows great but not unlimited, space to the birds on land where they can find an appreciable amount of food in the form of herbage, seeds and insects. At present due to advantages of intensive methods this system is almost out-dated, but it plays important role in rural areas.

Advantages

1. Less investment.
2. Minimum expenses on feed.
3. Less labour is required.
4. Bird's development is relatively better.

Disadvantages

1. Low egg production and growth.
2. More chances of infectious diseases including parasitic infestation.
3. No protection from predatory animals and birds.
4. Sometimes birds lay eggs outside the area.
5. Risk of theft of eggs and birds.
6. More loss of energy in movement of birds.

Semi intensive system

This system is adopted where the free space available is limited, but it is necessary to allow 10 square feet per bird for outside run. Shed should be constructed to protect birds at night time, birds lay eggs in the shed. Feed and water is made available in outside run area. This is old method but now a days this method is used for organic eggs and meat production.

Advantages

1. Less space is needed than free range system.
2. Capital investment is low compared to intensive system.
3. Protection from predatory animals and birds.
4. Reduced chances of spread of diseases than free range system.
5. Protection from cold, sunshine and rain.
6. Useful for both egg and meat production.

Disadvantages

1. Low egg production and growth as compared to intensive system of housing.
2. High expenses on labour as compared to free range system.
3. Daily cleaning of run is necessary.

Intensive system

In this system, the birds are confined to the house entirely, with no access to land outside and it is usually adopted where land is limited and expensive. The traditional system of maintaining poultry under free range or semi intensive has been replaced to a large extent by the intensive system. Under intensive system, large number of birds are reared under deep litter or cage system.

Under the intensive system there are two types namely.

A. Deep litter system

In this system the floor of house is covered with bedding material like rice husk, straw, saw dust, ground nut kernels or leaves up to depth of 4-6 inches; the birds are reared on it at all times. It is called deep litter. Deep litter system is commonly used all over the world. It is economical, hygienic, comfortable and safe to the birds. The deep litter should always be kept dry. For this only right number of birds should be housed. The house should be well ventilated. The litter should be stirred at least once in a week.

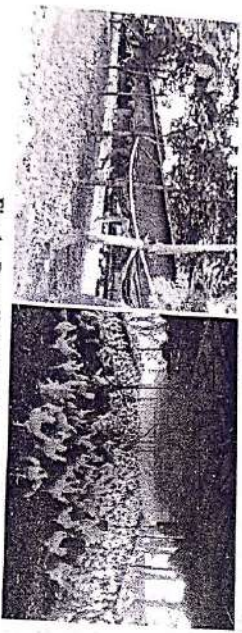


Fig. 1 : Deep litter house

When birds are housed on deep litter, placing of waterer should receive due attention to keep litter dry. At the end of the laying or after selling broilers, litter can be used as manure.

Advantages

1. **Safety of birds:** The birds and eggs are safe in deep litter intensive pen which is enclosed with wire mesh or expanded metal.
2. **Litter as a source of food supply:** It may come as surprise to learn that build up deep litter also supplies some of nutrients requirements of the birds. They obtain "Animal Protein Factor" from deep litter. The level of vitamin such as riboflavin increases up to nearly threefold, according to experiments conducted.
3. **Disease control:** Deep litter kept in dry condition with no wet spots around waterer has a sterilizing action. The level of coccidiosis and worm infection is much lower than the

birds kept in semi intensive method.

4. **Labour saving:** There is no need to clean a pen for a whole year or up to selling of broilers. The only attention required is the regular stirring and adding of same litter material as needed.

5. **Temperature control:** This is an important feature in a hot climate. The litter maintains its own constant temperature, so birds burrow into it when the air temperature is high and thereby cool themselves. Conversely, they can warm themselves in the same way when the weather is very cool. Deep litter house remains cool in summer and warm during winter.

6. **Organic manure:** Poultry droppings get mixed with the litter produces valuable organic manure at the end of growing cycle. Organic manure is an important economic factor with deep litter.

7. It increases egg and meat production efficiency of birds

8. It is very convenient for broiler farming.

Disadvantages

1. Requirement of balanced feed at all times.

2. It remains moist and full of foul smell if not cared properly.

3. It is difficult to control vices of birds like cannibalism, feather pecking, egg eating.

4. It increases chances of disease spread like coccidiosis, salmonellosis etc.

B. Cage system

In cage system the birds are kept in one, two or three per cage arranged in single, double or triple rows. It is useful to those who have small space. Farmers in urban and peri-urban area have found it very useful because they cannot spare open land for rearing birds. The cage system of rearing birds considered as a best intensive system.

In this system each hen is confined to a cage just large enough to permit very limited movement and allow her to stand and sit comfortably. Both food and water is provided from outside of cage. Cage floor set at a slope from back to the front, so that the eggs as they are laid, roll out of the cage to a receiving gutter. With due precaution, cage system can be used for birds of all age groups especially layer type and in all agro climatic conditions.

California type of cages is better than the three or four tier battery cages as it saves labour. Provision of automatic watering and feeding system increases the efficiency of cage system for commercial egg production.

Advantages

1. Economy in space.
2. Better prevention and control of diseases like coccidiosis.
3. Less mortality rate and expenses on medication.
4. Reduced feed consumption and less labour requirement.
5. Increased laying efficiency.
6. Better flock supervision and easy maintenance.
7. Cannibalism is minimized.
8. Convenient for layer farming.

Disadvantages

1. High initial investment.
2. Chances of diseases specific to cage layers include cage layer fatigue, fat liver syndrome and hysteria of chicken.
3. Skilled labour is required.

- Control of odour and flies is difficult

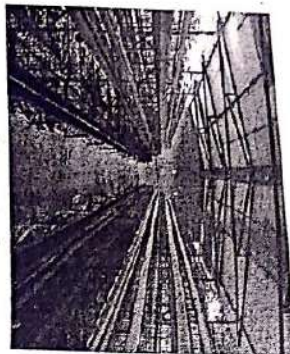


Fig. 8.2 : Cage system house

Table 2: Difference between deep litter and cage system

Sr. No.	Parameters	Deep litter	Cage system
1	Floor economy	Less	More
2	Disease prevention	Less	More
3	Mortality rate	More	Less
4	Expenses on medication	More	Less
5	Saving of feed	Less	More
6	Labour saving	Less	More
7	Supervision	Good	Better
8	Feather pecking	Yes	No
9	Maintenance	Easy	Easier
10	Investment	Low	High

Balanced ration for poultry

Ration is the allowance of feed given to the bird for a period of 24 hours

Ration which supplies the essential nutrients in right proportion according to the requirements for maintenance and various productive functions is called 'balanced ration'

The term nutrient means any single class of feed, or group of like feeds that supports the life and makes it possible for birds to produce meat or eggs.

Types of Feeds

Chickens of different ages require different levels of nutrients. Layer poultry feeds are of the following three types

- Starting poultry feed (chick mash / crumb):** A ration to be fed to chicks from 0 to 8 weeks of age.
- Growing poultry feed (grower mash / crumbs):** A ration to be fed to growing birds in between 9 to 20 weeks of age.
- Laying poultry feed (layer mash):** A ration to be fed to laying birds after 20 weeks of age.

Broiler feeds are of the following three types

- Pre-starter ration:** A ration to be fed during the 0 - 7 days.
- Starter ration (mash / crumbs):** A ration to be fed 8 - 21 days.
- Finisher ration (mash / pellets):** A ration to be fed from 22 days onward to sale.

Feed Requirements

Nutrient required for different types and age group of chicken as per ISI has been given Appendix-1

The feed requirement for different classes of poultry is as follows

Type of bird	Age (Weeks)	Crude protein (%)	Metabolic Energy (Kcal/kg)	Feed Quantity (kg)	Water requirement
Layer					
Chicks	0 - 6	20	2800	2.0	
Grower	7 - 15	16	2500	5.0	Twice the feed consumption
Layer	16 up to culling (72 weeks)	18	2600	40.0	
Broiler					
Pre-Starter	0 - 7 days	23	3000	0.150	Twice the feed consumption
Starter	8 - 21 days	22	3100	0.750	
Finisher	22 days onward up to sale	20	3200	3.00	

Principal points for consideration of feed formulation

- Easy availability of ingredients.
- Palatability of ingredients.
- Maximum inclusion level in feed.
- Cost of ingredient
- Nutrient composition and quality of each ingredient
- Nutrients requirement for poultry according to age, weight, class, breed, type etc.

Methods of feeding chicks, pullets, layers and broilers

A well balanced ration will give the most satisfactory results only when it is properly fed to the birds. Some of the popular methods of feeding are described below

1. Whole grain feeding

This is oldest method of feeding in which birds are allowed to have their required ingredients kept before them in separate containers. Birds are permitted to balance their ration according to individual needs, however, it appears doubtful.

Advantage

- This saves energy in grinding.

Disadvantages

- Several feed hoppers are required

2. More time is required to fill feed hoppers

2. Grain and mash feeding
This method is slightly better than whole grain method. It involves feeding of grain mixture along with balanced mash.

Advantage

- ❖ Protein level can be increased or decreased.

Disadvantages

- ❖ Poultry man should be skilled.
- ❖ It is inconvenient for handling and is time consuming.

3. All mash feeding

This method is common and desirable for all types of birds grown under litter and cage system. All the feed ingredients are ground, mixed in required proportion and fed as a single balanced mixture.

Advantages

1. Selective eating can be avoided.
2. Well balanced ration can be provided.

4. Crumbs / Pellet feeding

Feeding mash is followed by feeding pellets or crumbs. Mash is pressed under steam to make crumbs or pellets. Chicks are given mash or crumb up to 4 weeks and thereafter they may be given pellets. Pellet feeding is more popular in broiler farming.

Advantages

1. Improves weight gain and efficiency of feed utilization.
2. Reduced feed wastage.
3. Prevents selective eating.

Disadvantages

1. Destroys vitamin A.
2. Problems of wet litter develops.
3. Increases cost of feed.

5. Restricted or controlled feeding

The method involves restriction on feeding during growing period (grower) and breeder birds to reduce cost instead of *ad libitum* feeding. Feed restriction to birds can be made by two ways.

1. Quantitative method: Feed restriction on basis of quantity of feed
2. Qualitative method: Feed restriction on basis of nutritive quality of feed

Advantages

1. Delays age of sexual maturity.
2. Decreases the weight of bird at first egg and saves feed.
3. Slightly increases egg production and better egg weight.
4. Lower layer house mortality.
5. Increases feed efficiency.

Disadvantage

- Restricting feed during starter age especially before 6 weeks causes severe stress.

Rearing of chicks

Management of the farm is necessary, not only when chicks are kept but before bringing them is also very important. All in all out and multiple brooding are the two types of system of poultry

farming. All in all out system is important because there is no chance of spreading infection from one flock to other flock.

After selling the birds and bringing the new chicks to the farm, following important procedure should be followed for preparation of shed.

1. Collect all the litter material from the house and transport to the manure pit located away from the farm.
2. Scrap the floor and walls of house to remove all the waste materials present in it.
3. Wash the floor, walls and roof of the house with suitable sanitizer solution.
4. All metal windows should be blow lamped.
5. Clean the area of approximate 1-2 meters around the house.
6. The entire house should be white washed.
7. Poultry house and all equipments should be cleaned, disinfected and fumigated.
8. Brooding / lighting arrangement of the brooder house should be made at least 24 hours before arrival of the chicks.
9. Temperature of the chick house should be maintained before the arrival of the chicks.
10. Chick should be procured from good hatcheries. Ensure weight and the health status before taking the chick.

Chick Management

It is also known as brooding management. The chicks are transferred to a brooder house immediately after hatching and reared up to 6 to 8 weeks of age.

1. **Brooding:** Chicks cannot maintain their body temperature due to under development of thermoregulatory system. Therefore they should be provided artificial heat.

There are two general systems of brooding.

- A. Natural brooding
- B. Artificial brooding

A. Natural Brooding

Requisites for natural brooding are as follows

1. Deshi / broody hen
2. Number of chicks: 10 to 15 per hen.
3. Coop box / basket with soft clean litter

Advantages:

1. Reduces lot of responsibilities of owner as hen takes care of chicks.
2. Suitable for small number of chicks.

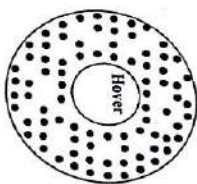
Disadvantages:

- Not suitable for commercial scale.

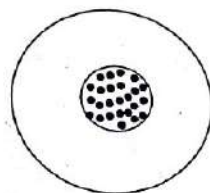
B. Artificial brooding

Requisites for artificial brooding are as follows

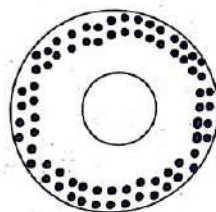
1. **Optimum temperature:** The optimum temperature for chicks in brooder is 95°F. The effect of optimum, low and high temperature in brooder (Fig. 10-1) is as follows.
 1. **Optimum temperature:** Chicks evenly spread out under the brooder.
 2. **Low temperature:** Chicks huddling together in centre.
 3. **High temperature:** Chicks are found at the edge / away from the centre.



A: Optimum temperature



B: Low temperature



C: High temperature

Fig. 1: Distribution of chicks under the brooders.

Age-wise temperature requirement in brooder is as follows

Sr. No.	Week	Temperature
1	First	95°F
2	Second	90°F
3	Third	85°F
4	Fourth	80°F

- Ventilation:** Brooder house should be well ventilated so as to remove dust, moisture from environment to prevent respiratory diseases.
- Sanitation and hygiene:** Brooder house should be thoroughly cleaned, scrubbed and disinfected using half kg chlorinated lime (with 30% available chlorine) in 3 gallons of water before housing the chicks.
 - Litter: Use 5 cm thick layer of suitable litter like saw dust, paddy husk, chaffed straw etc. and stir the litter at frequent interval to prevent formation of cake.
 - Never use mouldy material.
 - Wet litter be replaced by dry litter.
 - Moisture in litter should not exceed 25%.
 - Avoid reuse of old litter.
 - Chick guard: They are placed at about 60 to 90 cm from the edge of the brooder. The distance is adjusted with the age of chicks and normally removed after 4-5 weeks of age.
 - Floor, feeder and waterer space: Floor space of 0.5 sq.ft. should be provided per chick to start with and increased by 0.5 sq.ft. after 4 weeks until the pullets are about 20 weeks of age. Feeder watering space required during first 8 weeks is 0.5 inches. Arrange sufficient number of feeder and water placed alternatively.
 - Feeding of chicks: After bringing the chicks, give them crushed maize on the paper for 2-4 hrs and then offer feed. Chicks should be fed chick crumb/mash up to age of 8 weeks.
 - Protection from Diseases: Chicks are in stress due to transportation, so provide them water with electrolyte on 1st day and from second day onwards give antibiotics along with vitamin A, D₃, E and C for 3 days.

The golden rule that "prevention is better than cure" is appropriate to poultry than any other species of livestock"

1. Vaccination

- Vaccinate chicks against Marek's, Ranikhet disease, Gumboro disease and fowl pox at appropriate age as per table 10.3. Quality of water and its cleanliness has an important bearing on the efficiency of the vaccine.
- Removal of sick chicks: Chicks looking dull, droopy, isolated or sick be removed.
- Disposal of dead chicks: Always dispose off dead chicks promptly either by burning or burying.
- Visitors: Prohibit the entrance of visitor to brooder and rearing house because visitors may carry germs along with clothes, feet, shoes, hands etc. Their feet / shoes must be disinfected by dipping in foot bath or spraying of disinfectant solution before they enter the farm.

- Debeaking:** An electric machine known as debeaker is used for debeaking. Upper beak is cut one half and lower beak is cut one third. First debeaking is done in chicks at the age of 10-11 days and 2nd debeaking at the age of 11 to 12 weeks. Debeaking help in reducing feed wastage and cannibalism. Debeaking is must to reduce cannibalism and feed wastage.

3 Grower/Pullet management

Grower management includes care of pullets from 8 to 20 weeks age.

The technical standards for pullets during growing stage are as below.

- Average weight of pullet at 20 weeks should be 1.2 kg.
- Maximum feed consumption per pullet should be 6.5 to 7 kg.
- Maximum depletion during growing should be 5% including sexing error and culling.

Following care is essential in management of pullet

- Indicuous lighting programme to attain proper sexual maturity at proper age.
- Separation of cockerels as soon as they are recognized.
- Provide enough and clean space to avoid overcrowding in the house.
- Provide fresh, clean, balanced ration, extra shell grit and enough clean water.
- Debeaking should be done at 11 weeks of age.
- Deworm the pullets before transferring to layer house.
- Follow proper vaccination programme.
- Culling: Underdeveloped, weak, disabled and sick chicks must be removed during growing period.
- Transfer pullets to laying house (housing) at 18 weeks of age at one time. Pullets must be given electrolytes and vitamins in water to overcome stress of handling during transfer to laying house.

Layer Management

The flock transferred from grower to layer house at 18 to 20 weeks of age. Layer is defined as egg laying female chicken up to one year. In breeding flocks male should be placed in the laying quarters 1 to 2 days prior to house the females if they were grown separately. Management of breeder male is similar to layer management except that male breeders diet contains extra calcium, manganese and vitamin E to ensure proper fertility and hatchability.

Housing

In India open sided poultry houses are very popular except in very cold areas. California cage system is comfortable and profitable for grower and layer birds. Appropriate distance should be kept in between two houses to allow proper ventilation and prevent disease transmission. Floor space, feeder

space and water space should be provided as per recommendation. One nest is enough for 20-25 layers.

Lighting

Lighting should be increased gradually till it reaches 16-17 hours per day and maintained at that level thereafter. One 40 watt bulb with a reflector hung 2.1 m above the floor would provide the recommended intensity of light for every square meter of floor space. The duration of the light should not be decreased during the laying period. The artificial light hours should be provided both during morning and evening, particularly in summer.

Culling of poultry

Removal of non producer and uneconomical birds from the flock is called culling. The culling of the birds is done with following objectives

1. To increase or maintain good efficiency of the flock.
2. To reduce cost on maintenance of flock.
3. To increase the profit from the flock.

Poultry farmer may start with a good stock but invariably there will be some birds, which do not grow well, or hens which do not lay well. Such birds reduce the efficiency of the flock and also increase the cost of maintenance of the flock, because they require same attention as normal growing birds or good laying hens. Therefore culling of poor layers or non layers is very important and should be a continuous process throughout the year.

The distinguishing features of layers and non layers (Table 10.1) and good layers and poor layers (Table 10.2) are given in the following tables.

Table 10.1: Characteristics for distinguishing layers from non-layers

Sr. No.	Character	Laying hen	Non laying hen
1.	Comb	Large, bright, red, fully expanded	Small, pale with white scale
2.	Wattles	Large, prominent	Small, contracted
3.	Eyes	Bright, prominent	Dull
4.	Vent	Large, oval, moist and bleached	Small, yellow, dry
5.	Pubic bones spread	More than 2 fingers	Less than 2 fingers
6.	Beak	Faded at the base	Yellow at the base
7.	Pelvic bones	Flexible, wide open	Stiff, close together
8.	Spread of body capacity	3 to 5 fingers	Less than 2 fingers

Table 10.2: Differences between good layers and poor layer

Sr. No.	Character	Good layer	Poor layer
1	Eye	Bright, prominent	Dull
2	Ear lobes	Bleached	Yellow
3	Shank	Bleached, thin and flat	Yellowish, round, full
4	Beak	Bleached	Yellow
5	Plumage	Dry, old, brittle, soiled	New bright / clean
6	Time of moulting	Late	Early

7	Vent	Bleached, large oval and moist	Yellow, round, small
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Stress

Factors such as vaccination, debeaking, improper and restricted feed, medication, climatic change and shifting induce stress on birds. This result in drop in egg production, poor growth and increased susceptibility to disease. Vitamins and electrolytes should be given to prevent stress.

Medication and vaccination

The birds should be thoroughly checked daily for any abnormal behaviour and prompt attention should be given to diagnose and control the diseases. Routine prophylactic medication should be given in layer flock for control of salmonella and coccidiosis. Breeder stock should be routinely tested against salmonellosis and all the reactors should be destroyed and not used for breeding. Vaccination schedule should be followed as per Table No. 10.3.

Table No. 3 Vaccination schedule for layers.

Sr. No.	Disease	Vaccine	Age (day)	Administration
1	Marek's disease	HVT vaccine	Day old	0.2 ml s/c (bacterial)
2	Ranikhet disease	F-1/ LaSota / B-1	5-7	1 drop in eye / nostril
3	Gumboro disease	Georgia / Intermediate (live)	14-15	1 drop in eye / nostril
4	Infectious Bronchitis (IB)	IB live massachusetts strain	20-21	1 drop in eye / nostril
5	Gumboro disease	Georgia / Intermediate (live) (booster)	24-25	1 drop in eye / nostril or drinking water
6	Ranikhet disease	LaSota booster	29-30	drinking water
7	Fowl pox	Fowl pox	6 weeks	wing web prick/ intramuscular
8	Ranikhet disease	R,B (Mukteshwar)	8 weeks	0.5 ml S/C or I/M
9	Infectious Bronchitis (IB)	IB live Massachusetts	12 weeks	Drinking water
10	Gumboro disease	Gumboro (killed)	16 weeks	0.5 ml S/C
11	Ranikhet disease	Ranikhet (Killed)	18 weeks	0.5 ml S/C

Hen day production

A hen day average is obtained by dividing the number of eggs laid during a given period by the average number of birds on hand during the same period. The hen day average is usually determined on monthly basis as follows.

$$\text{Total no. of eggs laid} \times 100$$

$$\text{Hen day production} = \frac{\text{Actual no. of hen on that day}}{\text{Total no. of eggs laid} \times 100}$$

Hen house average

It is obtained by dividing the total number of eggs produced during a given period by the number of birds in the flock at the beginning (housing) of the period. The hen-house average is usually obtained on yearly basis. The total number of eggs laid during the year is divided by the number of birds in the flock at the beginning of the year. This method indicates income potential from a flock.

Total number of egg produced in a year

Hen house production =

No. of birds in the beginning of the year

Broiler Management

Broiler is defined as young chicken aged about 6 weeks raised only for meat purpose from a hybrid strain. Broiler grows from a hatch weight of 35-40 gm to a weight of about 1.8 to 2 kg in around six weeks. Broiler production is rapidly increasing year after year as evidenced by increased production of broilers. Success of broiler production rests primarily on the efficient implementation of improved management programme followed by sound marketing system.

The management practices for successful broiler raising are follows

Broiler growing programme

1. All in all out system: This is most practical program for broiler rearing in which only one age group of broilers is on the farm at the same time. All the chicks are started on the same day and later sold on the same day, after which there is a period when no birds are in the premises. The lack of birds breaks any cycle of an infectious disease. All in all out system is profitable for broiler farming.
2. Multiple brooding: Although it has been more profitable to keep one age group of broilers on the farm, recent advances in isolation and disease control have made it possible to keep chicks of several ages on the same farm.

Technical standards

- i. Weight at 6 weeks age : 1.8 - 2.0 kg
- ii. Feed conversion ratio to attain 1.8 - 2.0 kg body weight : 1.85 - 2.0
- iii. Mortality : maximum 3 - 5 percent

Chick quality

- i. Chicks should be from healthy parents.
- ii. Uniform size and weight : Average weight of 100 chicks should be between 3.8 to 4.0 kg
- iii. Chicks should be alert, active and free from deformities.
- iv. Vaccinated at hatchery for Marek's disease.

Housing

Deep litter system of housing is suitable for broilers. Artificial brooding, ventilation, litter management, sanitation and hygiene is discussed in detail in chick management. Management is almost same as chicks, except space, feed and water requirement due to faster growth rate. Floor, feeder and waterer space requirement are 0.5 to 1 sq.ft., 2-3.5" and 0.5-1" respectively depending upon the age.

General broiler management

- i. Check electrical equipment and thermometer.
- ii. Day before chicks arrive, turn brooders to maintain 95°F temperature.

- iii. Use chick guard of 18" height and place it 24" away from brooder.
- iv. Keep crush maize in trays.
- v. Place waterer between feed trays.
- vi. Give electrolyte and vitamin A, D, E and K on first day along with crushed maize.
- vii. After 24 hours, provide antibiotics and vitamins through water and broiler pre starter up to 1st week followed by starter ration up to 21 days and finisher onward up to sale.
- viii. Provide fresh, clean and cool drinking water.

Disease control and vaccination

- i. Keep litter dry to prevent coccidiosis.
- ii. Use coccidiostats in feed. Coccidiosis and chronic respiratory disease are major diseases causing loss in broiler farming.
- iii. Always use prophylactic medication against salmonellosis, colibacillosis and chronic respiratory disease.
- iv. Follow vaccination schedule strictly.

Table 4: Vaccination schedule for broilers

Sr. No.	Disease	Vaccine	Age (days)	Administration dose and route
1	Marek's disease	HVT vaccine	Day old	0.2 ml SC (at hatchery)
2	Ranikhet disease	LaSota/F-1/B-1	5-7	1 drop in each eye/nostril
3	Gumboro disease	Georgia/intermediate (live)	14-15	1 drop in each eye/nostril
4	Gumboro disease	Georgia/intermediate (live)	24-25	1 drop in each eye/nostril or Drinking water
5	Ranikhet disease	LaSota / F-1 (Booster)	29-30	Drinking water

Weight and feed conversion ratio

Broilers are efficient converters of feed into meat. They convert maximum feed into meat within minimum period.

Important parameters to be considered in broiler business are

- i. Weekly live weight
- ii. Weekly feed consumption
- iii. Cumulative feed consumption
- iv. Weekly feed conversion
- v. Cumulative feed conversion

The feed conversion ratio is calculated as follows

$$\text{Feed conversion ratio (FCR)} = \frac{\text{Total feed consumption (kg)}}{\text{Gain in weight (kg)}}$$

On the basis of feed consumption and gain in weight we can calculate FCR which is very important factor in cost of production. The data given in the Table 10.5 represent approximate average performance for good flocks. There may be variation due to management, season, feed, breed etc.

Table 5: Live weight, feed consumption and FCR of broilers

Sr. No.	Age of broiler (day)	Live weight (g)	Cumulative feed consumption (g)	Cumulative FCR (pellet feed)
1	7	150	160	1.06
2	14	400	500	1.25
3	21	700	980	1.40
4	28	1100	1700	1.55
5	35	1500	2640	1.76

CHAPTER - 11

IMPORTANCE, COMPOSITION AND UTILIZATION OF SHEEP AND GOAT MILK

❖ Importance of sheep and goat milk :-

Milk is the lacteal secretion of the mammary gland of generally obtained after lambing or kidding. In nature, it is produced by the mother for the survival of young one. Goat milk contributes 3% of total milk production in India. Goat milk is highly nutritious contains essential higher amount of potassium, iron, vit. A than the cow milk. Goat milk can be use for the humans having lactose intolerance of cow milk. Raw goat milk helps in healing a lot of diseases. It improves platelet count. Free fat globules size is small and fine up to 2 micron and easily digested. Goat milk is rich in antibodies and alkaline in nature used for peptic ulcer patient. Goat milk contains 7 to 10 times as much mineral than cow milk. Milk and curd of goat milk is mild laxative in children. From goat ghee can be prepared. Goat ghee has potense value. The vitamin content of goat milk per litre are vitamin A 2074 IU, vit C, vit D, thiamine, riboflavin, vit B12. Very few Indian goat breeds famous for milk production and they produces average milk yield of 300L in a lactation period of 5 months. These breeds are Surati, Kutchi, Jamunapuri and becle, due to less milk production, milk products like ghee butter is not produces from Indian goat milk only raw milk or curd is sale on retail basis.

❖ General characteristics of goat milk :-

Goat milk contains 3.8% fat, 3.4% protein, 4.1% lactose, 0.8% ash, 8.9 % SNF and 87% water. Goat milk differs from cow or human milk in having better digestibility, alkalinity, buffering capacity and certain therapeutic values in medicine and human nutrition. Density of goat milk is comparable to that of cow milk, while it has higher species gravity, viscosity, titratable acidity, but lower refractive index and freezing point than cow milk. The freezing point of goat milk is about -0.580°C, viscosity 13.4 centipoise at 27°C, titratable acidity as lactic acid ranges from 0.11 to 0.18 per cent. Surface tension of goat milk is within the range of cow milk. The mean pH value ranges from 6.5 to 6.9. The curd tension of goat milk is much lower than that of cow milk. The average value with pepsin-HCL test was 36.

❖ **Functional benefits of sheep and goat milk cheese :-**

Goat cheese, like goat milk, is easier on the human digestive system and lower in calories, cholesterol and fat than its bovine counterpart. In addition, goat milk cheese is rich in calcium, protein, vitamin A, vitamin K, phosphorus, niacin and thiamin. The fats found in goat milk products are high in middle chain fatty acids, which are easier for the body to process than those of cow milk.

❖ **Average chemical composition of sheep and goat milk :**

	Water	Fat	Protein	TS	SNF	Lactose	Ash	Calories/100gm
Goat	87%	4.25	3.52	13.00	7.75	4.27	0.86	69
Sheep	80.7%	7.90	5.23	19.29	11.39	4.89	0.90	180

The chemical composition varies with the individual due to factors like age, breed season, feeding. Indian sheep breed produces very less milk which is sufficient for the survival of their lambs. Exotic sheep breed like a was from Jordan in South West Asia is the highest milking breed after East Friesian breeds of sheep. Ewe milk is less common to make cultured dairy products like sheep's cheese feta (Greece) sheep excellent source of cheese production due to milk is high proportion of fats and proteins. The macromineral can Mg,P and Na are present more in sheep milk commonly processes into frozen dried cheese man's yoghurt dried powder for storage. Sheep milk has higher Caesin content and larger caesin size which functions as a chelator. The size of fat globules is smaller (<3.5micron),the higher Caesin content and plasmin activity in sheep makes more sensitive sheep milk contains about one third more energy than goat milk.

❖ **Utilisation of sheep and goat milk :**

Traditionally, goat and sheep milk is produced in small farms. Fresh goat and sheep milk is sold as pasteurized milk and in variety of packaging in super market chains and health food shops in many western countries. In fact, fresh milk obtained under sanitary conditions from properly fed and managed healthy goats is free from objectionable flavor and odour. The consumer acceptance of goat and sheep milk and its products is reported to be excellent.

1. Khao or Mava :- Khao made from goat and sheep milk is sticky, no release of fat occurs during preparation, yellowish colored with moist surface, hard body and smooth texture. Khao is defined as the partially dehydrated whole milk product prepared by the continuous heating of milk in karahi over a direct fire while also constantly stirring cum scrapping by using a khunti till it reaches a semi solid doughy consistency.

2. Butter :- Butter is defined as a fat concentrate product obtained by churning cream gathering fat into a compact mass and working it. Butter is made exclusively from milk or cream with or without common salt and colouring matter and contains fat not less than 80%.

3. Chhanna :- Chhanna is a traditional Indian milk product obtained by heat and acid-coagulation of milk followed by partial removal of whey. Good quality chhanna has been prepared from goat milk which has been used for preparing Sandesh Rasgulla, Rasomalai, Cham cham, pantaoca etc.

4. Paneer :- Good quality paneer free from goaty odour and flavor can be prepared

5. Curd :- Curd (Dahi) is a well known fermented milk product consumed throughout India. The conversion of milk into dahi is an intermediate step in the manufacture of shrikhand, makkhan and ghee. There are three types of dahi prevalent in the country viz. (i) Sweet mildly sour dahi (ii) Sour dahi and (iii) Sweetened dahi (called misri, lal or payachh). Dahi has higher nutritive value as compared to milk.

6. Chakka / Shrikhand :- The curd (dahi) is partially strained through a cloth to remove the whey and thus produce a solid mass called chakka (the basic ingredient for Shrikhand). This chakka is mixed with required amount of sugar etc. to yield shrikhand. Shrikhand is a semi soft, sweetish sour, whole milk product, prepared from latic fermented curd.

7. Ghee :- Ghee is clarified butter fat. It is prepared on both small and large scale. The ghee is prepared by fermenting whole milk to curd, churning the curd to butter and boiling down the latter to ghee. Ghee is the richest source of animal fat in vegetarian diet. In India, ghee is prepared from makkhan (desahi butter).

8. Cheese :- Soft and semi hard varieties of cheeses are made from goat milk. In European countries, these cheeses are marketed as Premium Cheese. According to Pal et al., 2011, Greece and France have the largest goat milk cheese production. In India, goat milk has been used for making hard cheese. Attempts have also been made to manufacture Mozzarella cheese from blends of cow, goat and/or buffalo milk

9. Yoghurt :- Literature says that goat milk yoghurt is available on most supermarket shelves. The characteristic goaty flavor is completely masked in goat milk yoghurt. Another positive aspect is that it does not show wheying off at 4°C storage as in case of unhomogenized cow milk yoghurt.

10. Infant Foods :- In USA and South Africa, goat milk is sold in evaporated or spray dried form for pediatric use.

11. Special beverage :- The goat and sheep milk standardized to 2% fat and 10.5% SNF was fortified with Vitamin A and D to label it as protein fortified low fat goat milk.

CHAPTER - 12

MARKETING OF GOATS & SHEEP

Marketing of Sheep and Goats their products :

The population of sheep and goats in India has shown increasing trend from 1951 to 2019 sheep population 74.26 million in 2019 and goat population 148.88 million. With the economic developments, the house-wives living in big towns and cities have been looking for meat cuts that require less preparation for cooking and to better retailing services in general. Thus the meat marketing system is enlarged to provide wider range of meat and meat products including that of sheep and goat meat and in particular the range of processing facilities including canning, sausage making, smoking, precooking and other related enterprises.

Marketing of live sheep and goats and sheep and goat meat in India is in a primitive way though the goat population has been increasing alarmingly. Goats are not fattened for meat purpose and thus the dressed weight of carcasses is less and there is lack of marketing in meat apart from receipt of less price from importers and low per capita availability. The transport facilities for live sheep and goats and their meat are inadequate for domestic consumption as well as for export. Same is the situation for preservation and storage of meat. There are many problems in marketing of sheep and goat commencing from procurement of sheep and goats to sale of meat, including exploitation by middle-men and lack of marketing infrastructure, movement, selling up of slaughter houses, enforcement of quality control on meat, absence of grading of sheep and goats and meat.

Marketing of live sheep and goat :

Sheep and goats from or the small traders. The goat farmers sell their sheep and goats to the local traders or in the market whenever they are in need of money without villages are taken to the nearby livestock markets by the sheep and sheep and goat farmers/keepers taking adequate measures for obtaining the optimum price for their animals. Normally they do not prepare animals for the slaughter purposes by feeding extra energy in the form of concentrates. In the absence of any coordination among the sheep and goat farmers there is no cooperative system of marketing of their sheep and goats. They are also illiterate and they are not well versed with the market information and they squarely depend upon the brokers/buyers in the local market.

The local traders, who buy sheep and goats from sheep and goat farmers/keepers also look forward to brokers as they are also not fully conversant with the prices prevailing in the major markets and the price at which they can sell the sheep and goats in local markets. The sheep and goat which are assembled in the local markets are taken to the local slaughter traders and some of them are sent to the big town/city (terminal) markets. Some of the big from small markets to market them in big markets directly or through commission agents. In the small markets the mediators are called as brokers or middle men and in the big markets they are called as commission agents. Though these people are supposed to help the

producers/local traders/big traders to market the sheep and goats in the respective markets and charge the fee from them. Most of the mediators collect collected from both the sellers and the buyers.

So far there has been no undertaking or contractual arrangement between the sheep and goat farmers and the butchers or the management of the big meat processing units for purchase of sheep and goats on regular basis that too laying down number of animals required, the type of animals and the size of the animals, the delivery and payment schedules etc. The livestock markets are mostly weekly markets and they are owned privately or trust or by local bodies (panchayat/ municipality/ corporation). Most of the livestock markets where sheep and goats are being marketed do not have the facilities even for shelter. The Bureau of Indian Standards (the then ISI) has laid down specifications for regulated market yards for cattle under 1788-1961 and in spite of it, no tangible achievement has been made to adopt the minimum requirements for marketing of goats. Some of the agricultural marketing departments of states have also brought marketing of livestock under Agricultural Produce Markets Act (APMA) notified in different years by various states. The sheep and goats are assembled in city markets and they are normally grouped in lots of 10 or 20. Sometimes they are also sold as truck load numbering around 200.

Though there is no system of licensing or legalising the merchants, brokers, workers for transshipping and stall dealers in small towns, but all the functionaries in the markets particularly those maintained by local authorities or the State Governments governed by the APMA are licensed and annual fee for the same is collected. Most of the sheep and goats which are brought to livestock markets are sold in the same market and few of them are taken back or moved to the neighboring markets.

Prices settled by seeing or identifying of sheep and goat like animals for its musculature, fat distribution, etc. and of the following ways in the markets:

- (i) Direct or private treaty where buyers announce their offers publicly or through secret whispers to sellers,
- (ii) Negotiations through brokers directly,
- (iii) Negotiations under the cover or hatha system, and
- (iv) Auction.

Through the auction or the bid system of purchases is ideal, most of the transaction takes place under the cover or Hatha system and most of it through the brokers. It is difficult for even an educated person to know from outside what happens under the cover or hatha system. In some cases advance payment is made to the small traders/sheep and goat farmers and in the regulated markets it is only formalizing the deal that took place. Sheep and goats are also sold in some of the annual fairs in the country.

marketing have more than their due share in the buyer's rupee resulting transfer of very small sum to the producers. This has resulted in the inadequate attention to improve the conditions of goat meat producer in the country.

Meat : The primary product from goats and sheep is meat. There is a demand for animals of allages, weights and qualities (unlike beef, pork and poultry that have well defined carcass

and quality targets). Market price is influenced by supply and demand, dressing percentage and the carcass quality of the animal offered for sale. Neither the goat or lamb meat trade has a use for excessively fat animals.

Most goat and lamb is sold bone-in. Packers generally sell young goats as whole carcasses, which then may be quartered for retail presentation. Fabrication specifications for retail products can vary significantly, depending on consumer group preferences. Older goats are usually processed and sold as bone-in cubes. Small lambs may be presented for retail sale similar to kid goats. Heavier lambs (>50 lb carcass) are generally fabricated in to the four retail cuts (leg, loin, rack and shoulder), each of which may be further fabricated before sale.

Offal : Offal includes uneatable like organs the head, skin, shanks and viscera. Some consumers enjoy dishes prepared from the head, organ meats and/or the viscera.

Goat and sheep skins yield very high quality leather.

Most fresh skins are salted and exported 'raw' to other countries (ex. Mexico) for tanning.

Market Timing :

Most goats and lambs are born in the spring and come to market mid-summer to late fall. Consequently, supply often exceeds demand during late summer and early fall and prices soften. Kid and lamb prices are historically the highest from mid-November through the Easter holidays. Holidays and religious celebrations often drive market prices higher.

Breeding Stock :

Kids, lambs and yearlings of acceptable quality and confirmation can often be sold at a premium to their value as a slaughter animal.

If using the services of a commission company, let the marketing professionals know you are bringing quality replacement breeding animals, thus providing them an opportunity to promote your consignment.

When culling breeding females (especially does), if forage conditions permit, allow thin females to gain some condition and udders to dry up before marketing.

Thin does with distended udders have little market value.

May is historically the worst month of the year to sell cull ewes.

The major problems involved in marketing of meat are:

1. Lack of education at the level of butchers.
2. Absence of hygiene or poor maintenance in slaughter houses and lack of transport and storage facilities.
3. Most of the meat shops are also not ideally suited though meat is highly perishable.
4. Cost of transport and refrigeration.
5. Ignorance of consumers about the quality of the meat produced and marketed.

Marketing Agencies :

Producer can sell his sheep and goat and hair through a number of different agencies. These include private enterprises and cooperative associations.

a) Private enterprises :

These can be divided into local dealers, state dealers, central market dealers, commission merchants, brokers and manufacturers.

b) Cooperative associations :

These may also be divided into local, state wide and nation wide.

There are now agencies which correspond to all of these designations.

All of them may perform a similar service, i.e. assist in getting the hair/wool from the producer to the manufacturer, but the objective may be different and the character of the services vary widely.

There are no organized markets in India.

The village agents of big merchants or of mills buy hair/wool from the sheep and goat farmers mostly on per sheep and goat or per fleece basis, against money advanced to the sheep and goat farmers

Market Observations :

- Regardless of age, healthy, well conditioned animals top the market.
- Unhealthy, lethargic or thin animals are generally discounted.
- Sell when it rains (or other inclement weather that restricts the numbers coming to a weekly auction market).
- Sell when nobody else does.
- An 'optimum' live weight for young slaughter goats is 60 lbs.
- Goat kids weighing 46-49 pounds are difficult to sell. In this narrow weight range, goats are too heavy for the traditional 'cabrito' market and too light for the markets on the coasts and in the northeast. Maximum live weight for the cabrito market is 38-42 pounds.
- Castrate male goats/lambs. Wethers/muttons sell well any time of the year and will bring "top dollar all day". Although opportunities exist to sell intact male goats/lambs for a premium (to castrates), these opportunities occur infrequently and are relatively small in size (number of head required).
- Another justification for castrating young lambs or goats to eliminate the possibility of ewe lambs or doe kids breeding prematurely.
- Woolled breed lambs (finewools, medium wools and crosses) remain in demand, both as feeders and fairs.
- An 'optimum' target slaughter weight for hair lambs is 60-70 pounds.
- Compared to the woolled breeds, the hair sheep are earlier maturing and fatten very quickly. Consequently, harvest weight for fed hair lambs (with 0.5 inches of backfat or less) will seldom exceed 100-120 pounds.
- The summer months (June - September) are generally a difficult time to sell hair lambs and market prices are usually at their annual low.

SELECTION OF EGGS, INCUBATION, HATCHING AND BROODING IN POULTRY

Eggs should be collected for incubation which are laid after one week selection of eggs incubation, hatching and brooding in poultry

For selection of eggs for hatching following points are considered

- 1) Hatching of eggs refers to the production of day old chicks.
- 2) Examine external quality like shape 2 texture of shell. All hatching eggs should have uniform shape. It should not be too large or too small
- 3) Examine internal quality of egg for albumen, yolk, absence of blood spot
- 4) Albumen quality judge and by haugh unit and yolk quality of yolk index
- 5) Dirty soil eggs should not be used for hatching size and shape of eggs and condition of egg shell are most important criteria for selection of hatching eggs
- 6) Discard eggs with hair crack sell and 2 birds sulphuring from salmonella

Incubation :- Means hatching of eggs by means of providing heat

It is two type

1. **Natural incubation :-** Mother hen sits on the eggs by her feathers 2 her abdomen. In natural incubation mother hen hatch 12 to 14 eggs

2. **Artificial incubation :-** An equipment incubation is used for providing artificial heating and humidifying the air and fresh air supply to chamber. Incubation is eggs hatching machine. The capacity of the incubation is range from 100 to 10000 eggs and hatching ratio is 91 to 95%. These machines regulate The incubation temperature and perfect humidity. Now a day fully automatic digital eggs incubator machines are used.

Collect about 7 days of eggs for hatching older eggs more than one week don't hatch well.

The physical factors necessary for successful incubator temperature humidity gaseous environment and turning of eggs optimum and uniform temperature inside the incubator is very essential. In case and electricity supply is stop alternative arrangement for generator should be kept ready the incubator temperature and humidity is maintains by the manufacturer direction. The temperature range varies from 99.5°F to 100.5°F for forced draft type incubators and about 4°F higher for still air incubator. Optimum temperature for holding fertile eggs before incubator varies from 50 to 70°F Average 65°F and relative humidity maintain 70 to 80%. Abnormal temperature and humidity results in to increase in embryonic mortality weak chicks and less hatching ratio.

The relative humidity should be around 60 percent in last 3day of incubation. Inside the incubator carbon dioxide concentration should not exceed 0.5 percent hence adequate ventilation with fresh air is essential in incubator room. While setting the eggs in incubator precaution should be taken that always kept eggs with broad end up word and narrow end downward automatic turning of eggs trays turn through the angle of 90° no turning is required after 18 days of incubation. Testing of incubated eggs by candling examination is carried out on 7th day and on 18th day to remove eggs with dead germ.

Hatchery :- A place where day old chicks are hatched and available for sale. At the beginning the hatchery room incubator is disinfected by fumigation to kill all disease causing organisms to prevent spoilage. The incubator should be start at least 24 hrs before setting the eggs to maintain constant temperature. Only Pearson's working in hatchery should be allowed with strict sanitation practices.

Brooding of chicks :- It is also known as brooding management. The chicks are transferred to a brooder house immediately after hatching and reared up to 6 to 8 weeks of age.

Brooding :- Chicks cannot maintain their body temperature due to under development of thermoregulatory system. Therefore they should be provided artificial heat.

There are two general systems of brooding :-

- a) Natural brooding
- b) Artificial brooding

A. Natural Brooding :-

Requisites for natural brooding are as follows

1. Deshi / broody hen
2. Number of chicks: 10 to 15 per hen.
3. Coop box / basket with soft clean litter

Advantages :-

3. Reduces lot of responsibilities of owner as hen takes care of chicks.
4. Suitable for small number of chicks.

Disadvantages :-

- Not suitable for commercial scale.

B. Artificial brooding:-

1. **Optimum temperature :-** The optimum temperature for chicks in brooder is 95°F. The effect of optimum, low and high temperature in brooder (Fig. 10.1) is as follows.

4. **Optimum temperature :-** Chicks evenly spread out under the brooder.
5. **Low temperature :-** Chicks huddling to gether in centre.
6. **High temperature :-** Chicks are found at the edge / away from the centre.

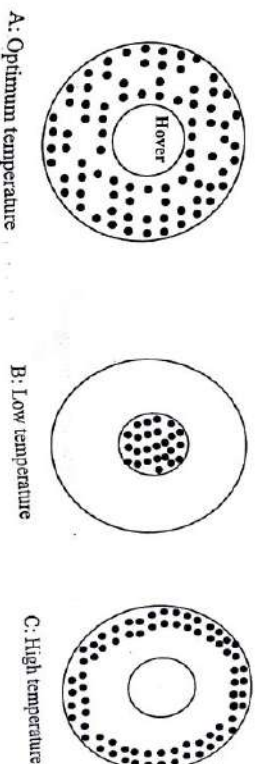


Fig. 1: Distribution of chicks under the brooders.

Age-wise temperature requirement in brooder is as follows

Sr. No.	Week	Temperature
1	First	95°F
2	Second	90°F
3	Third	85°F
4	Fourth	80°F
5	Fifth	75°F
6	Sixth	70°F

Artificial brooding is practiced in all commercial poultry farms. It is artificial rearing of chicks from 1st day to 6 week by providing warmth at controlled temperature in the brooder house. Normally electric bulb or electric room heater are used to maintain warmth during brooding process.

As brooding is required for faster growth of fadlers on the body of the chicks to protect from cold weather. Brooding is most important in winter and rainy season.

Make alternative arrangement of warmth if electric failure occurs. Otherwise due to electric failure and darkness will result in huddling of chicks resulting death due to piling of chicks on each other. The behaviour of chicks provides better indication of whether they are getting desired amount of heat. When the temperature is less chicks try to get closer to source of heat and huddle down under the brooder. When the temperature is too high they will get away from the source of heat they gather towards chick guard. When the temperature is right the chicks evenly scattered. Hover type electric brooders are most common types of brooders commonly used.

Types of brooder commonly used are :-

- Gas brooder
- Electric brooder
- Infra red bulbs
- Hovers
- Electric heaters

Battery brooders are used for large scale poultry farming.

Chapter - 14 PRESERVATION, GRADING, MARKETING OF EGGS AND ITS ECONOMICS

- In order to preserve eggs only good quality eggs should be produced. Therefore any method of preservation starts from the point of production itself.
- The following practices are recommended as routine for the production of quality eggs on the farm.

- Collection of eggs at least 3 times daily.
- Using a clean receptacle with ventilated sides and bottom, preferably filler flaps.
- Careful handling of eggs during collection and while keeping in filler flaps etc.,
- Eggs Cooling at 50 °F quickly or relative humidity less at 75-85%
- Marketing the eggs twice in a week.

Preservation :

- The shell of an egg normally carries a wide range of microorganisms on its surface which are mostly responsible for spoilage of eggs.

- Various methods have been used in the past to counteract this and extend the shelf life of eggs. These include:

Dry packing :

- Eggs are kept in an earthen pot with clean dry packing material and the pot is buried in wet sand.

Immersion in liquids :

- This is fairly an old method and it primarily prevents the evaporation of moisture from the egg.
- Depending on the liquid used it may also inhibit bacterial decomposition by chemicals action or by physical means such as occlusion of air passages/pores.

❖ Lime water treatment

- Lime water is prepared by mixing about 0.5kg of quick lime (calcium oxide) in about 1 litre of boiling water.
- The mixture is left to settle overnight and the clean supernatant liquid is poured out into a jar.
- Sodium chloride of 112 grams per litre may also be added to increase the specific gravity of water and will minimise the chance of breakage of eggs.
- In this solution, 2.5 liters of cold water is added and filtered through muslin cloth.
- Keep the eggs to be preserved in a glass jar or earthen pot and pour the lime solution over the eggs till all the eggs are completely immersed.
- Eggs have to be kept in this solution for 24 hours to get maximum beneficial effect.
- After 24 hours they are taken out, dried and arranged in filler flaps.
- Eggs can be kept for 2-3 months in a good edible condition at normal ambient temperature.
- The only disadvantage however, is the taste of lime can be detected in the eggs.

- Water glass method
 - A 10% solution of sodium silicate is prepared in hot water and allowed to cool.
 - The cooled solution is poured into a jar containing the eggs till they are immersed completely.
 - The jar is covered and kept in a cool place where the temperature should not exceed above 70°F.
 - Eggs preserved by this method are usually punctured before boiling to avoid the breakage of shell while boiling and it also helps for easy peeling of shell.
- ❖ **Shell - Sealing treatments :**
- When the shell is sealed through this treatment the water vapour and CO₂ do not escape and microorganisms are unable to penetrate the shell.
 - Coating with oil
 - The rate of CO₂ escape is considerably reduced.
 - This is a fairly successful method of rendering the egg less permeable.
 - It can be done by simply dipping the egg in a bowl of tasteless, odorless, colourless edible oil, having a specific gravity of about 0.855 to 0.870 at 15°C; viscosity should not be more than 70 to 90 and having a high boiling point so that at lower temperature it remains in the liquid form.
 - The eggs are immersed only for a moment and are then removed and the excess oil is allowed to drain.
 - If oil treatment is to be effective it should be done preferably at the point of production the day after the egg is laid.
 - Oiling is not a substitute for refrigeration.
 - These eggs must be held at a low temperature.
 - Cotton seed, linseed and groundnut oil are good sealing agents but mineral oils are preferable since they are less subject to oxidative changes during storage. oil immersed eggs and these eggs are not likely to absorb foreign odours.
 - The oil treatment can also be done by spraying using a hand or electric sprayer.
 - Eggs can be sealed under vacuum.
 - Oil may be successfully used in vacuum impregnation method.
 - The egg is first immersed in oil and then subjected to reduced atmospheric pressure, when normal pressure is restored the tendency of the air to enter the pores of the shell causes the solution also to be drawn in.
 - The oil does not penetrate through the egg membranes.
 - The commercial egg treatment with oils are
 1. Heavy paraffin oil (Central Food Technology Research Institute)
 2. Myvacet 9-40 (developed at CFTRI - Mysore)
 3. Myvacet 5
 4. Myvacet 7
 5. Petroleum jelly
 6. Liquid paraffin
 7. Paraffin wax
 8. Coconut oil
 9. Dalida
 10. Carboxyl methyl cellulose
 11. Technical white oil.
 12. Thermostabilization

- This method is good for fertile eggs since it kills the embryos and therefore is also known as 'defertilization' method.
 - It essentially consists of immersing shell eggs in hot water at 130°F for 30 minutes which tend to coagulate the albumin and then the egg is cooled under tap water.
 - Treated eggs remain edible for 3 to 4 weeks even during summer months.
 - Though this method has many advantages such as stabilizing of the albumin and sterilization of the egg shell, the egg loses the property of foaming to a remarkable extent.
 - Moreover, embryonic development in fertile eggs is completely arrested.
 - Over-wrapping
 - For over wrapping of eggs polyethylene, cellophane, polyvinylidene and other transparent, thin but sufficiently strong, films are used.
 - These films should be impervious to gases and moisture.
 - Over wrapping of eggs in different atmosphere like carbon dioxide, vacuum etc. have been tried.
- ❖ **Cold storage :**
- This is the best and most efficient method for commercial storage.
 - Eggs for cold storage must be clean, unbroken, and free from fungus and other infections.
 - A temperature of 0°C or 30-32°F and relative humidity of 85-90% is recommended for cold storage of eggs to preserve them for 5 to 8 months.
 - For short period of preservation of 2 to 3 months, eggs can be stored at 10-12°C or 50-55°F with a relative humidity of 60-70%.
 - Intact eggs are held at the lowest possible temperature that will avoid freezing and bursting of the shells.
 - It has been observed that intact eggs do not freeze at temperature between -1.5°C and -2°C and the relative humidity must not go beyond 90%.
- ❖ **Dried and frozen eggs :**
- This is another method of preserving egg contents or edible eggs.
 - Egg products of commercial utility are prepared by drying or freezing eggs.
 - Albumin flakes, yolk and egg white powder can be produced by drying process.
 - Frozen yolk or frozen egg white can be produced by freezing.
 - For egg white powder production the best known method is spray drying and for albumin flakes, pan or cabinet drying method is mostly adopted
- ❖ **Grading**
- I Grading of eggs :**
Grading is the classification of eggs into different categories. It helps in reducing wastage and facilitates uniform packaging, pricing and quality assurance to the consumers.
- Egg grading involves inspection of
- i. Egg weight
 - ii. Shell cleanliness and soundness
 - iii. Internal quality
 - a. Size of air cell

- b. Firmness of albumen
- c. Position of yolk
- d. Blood and meat spots

Egg can individually flash candled to detect the above defects. The standards for table eggs are given in following fig.

In India, eggs are graded according to the weight into 4 grades. Extra large - more than 60g, large - 53-59 g, medium - 45-52 g, small - 38-42 g. Clean eggs with unbroken shell are graded on quality depending upon depth of the air cell. Centering of the yolk and free defects are given grade A and B in India.

❖ Egg Grades :

Eggs sold at grocery stores in Alberta are primarily Grade A eggs. When examined at the grading station, Grade A eggs must meet the following requirements:

Grade A :

- Thick white
 - Round, well centered yolk
 - Small air cell (less than 5 mm deep)
- Clean, uncracked shell with normal shape

Grade B :

- These eggs are mostly used for commercial baking or go to hospitals, restaurants, etc. Very few are sold at retail stores.
- Yolk is slightly flattened; white is thinner.
- Shell is uncracked and may have a rough texture; and/or be slightly soiled and stained

Grade C :

- The lowest egg grade, these are used in the production of processed egg products only. They are not sold in grocery stores.
- Yolk is flattened and may be oblong in shape; white is thin and watery.
- Shell may be cracked and/or stained.
- Candling is done to observe the internal qualities of eggs through a source of light such as depth of air cell, free or movable air cell, bubbly air cell, blood spots and meat spots in the eggs, etc.
- **Depth of air cell**
The depth of the air cell is the distance from its top to its bottom when the egg is held air cell upward.
- **Free air cell**
An air cell that moves freely towards the upper most point in the egg as the egg is rotated slowly.
- **Bubbly air cell**
A ruptured air cell resulting in one or smaller separator air bubbles usually floating beneath the main air cell.

Grading of chicken eggs :

- Eggs are graded and marketed based on weight and
- quality

BIS standards based on weight :

- Extra large - 60 g and above
- Large - 53 to 59 g
- Medium - 45 to 52 g
- Small - 38 - 44 g

Table 9: Grade designation and quality of table eggs produced in India

Sr. No	Grade	Weight per egg (g)	Shell	Air cell	White	Yolk
Grade "A"						
1	Extra large	60 & above	Clean unbroken & sound. Shape normal	Up to 4 mm in depth, particularly regular or better	Clear, reasonably firm	Fairly well centred practically free from defect. Outline indistinct
2	Large	53-59				
3	Medium	45-52				
4	Small	38-44				
Grade "B"						
1	Extra large	60 & above	Clean to moderately stained & sound.	8mm in depth, may be free & slightly bubbly	Clear, may be slightly weak	May be slightly off centred out line slightly visible
2	Large	53-59				
3	Medium	45-52	Shape slightly abnormal			
4	Small	38-44				

Source - Indian Poultry Industry, Year book 1990, 9th Edn.

❖ Marketing of Eggs :

- **National egg coordination committee :** (NECC) is an association of poultry farmers in India with a membership of more than 25000 farmers. NECC played significant role for betterment of the poultry industry in general and the egg industry in particular, through its various programmes like market intervention, price support operation campaigns, consumer education, market research, rural market development and liaisons with the govt. on vital issues concerning the industry.

• Marketing organization for eggs :

In marketing of eggs it includes marketing organization of eggs. The greater the distance between producer and consumer, the more complex is the marketing organization required to market their eggs reach consumers in the form, place and time desired. Producers may decide to market eggs produce directly to consumers - direct marketing - or may choose from a variety of marketing organizations that make up a marketing channel.

❖ Direct marketing includes the following methods of selling :

- sales from the farm (farm gate);
- door-to-door sales;
- producers' markets; and
- sales to local retail shops.

A typical marketing channel is made up of :

- collectors;
- assembly merchants;
- wholesalers; and
- retailers.

Figure - Direct marketing

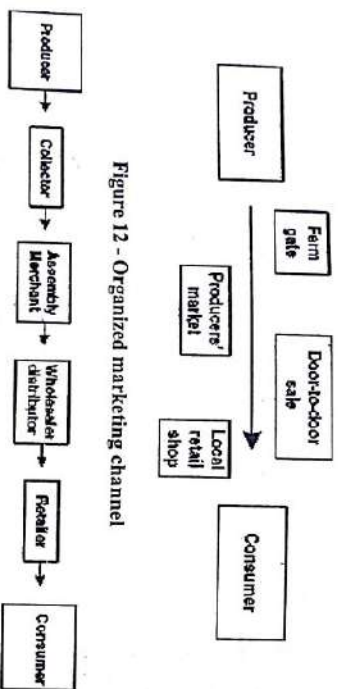


Figure 12 - Organized marketing channel

❖ Direct Marketing :

Egg producers who are situated a short distance from consumers may be able to practise direct marketing. Before choosing to sell their products directly to consumers, however, they must evaluate two main factors:

- Time. Producers who choose direct marketing have less time for production activities.
- Cost. The costs involved in direct marketing.

There are four main ways to carry out direct marketing.

Sales from the farm :

Producers may be able to sell eggs directly from the farm (farm gate). This, however, will depend on whether consumers are able and willing to go to the producer's facilities. The main advantage of farm-gate selling is that the producer may be able to obtain a market price for eggs without incurring marketing costs. The main advantage for the consumers is that eggs will be fresh with little or no quality loss.

Door-to-door sales/street hawking :

Some consumers prefer that eggs be brought directly to their door. This means that the producer must spend time on marketing; however, consumers may appreciate the service and be willing to pay a good price. Furthermore, the producer can take orders directly from consumers and carry only what he/she is assured will be bought.

Producers' markets :

Usually the producer simply occupies a stall in a public marketplace and offers his/her produce for

sale. Eggs are commonly displayed in baskets and often differentiated by weight/size and colour. Sales in producers' markets permit a farmer to make direct contact with consumers who are not able to go to the production facilities. The main disadvantage of using such markets is that, towards the end of the day, the producer may have to either reduce his prices sharply to dispose of remaining stock or carry it back to the farm.

Sales to local retail shops :

Producers can also sell directly to local retail shops. This requires some short time agreement between the two parties regarding constant supply, quality and payment methods. In some cases it may be possible for producers to sell directly to institutional consumers such as hotels, restaurants, schools and hospitals. This type of direct marketing, however, requires negotiation, which may result in a written contract of the duties and obligations of both parties. It also requires continual interaction over time between producer and buyer, a standard egg quality agreement and a constant supply. The producer must carefully evaluate the issues involved including the regular production and transport of large quantities of eggs.

Marketing channels :

A marketing channel is composed of a set of separate but interdependent organizations involved in the process of making a product available to consumers. The use of a marketing channel is convenient particularly when the producer does not have the time or financial means to carry out direct marketing. Intermediaries are usually able to make the product widely available and accessible because they are specialized and have experience and contacts. They also have a better understanding of the egg market. Intermediaries take the risks involved in marketing and also pay for the produce immediately.

❖ Marketing Intermediaries :

Collectors :

Collectors undertake the initial work of collecting eggs from various producers or local country markets. They operate either on a commission basis or by purchasing on their own account. Where the quantity of eggs collected at each stop is small and frequent, this system is often the most economic. Collectors may be itinerant merchants, producers themselves, assembly merchants, wholesalers and retailers.

Assembly merchants :

Assembly merchants may be divided into the following categories: local assembly market, independent processor-packer, and, cooperative processor-packer.

Local assembly market : In a typical local assembly market, a private firm, a producers' cooperative or a municipality provides an enclosed space for the use of sellers. Sales may take place by public auction or by private negotiation, subject to rules such as those on quality and payment arrangements. Auctioning requires the eggs to be graded and possibly presented in standardized containers, marked with identifying names or symbols. The local assembly market may provide cold storage facilities for the convenience of market users.

Independent processor-packer : This type of enterprise usually purchases eggs either through collectors or directly from producers. The processor-packer may pass by the farm and pick up the eggs or the producer may deliver the eggs to the processing facilities where they are graded and packed. Usually eggs are sold to wholesalers; however, they are also sold directly to retailers and institutional consumers such as hotels, restaurants and hospitals.

Cooperative processor-packer : The same as enterprise may be set up and run by a cooperative association of producers. The main advantage is that the business is run by and for those who use it, rather than by those who own it.

Before forming a cooperative, producers should carefully evaluate:

- the market for eggs;
- problems in existing marketing channels and how to remedy them;

- the degree of know-how that producers have in marketing;
- rules and regulations;
- legal status;
- availability of finances;
- staffing requirements; and
- appropriate geographic location.

Wholesale distributor :

Wholesaling includes all the activities involved in selling goods to those who buy for resale or for business use. The main function of the wholesale distributor is to balance supplies against retail requirements. Wholesalers usually have a good knowledge of the market, access to the best information on trends and prospects and working capital to carry business risks as required.

Wholesalers usually obtain eggs from central wholesale markets, assembly merchants, collectors and local country markets; however, in some instances they go directly to the producers. Eggs may be purchased directly or accepted for sale on a commission basis.

Central wholesale markets :

Central wholesale markets receive shipments from large farms and from country markets, and constitute a supply source where wholesalers and retailers can obtain the various types of produce they need. Central market is usually the primary price-making mechanism for the production areas it serves. In this way it balances demand and supply.

Retailer :

In urban areas, egg sales are made through retailers. Four types of retailers usually carry eggs in their shops:

- poultry shops where only eggs and poultry are sold;
- food shops specializing in eggs, poultry, cheese, butter, meat and fish;
- general food shops and supermarkets selling all kinds of foods and household goods; and
- meat markets where all types of meat are sold and eggs are also offered for sale.

In some instances retailers buy eggs directly from the producer and may have their own process-packing facilities.

❖ Evaluation of the marketing channel :

Before choosing a marketing channel or channels to market eggs, producers should carefully evaluate the following factors:

- market requirements and their ability to meet these;
- the type of intermediaries available;
- the number of intermediaries necessary to reach the market;
- alternative intermediaries different from the established marketing channel;
- the responsibilities of intermediaries and terms of possible agreements;
- costs involved;
- possible sales by the marketing channel; and
- the possibility of selling through a number of marketing channels

CHAPTER - 15 STUDY OF DISEASES OF SHEEP, GOAT AND POULTRY

The diseases of sheep and goats are primarily divided into two types contagious and non contagious diseases. Contagious diseases includes Enterotoxaemia, Anthrax and Hemorrhagic septicaemia are the bacterial, while Foot and Mouth disease, Rinderpest, Contagious pleuropneumonia and Sheep or Goat pox are the viral disease. Mastitis, Diarrhea and Mange are the non-contagious of importance.

Health :- Health denotes physical, physiological and mental well being of an individual.

Disease :- Disease means any deviation from normal state of health or normal functioning of any or all the tissues and organs of the animal body.

Etiology :- Study of causal organism of disease.

Classification of Diseases :-

A. According to mode of origin :-

1. **Hereditary diseases** - Are transmitted from parents to the offspring e.g. Hemophilia.
2. **Congenital disease** - Are acquired during intra-uterine life, e.g. TB.
3. **Acquired diseases** - Are acquired after birth.

B. According to Specific Cause :-

a) **Specific Disease** - are produced by specific pathogen or factor.

1. Infectious Disease

- are caused by pathogenic organism

• Bacterial disease - H.S.B.Q., Anthrax, Brucellosis.

• Viral diseases - Rinderpest, FMD.

• Protozoan disease - Surra, Theileriosis.

2. **Non infectious disease** - are caused by physical or Chemical or poisonous agents, nutritional deficiency or disturbed metabolism, e.g.

- Deficiency disease - Rickets
- Metabolic disease - Milk Fever

b) **Non-specific disease** - Those diseases whose cause are indefinite or multiple e.g. Diarrhea.

C. According to mode of spread :-

contagious disease - Spread by means of direct or indirect contact, e.g. FMD,

All contagious disease are infections but all infectious disease may or may not be contagious.

Non-Contagious disease - Do not spread by means of direct or indirect contact, e.g. Rickets.

D. According to duration and severity :-

1. **Peracute disease** - Disease is characterized by very short course i.e. few hours to 48 hours and very severe symptoms, e.g. Anthrax

2. **Acute disease** - Disease is characterized by short course i.e. 3 to 14 days and severe Symptoms, e.g. B.Q. and HS.

3. **Subacute disease** - Disease characterized by course having 2 to 4 weeks and severity is less than acute one. e.g. FMD, Subacute mastitis.
4. **Chronic Disease** - Whose course is more than 4 weeks and signs are not severe in character. e.g. Tuberculosis

E. According to intensity and spread of disease :-

1. **Spontaneous disease** - Affects one or two animals and shows little or no tendency to spread within the herd. e.g. Johnes disease.
2. **Enzootic/ Endemic diseases** - Means an outbreak of disease among animals in definite area or particular district. e.g. Anthrax, H.S.
3. **Epizootic/ Epidemic diseases** - Which affects a large population of animals in large area at the same time and spread with rapidity. e.g. FMD and Rinderpest
4. **Panzyotic / Pandemic diseases** - is widespread epidemic disease Usually of worldwide distribution. e.g. Influenza
5. **Zoonotic disease** - A disease which can be transmitted Man and vice versa. e.g. Anthrax and Brucellosis.

❖ General measures for prevention Contagious diseases

1. Identification of diseased animals and isolation of diseased animals.
2. Treatment of affected animals.
3. Slaughter of animals suffering incurable diseases.
4. Disposal of dead animals by burning/ deep burial.
5. Destroy contaminated fodder by burning.
6. Regular cleaning and disinfection of cattle shed and premises.
7. Disposal of contaminated water.
8. Do not allow grazing affected area to clean area.
9. Do not allow animals to drink water from ponds, rivers etc.
10. Regular spraying of insecticides to control ectoparasites.
11. Regular deworming to control internal parasites.
12. Close animal markets, cattle show etc. during outbreak of disease.
13. Provide adequate ventilation and sufficient space.

❖ BACTERIAL DISEASE

Particulars	Hemorrhagic Septicemia (H.S)	Black Quarters (B.Q.)
Synonyms	Shipping fever, Ghatsump	Black leg, Farrya, Sujaa
Etiology	It is caused off by <i>Pasteurella Multocida</i>	It is caused by <i>Clostridium chortweil</i>
Transmission	The source of disease spreads through contaminated feed and water and inhalation /breathing	The source of disease spreads through contaminated feed and water and inhalation / breathing and wounds.

Symptoms	Body temperature increase up to 106-107°F. Loss of appetite. Rapid pulse rate and heart rate. Profuse salivation and nasal discharge. Difficult to respiration, swelling of throat region. The tongue is dark red. The Lungs may be affected with bronchopneumonia resulting in. Death within 10-72 hours. Depression and depression. Suspended rumination. Shivering and cyanotic congestion of visible mucous membrane.	High fever (106 to 108°F). Loss of appetite. Suspended rumination, dullness, increases pulse and respiration rate, difficult breathing. (Profuse nasal discharge, swelling of throat region. Lameness in affected leg. Creeping in swelling over hip, shoulder and back) recumbency and death within 12 to 48 hours
Control	General measures- Isolation of affected animals, deep burial of dead animals, disposal of contaminated feed and water disinfection of lambs and goat shed, don't allow grazing affected area	General measures - Isolation of affected animal's deep burial of dead animal, disposal of contaminated feed and water disinfection of sheep and goat shed, don't allow grazing in affected area.
Vaccine	H.S. Vaccine@ 5ml subcutaneous every year before rainy season.	Alum precipitated B.Q. Vaccine @5m. S/C every year before rainy season.
Treatment	1) Inj Oxytetracycline @10mg/kg body wt. IV/IM for days 2) Inj. DNS IV (Dextrose w/ normal saline) 3) Inj. Sulphadimidine @150mg/kg body wt. IV daily for 3 days	1) Inj Oxytetracycline @10mg/kg body wt. IV/IM for 3 days 2) Inj. DNS IV (Dextrose with normal saline) 3) Incise the swelling and drain off. 4) B.Q. antiserum in large doses if available. 5) Penicillin @10000 units/kg body IM

Particulars	Enterotoxemia
Synonyms	• Also called "Overeating Disease"
Etiology	<ul style="list-style-type: none"> The disease is the toxin (poison) produced by the bacterium <i>Clostridium perfringens</i> type C or type D. The bacteria are normally present in the soil and the intestinal tract in relatively small numbers. The Type D infection is probably far more common than Type C. Type C produces a toxin called "Beta Toxin" which causes intestinal necrosis and severe intestinal hemorrhage. It occurs in adult goats. Epsilon toxin is produced by the type D bacteria. Affected baby kid or lamb may be found dead with no signs. It may occur after consuming excess feed or after prolonged hunger and a normal quantity of feed.
Symptoms	

	<ul style="list-style-type: none"> Affected goat of this disease lasts 4 – 26 hours and usually ends in death. Initially the temperature may go to 105° F with severe abdominal pain (the kid cries so loudly it is best described as screaming). Profuse slimy or watery diarrhoea will occur. Depression, wobbly gait, recumbency (lying down on its side often with head down) occurs early. Head thrown straight over back. The animal may slip into a coma before death or die groaning or even crying. These signs occur in kids but can occur in adult milking goats from either Type C or D bacteria. The Subacute disease is more to occur in older kids and adults. They will occasionally eat and with time and appropriate treatment, they will usually recover. The Chronic form is characterized by intermittent illness lasting several weeks. The goat will have a dull, stary look, loose feces, an irregular appetite and, if a milker, drop in production.
Control and Treatment	<ul style="list-style-type: none"> Vaccination with Clostridium perfringens type C and D toxoid by schedule along with the feeding practices when making changes and increases in feed and milk gradually has provided excellent prevention of the disease. Vaccinate unvaccinated adults twice at 4 to 6 weeks intervals. Vaccinate again during the last month of each pregnancy in order to "booster" her immunity and provide colostral antibodies for the immediate protection of the newborn kids. Vaccinate kids at 2 – 3 weeks of age and 4 – 6 weeks later. Consult your veterinarian to plan the best vaccination program for your herd.

4. Anthrax

1. It is an acute infectious disease of livestock that occurs throughout the world.
2. This disease is also known as **splenic fever** due to the fact that there is extensive enlargement of the spleen (splenomegaly) due to this infection.
3. It is a zoonotic disease.

Causes :

1. The disease is caused by bacteria known as *Bacillus anthracis*.
2. When the organisms are exposed to air (oxygen), spores are formed.
3. The spores are never formed so long the organisms remain in the circulation.

Mode of transmission :

- ❖ The anthrax spores have got the ability to remain viable in the soil for a considerable period of time and thus remain as a continuous source of spread to the susceptible animals.
- ❖ The stream, rivers and flood may carry the spores from place to other and thus may spread the disease to the virgin soil.
- ❖ Flying birds may disseminate the infection from one place to the other.
- ❖ Animals while graze in the infected pasture pick up the infection through ingestion or through breach in the oral mucosa or skin.
- ❖ The new area may be infected due to contaminated animal products such as bone meal, fertilizers, hide, hair, wool or forage.

Symptoms :

- There is increases of body temperature (104 to 108°F).
- Animal refuses to eat and there is development of float.
- Animal is extremely depressed. Animal shows distressed breathing.
- Extreme dyspnoea leads to mouth breathing due to oxygen hunger.
- Sudden death within 48 hrs. of illness of animal.
- Following death there is oozing of blood from the natural orifices.
- Oedema may predominantly notice under the neck, brisket region, thorax, abdomen and flank.
- In per-acute form animals may be dead without any premonitory signs.

Preventive measures :

- Periodical and regular vaccination should be done.
- Strict quarantine measures in anthrax prone areas.
- Preventing the introduction of infected animals into disease free areas.
- Carcasses should not be opened as it may contaminate the pasture.
- Care should be taken to destroy the dead body by deep burial with quick lime.
- Persons handling the anthrax infected animals should adopt adequate sanitary measures.
- The adjacent areas of the dead and infected animals should be thoroughly disinfected by 3% per acetic acid or 10% caustic soda or 10% formalin.
- Annual vaccination of spore vaccine @ 1 ml /sc before summer season.

5. Mastitis :

About the Diseases :

- Mastitis is denoting an **inflammation** of the udder irrespective of causes.
- It manifests the changes in the milk colour and consistency.
- Mastitis is known as **Dagadi or Mammatitis**.

Causes :

- A large number of species of microorganisms have been implication.
- **Causes of mastitis.** They are bacteria, fungus, Mycoplasma and virus.
- The most important bacterial organisms causing mastitis are *Staphylococcus aureus*; *Str. agalactiae*; *Str. zooepidemicus*; *Str. faecalis*; *Str. pyogenes*; *Klebsiella*; *Str. Mycobacterium bovis*; *E. coli*; *Brucella abortus*; *Pseudomonas pyocyaneus*; *Leptospira pomona*; *Pasteurella multocida*.

Mode of transmission :

- The cutaneous surface of the sheep and goat may have many organisms as resident population and from where the organisms may have the chance of invade through contamination by handlers.
- The source of spread through contaminated bedding, infected water utensils.
- The contamination of milker's hands, clothes and machine cup by milk from the affected quarter may lead to the spread of the disease to other non- infected teats of sheep and goat.
- Fly and other insects may also spread the infection from one place to the other.

Symptoms :

- Swelling of udder as a hard mass.
- Swollen udder with hot and pain while touching it.

- Animal will not allow touching the udder and will kick while touching it.
- Acute from fever, loss of appetite.
- Swollen and redness of teats.
- Milk mixed with blood.
- Milk mixed with yellow or brownish fluid with flakes or clots with foul smelling.
- Reduced milk yield.

Preventive measures :

- Always the animal sheds should be clean.
- Washing the udder and hand of the milker with antiseptic lotion.
- (4% Potassium permanganate solution) before and after milking.
- The floor of the milking shed should be washed with running water.
- Dipping of all teats following each milking with Iodophor solution containing 1% available iodine or hypochlorite solution and Chlorhexidine in 0.5% to 1% polyvinylpyrrolidone solution.
- Application of ice cubes on the udder surface
- The milk from infected teat should be milked out daily three times and disposed safely outside.
- Lambs and kid should not be allowed to suck the infected teat.
- Antibiotic treatment and consultation should be made with qualified veterinary Doctor.

Treatment :

- 1) Give antibiotic like penicillin, streptomycin, tetracycline 1M for 3 days.
- II) Give vetlox plus or tilox @ 1 tube twice daily for 3 days.

❖ VIRAL DISEASE

1.	Sheep pox and Goat pox
Transmission	Close contact of infected animal to healthy animal. Inhalation of aerosols, abraded skin, insects (mechanical) . Infection virus present in all secretions, excretions and scabs.
Cause	It is caused by ungulate pox virus highly contagious which is antigenically distinct from genus capripoxvirus. It is most serious, causes death in 50% of affected animals. Major losses may occur in each new crop of kids.
Symptoms	All ages of goats are susceptible but a evil form with a general distribution of lesions occurs in kids. Goat pox in sheep is more severe than sheep pox . High fever with eruption of pustules over skin, specially under tail region and belly. The pustules later dry up with scab formation There is shedding of wool. Lesions occur in goat on the lips and oral mucosa, the teats and udder causing wound over the part. In kids , the malignant (natefu) form is more common type. There is marked depression and prostration, high fever and discharges from the eye and nose. Affected kids may die during this stage before typical pox lesions develop. Skin lesions appear on skin and on the buccal, respiratory, digestive and

Preventive measure	Quarantine of infected premises, vaccination by tissue vaccine absorbed on aluminium hydroxide has been followed by no ill effects and by the establishment of immunity in 2 weeks which persist for 9 to 12 months. A killed vaccine with adjuvant provides protection for 3 months. Vaccination in the face of an outbreak is unlikely to prevent deaths during the subsequent weeks.
Control and treatment	Apply boric acid ointment over the pustules. Supportive treatments with antibiotics may be given. No specific treatment is advised.

2.	Peste Des Petits Ruminant (PPR)
Synonyms	Bulkandi.
Etiology	It is caused by <i>Paramyxovirus</i>
Transmission	Spreads through ingestion of contaminated feed and water. It also spreads through inhalation/breathing
Symptoms	Internal rinderpest :- 1st stage Rise in temp. 105° to 108° High fever, weakness, dullness, drooping head & ears. Dry muzzle, pain in animals 2nd stage:- Mucous on membrane of lip, gum & tongue are reddened with pinhead vesicles are developed Increased flow of saliva from mouth doing with foetid smell. Eyelid get swollen, laceration from eye. Watery nasal discharge. 3rd stage:- Shooting diarrhea, faeces dark in colour, foetid odour from faeces, faeces usually contain blood. Urine is scanty, dark & albuminous External Symptoms :- Skin of udder, neck, shoulder surface of body & inside of thigh become covered with scabs scales & ulcers.
Control	General measures - Identification and isolation of sick animals. Destroy of animal dead body by deep burial with quick lime. Disinfection of contaminated shed and premises. Contaminated bedding and fodder should be burnt.
Vaccine	a) Goat tissue culture vaccine (ml/se in neck region (source IVRI, BAF) b) Revaccinated after 3 years.
Treatment	Injection of Antiserum 50 to 100 ml in diseased animals 2) Good soft nourishing diet is given to animal 3) Glucose saline injection are given to check dehydration 4) Vitamins, Antibiotics & other supportive treatments are given 5) Mouth lotions a) Mouth should be swabbed with Potassium permanganate lotion (1:2000 ml normal saline)

6) Control of dehydration & weakness: Controlled by fluid therapy e.g. Glucose therapy. Glucose saline. Normal saline & Gum saline may be given.

3. Pneumonia :

Etiology: It is infectious and non infectious agents cause the lungs of sheep and goat. *Virus* and *mycoplasma* are considered to be the initiating factors and subsequently complicated by secondary bacterial involvement such as *pasteurella multocida*. It may also be due to ordinary cold or living in unfavorable conditions.

Symptoms :

1. Increase in respiratory rate, cough, abnormal breath sounds on auscultation.
2. Fever with temperature of 104 – 106 °F, loss of appetite, uneasiness and dullness.
3. The death of the kids occur in pneumonia due to intervention with gaseous exchange between the alveolar air and the blood.
4. In bacterial pneumonias as the added effect of toxins produced by the bacterial and neurotic tissue.

Treatment :

1. The diseased animal should be removed immediately to some dry, warm place where there is insufficiency of fresh air and no strong drought.
2. Turpentine oil with camphor should be applied on the chest. Nursing is very essential.
3. Plenty of fresh clean water, some warm milk should be given.
4. Tetracycline, Penicillin, Amphibacillin.
5. Cefixlor is the only FDA – approved antibiotic to treat Caprine pneumonia. The daily doses is 0.5 to 1.0 mg/lb body wt. Injected IM

4. Foot & Mouth Disease (FMD) :

Etiology: Causal organism: *Virus A, O, C*

Mode of transmission :

- Generally by direct or indirect contacts between susceptible and infected animals.
- Through movement of clinically affected animals.
- Through inanimate vectors such as vehicles, feeders, utensils, equipment etc.
- Through air, infected animals have a large amount of aerosol virus in their exhaled air, which can infect other animals via the respiratory or oral routes. The virus can travel up to 60 km overland and 300 km by sea.
- All secretions and excretions from the infected animal such as saliva, faeces and urine. The virus may be present in milk and semen for up to 4 days before clinical signs appear. The disease has been transmitted to lambs and kids via infected milk.

Symptoms :

Mouth disease :

1. Primary symptom animal is sluggish.
2. Decline milk production. Body temp. increases 104-105 °F.
3. Few hours of sluggishness secrete saliva rapidly in the form of long wire.
4. Special way of mouth motion.
5. Hanging tongue if examine, vesicle formed on tongue.

6. Vesicle increase in size & rupture & secrete yellow fluid.
7. After 6-15 days vesicle clear.
8. Lesions painful, animal not take dry fodder only green are taken.

Foot disease :

1. First symptom is lameness. Occur 4-5 days after occurrence of vesicle in mouth.
2. Vesicle formed between hoof. Vesicle rupture & secrete yellow fluid.
3. In sheep & pig foot disease is general than mouth.
4. Lactating animals udder is affected decrease in production.
5. Period of disease 2-3 weeks.
6. Disappear of disease from herd & village 1-2 month.

Control measure : Wash mouth lesions with Boric acid 15gm in 1 lit water, or Alum 5 gm. in 1 lit water. For foot wound dissolve zinc oxide or CuSO₄ 40 gm in 1 lit water. Wash wound with 1 gm KMnO₄ in 3 lit water & apply cream eg. VAS, Himax, calendula. Wash 3-4 times foot wound with 0.5% lime water.

Preventive measures :

1. Separate disease animal from herd.
2. Sterilize sheep and goat shed with 1-2% lime, 1-9% formalin, 4% sodium bi-carbonate.
3. Sterilize cloth of labour.
4. If animal are die buried them 4-5 m deep with lime & soil.
5. For avoid disease vaccination is important.
6. Use Raksha FMD vaccine.
7. Antibiotic treatment and consultation should be made with qualified veterinary Doctor.

5. Bluetongue :

It is an insect-borne viral disease to which all species of ruminants are susceptible although sheep are most severely affected.

The disease is caused by a virus which is transmitted by certain species of biting midges (a small biting fly).

The *Culicoides* species of midge which carries the infection during the rainy season while blood sucking.

Mode of transmission :

Virus transmission between animals occurs via an insect vector (midges of *Culicoides* species) when a midge bites an infected animal and passes the infection to an uninfected native animal. Transmission of the virus during an outbreak therefore depends on continuing cycles of infection between infected animals and vector insects.

Symptoms :

1. Major are high, excessive salivation.
2. Swelling of the head, neck, face and tongue and of the tongue its typical blue appearance, though this sign is confined to a minority of the animals.
3. Swelling of the lips and tongue gives the tongue its typical blue appearance.
4. Nasal symptoms may be prominent, with nasal discharge and stertorous respiration.
5. Some animals also develop foot lesions, beginning with coronitis, with consequent lameness.
6. Inflammation and ulceration of the mucous membrane of the mouth, nose and eyes.

7. Drooling, haemorrhages in the skin and other tissues.
8. Respiratory problems, such as froth in the lungs and an inability to swallow.
9. Torsion of the neck is observed in severely affected animals.
10. In sheep BTV causes an acute disease with high morbidity (strong interest in death) and mortality.
11. For affected animals which do not die, recovery is very slow, lasting several months.

Treatment and prevention :

1. There is no efficient treatment. Prevention is effected via quarantine, inoculation with live modified virus vaccine and control of the midge vector, including inspection of aircraft.
 2. Practically midge control measures may help break the livestock infection cycle.
 3. Housing livestock during times of maximum midge activity (from dusk to dawn) may lead to significantly reduced biting rates.
 4. Similarly, protecting livestock shelters with fine mesh netting or coarser material impregnated with insecticide will reduce contact with the midges.
 5. The Culicoides midges that carry the virus usually breed on animal dung and moist soils, either bare or covered in short grass.
 6. Control by mopping midges and removing their breeding grounds may reduce vector numbers.
 7. Dung heaps or slurry pits should be covered or removed, and their perimeters (where most larvae are found) regularly scraped.
- Vaccine:**
- Vaccination should be 1st vaccination at 3 months of age, next vaccination ones in a year, serotypes 2 and 4, and vaccines are available against these serotypes (A/Cvet) for sheep.
 - A BTV vaccine is now available, but can only be used in a Protection Zone.

PROTOZOAN DISEASES

1. Coccidiosis :

Cause : It is a contagious enteritis of young kids caused by infection with *Eimeria* sp.

The pathogenic coccidia of goats have in most instances, not been identified although *Eimeria arloingi* and *Eimeria faurei* are known to occur.

Mode of transmission :

The source of infection is the faeces of clinically affected or carrier animals and infection is acquired by ingestion of contaminated feed and water or by licking the hair coat contaminated with infected faeces.

Symptoms:

1. A mild fever may occur in the early stages but in most clinical cases, the temperature is normal or subnormal.
2. The first sign of illness is usually the sudden onset of severe diarrhoea with foul smelling, fluid (loose motion) containing mucus and blood. Severe straining is characteristic, severe dehydration ensues and complete anorexia are usual.
3. Rough hair coat, anemia, No appetite, wt. Loss.
4. Kids generally die of haemorrhagic anemia some days before oocysts appear in the faeces.
5. A count over 5000 oocysts are discharged in significant number is quite short (3 to 6 days).
7. The morbidity rate is usually low.

Preventive measures :

1. In an outbreak, the clinically affected animals should be isolated and treated with one of the more efficient drugs.
2. The control of Coccidiosis depends largely upon hygiene and avoidance of over-crowding.
3. As far as possible, the young kids should be separated from adults which provide source of

infection.

Treatment :

1. Sulphabromomycin or phthalyl sulphathiazole 40% solution 100 ml are the drugs of choice.
2. The treatment should be continued for at least 14 days.
3. Sulfadimidine sulmet course 4 days, Pesulin bolus.
4. Use bifturan or emproleum in feed.
5. Administration of enterovioform or entroquinol

POULTRY DISEASES

Most of the poultry diseases are highly contagious in nature. Hence, they spread rapidly and cause heavy morbidity and mortality. Further there is no effective treatment for viral diseases and most of the bacterial diseases are less amenable to treatment. Hence prevention is better and economical than controlling an actual outbreak of disease.

1. BACTERIAL DISEASES

1. **Bacillary White Diarrhoea :** Synonyms : Pullorum Disease
It is an acute wide spread bacterial disease mostly of baby chicks, causing mortality up to 90 per cent. Bacillary white diarrhoea is an egg borne disease of poultry. Adult birds do not show symptoms and remain as carrier.

Cause : It is caused by *Salmonella pullorum*.

Transmission

- The disease spreads in two ways
1. Vertical transmission - It takes place through infected eggs.
 2. Horizontal transmission - It usually takes place through contaminated feed and water.

Symptoms

- Dead in shell chicks
- Drowsiness
- Weakness
- Loss of appetite
- Ruffled feathers
- Gasping
- Loose chalky white faeces
- Soiling of vent

Control :

- a) **General measures**
 - Periodical testing of breeding stock for Pullorum disease.
 - Culling of reactor / positive birds
 - Purchase of chicks from pullorum disease free flock
 - Infected eggs should not be used for hatching purpose
 - Adopt hygienic measures on farm.
 - Fumigation of incubators. Use 355 ml of Formalin and 17.5 gm. of Potassium Permanganate per 100 cubic feet area.
- b) **Vaccination**
At present no commercial vaccine is available in India.

2. Chronic respiratory disease: Synonyms : Air sac disease.

It is chronic slow spreading contagious bacterial disease of poultry. The disease is affecting birds of all age groups but more common and severe in young chicks. Mortality is up to 30-40 per cent in chicks. The disease is causing heavy economic losses especially in broilers.

Cause : It is caused by *Mycoplasma gallisepticum*.

Transmission

The disease spreads in two ways

1. Vertical transmission through infected eggs from chickens to chicks (egg borne).
2. Horizontal transmission takes place through inhalation (air borne).

Symptoms

1. Nasal discharge
2. Sneezing
3. Open beak breathing/ gasping
4. Loss of body weight
5. Reduced appetite
6. Drop in egg production up to 50%
7. Death in 3-8 weeks

Control

a)

General measures

1. Periodical testing of breeding stock for chronic respiratory disease.
2. Culling of birds positive for chronic respiratory disease.
3. Purchase of birds from disease free farm
4. Dipping of eggs in tylosin solution before incubation.
5. Adopt hygienic measures on farm.
6. Prophylactic dose of tylosin to day old chicks

b) Vaccination

At present no commercial vaccine is available in India.

3. **Colibacillosis** : It is an acute contagious bacterial disease of poultry. The disease affects birds of various age groups but most common in 5-10 week old chicks. Mortality is usually 5-10 per cent in chicks. The disease usually occurs along with chronic respiratory disease.

Cause : It is caused by *Escherichia coli*.

Transmission

The disease spreads through contaminated water, food and air.

Symptoms

1. Reduced appetite
2. Depression
3. Diarrhoea- loose faeces
4. Soiling of vent
5. Sneezing
6. Difficult breathing

Control

a) General measures

1. Avoid stress.
2. Maintain adequate sanitation.

3. Provide sufficient space to birds
 4. Purchase of chicks from chronic respiratory disease free farm
 5. Disinfect eggs prior to hatching.
 6. Fumigate the incubators.
- b) **Vaccination** : At present no commercial vaccine is available in India.

2. VIRAL DISEASES

1. Ranikhet Disease :

Synonyms : New Castle Disease, Marnoti

It is an acute highly contagious viral disease of poultry. The disease affects all age groups of birds. It causes heavy economic losses to poultry industry by way of high morbidity (100%) and mortality (50 - 90 %) and drop in egg production.

First case of New Castle Disease was recorded in 1928 at Ranikhet near Almor in India, hence it is named as Ranikhet disease.

Cause : It is caused by *Paramyxovirus*.

Transmission

1. The disease spreads through infected feed, water or air.
2. Air borne transmission is the most important way of disease transmission.

Symptoms

1. Loss of appetite, Dullness and depression
2. Ruffled feathers, Respiratory rales
3. Gasping (difficult breathing), Sneezing
4. Coughing, Nasal discharge
5. Greenish watery diarrhoea
6. Paralysis of one or both legs or wings
7. Tremors (twitching), Torticollis i.e. twisting of neck (Fig.1)
8. Drop in egg production in layers, Finally death

Control

a) General measures

1. Restrict the entry of visitors.
2. Depopulation of site.
3. Proper sterilization of poultry equipments.
4. Disinfection of poultry house.
5. Burial or burning of dead birds.
6. Control of rodents and free flying birds.
7. Isolation of affected birds.

b) Vaccination

1. LaSota vaccine @ 1 drop in each eye or nostril in first week of life.
2. R2B Mukteswar vaccine in 8th and 18th week.



Fig. 1 Ranikhet disease

2. Marek's Disease :

Marek's disease is highly contagious viral disease, primarily of young chickens between 3-5 months of age.

Cause : It is caused by *Herpes Virus*.

Transmission

- Infection is transmitted through inhalation of infective material from the environment.

Symptoms

- Dullness, Inco-ordination.
- Paralysis of one or both legs, neck and wings
- Drooping or hanging of wings
- One leg is extended forward and other backward
- Loss of body weight, Recumbency
- Blindness in one or both eyes (ophthalmic form)
- White nodules on skin (cutaneous form)
- Sudden death in acute form

Control

a) **General measures**

- Selection and breeding of genetically resistant stock.
- Isolation of affected birds.
- Disposal of dead birds by burning or deep burial.
- Disinfection of poultry house.

b) **Vaccination**

- HVT (Herpes Virus of Turkey) vaccine is given to day old chicks.

3. Gumboro Disease :

Synonym : Infectious Bursal Disease

Infectious bursal disease was reported for the first time from Gumboro in USA. It is an acute highly contagious viral disease of 3 to 6 week old chicks. It causes heavy economic losses to poultry industry by way of high morbidity (100%) and mortality (20-30 %).

Cause

- It is caused by *Avian Reovirus / IBD virus*.

Transmission

- The disease spreads through ingestion of contaminated feed and water.

Symptoms

- Loss of appetite, Dullness and depression
- Ruffled feathers, Diarrhoea- loose faeces
- Soiling of vent, Pecking at vent
- Tremors (twitching), Inco-ordination
- Death in 4 to 8 days

Control

a) **General measures**

- Restrict the entry of visitors.
- Depopulation of site.
- Proper sterilization of poultry equipments.
- Disinfection of poultry house.
- Disposal of dead birds by burning or deep burial.
- Isolation of sick birds.

b) **Vaccination**

- IBD vaccine should be given at the age of 2 to 3 weeks and repeated at 18th to 20th weeks of age.

4. Fowl Pox :

Synonym : Avian Pox

It is one of the most common slow spreading viral diseases of poultry. The morbidity is high and mortality may be up to 50% in chicks. Disease occurs in mild form in adults in severe form in young chicks

Cause : It is caused by *Avipox Virus*.

Transmission

- It spreads through direct contact, wounds or insect bites.

Symptoms

- Scabs or wart like growths on featherless parts of the body such as comb and wattles (Fig.2)
- Yellowish cheese like deposits on tongue, in side of mouth and under eyelids
- Lacrimation
- Nasal discharge
- Reduction in appetite
- Loss of body weight
- Decreased egg production
- Death due to starvation as a result of blindness

Control

a) **General measures**

- Isolation of sick birds.
- Disinfection of poultry house.
- Avoid overcrowding of birds.

b) **Vaccination**

Fowl Pox Vaccine in 6th and 16th week of life by cutaneous scarification/wing web method.



Fig. 2. Fowl pox

5. Bird Flu :

Synonyms : Fowl plague, Avian influenza.

Bird flu is very dangerous and highly contagious viral disease of poultry. The disease affects all age groups. Bird flu is a disease of great zoonotic importance as it is transmitted to human beings.

Cause : It is caused by *H5N1 influenza virus*.

Transmission

- The disease spreads through contaminated air, water and feed. Disease is usually transmitted to domestic poultry by wild birds.

Symptoms

- Loss of appetite, Dullness and depression
- Bluish colouration of comb and wattles (Fig. -3)
- Gasping (difficult breathing), Sneezing
- Nasal discharge, Diarrhoea-loose faeces
- Egg production stops
- Finally death

Control :- a) General measures	
1.	Restrict the entry of visitors.
2.	Depopulation of site.
3.	Proper sterilization of poultry equipments.
4.	Disinfection of poultry house.
5.	Disposal of dead birds by deep burial or burning.
6.	Control of wild birds.
7.	Slaughter of affected and in contact birds.
b) Vaccination :- Vaccination is not practiced in India due to virus mutation.	

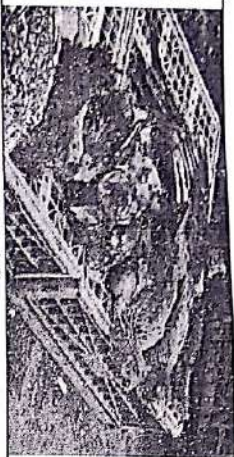


Fig.3 Bird flu

1. Restrict the entry of visitors.
2. Depopulation of site.
3. Proper sterilization of poultry equipments.
4. Disinfection of poultry house.
5. Disposal of dead birds by deep burial or burning.
6. Control of wild birds.
7. Slaughter of affected and in contact birds.

3. Fungal Diseases:

1. Aspergillosis :

Synonym : Brooder pneumonia.

Aspergillosis is an infectious fungal disease usually of young chicks up to 10 weeks of age. Morbidity is usually very low. Mortality among affected birds is 10 to 50%.

Cause :- It is caused by <i>Aspergillus fumigatus</i> .	Symptoms
Transmission :- It spreads by inhalation.	Dullness, weakness
	Increased thirst
	Reduced appetite
	Rapid breathing
Gaspings (Fig. 14.4)	
Death in 24 to 48 hours	

Fig. 4 Aspergillosis in chick

Control

1. Avoid dampness of litter.
2. Provide dry good quality feed.
3. Storage of poultry feed in a dry place.

4. PROTOZOAN DISEASES

1. Coccidiosis :

It is serious protozoan disease of young stock up to 10 weeks of age. Disease outbreak occurs in warm and humid climate and damp litter condition. Coccidiosis is most common in birds reared in deep litter system.

Cause :- It is mainly caused by *Eimeria tenella* and *Eimeria necatrix*.


Transmission :- Disease spreads through contaminated feed, water or litter.	Symptoms
	Depression, weakness
	Ruffled feathers
	Reduced appetite
	Bloody diarrhoea
	Soiling of vent
	Loss of body condition
	Poor egg production
Pale comb and warts due to anaemia and last stage of death.	

Fig.14.6 Coccidiosis in poultry

Control

1. Isolation and treatment of affected birds.
2. Use of proper waterers and feeders.
3. Use of dry litter or regular changing of litter.
4. Provide good ventilation and sunlight in poultry houses.
5. Use of anti-coccidial drugs as control measure.

5 Nutritional Diseases :

Improper brooding, housing and feeding conditions, rapid growth, high egg production and use of processed feeds often result in various nutritional deficiencies in poultry. Nutritional deficiencies can be overcome or prevented by providing mineral- vitamin supplements through diet.

Str No.	Vitamin/Mineral	Deficiency symptoms
1	Vitamin A	Chick : Retarded growth, pusules in the mouth. Adults : Decreased egg production, poor feed efficiency and reduction in hatchability.
2	Vitamin E	Nutritional encephalomalacia / crazy chick disease characterized by incoordination of movement and retraction of head
3	Vitamin K	Failure of blood clotting cause haemorrhagic disease.
4	Vitamin B ₁	Polynueritis/star gazing posture - pulling of head towards back
5	Vitamin B ₂	Curled toe paralysis - inward curling of toes and tendency to walk on hocks.
6	Vitamin B ₁₂	Poor growth in chicks and decreased egg production and hatchability in hens
7	Niacin	Enlargement of hock joints and outward bending of legs
8	Folic acid	Cervical paralysis, anaemia, poor feathering, poor growth,

9	Biotin and pantothenic acid	depigmentation, embryo mortality, foot pad dermatitis (cracks in the skin of foot pad), dermatitis of skin around beak and eyes.
10	Calcium, phosphorus and Vitamin D ₃	Chick : Rickets characterized by leg weakness, swollen hocks and rubbery beak. Adults : Drop in egg production, soft and thin shelled eggs, reduction in hatchability
11	Iron and copper	Nutritional anaemia characterized by emaciation, reduced egg production and hatchability.
12	Manganese	Slipped tendon or perosis
13	Zinc	Goose stepping gait due to shortened and thickened bones

PARASITES

A. External Parasites

Cause : *Mites, Lice, Ticks etc.*

Symptoms :

In sheep and goat loss of wool production.

Irritation to birds; loss of appetite; drop in egg production; some blood sucking ectoparasites cause of anaemia, skin diseases.

Diagnosis :

Parasites or egg clusters may be under the wool in sheep and goat and poultry under the wings or around vent.

Treatment in sheep and goat :

a) To get rid of external parasite, the dipping in / spraying / pouring of insecticide solution with recommended strength be done 3 to 4 times a year.

b) Application of drugs on body surface like gammaxene, asutol, malathion controls the ticks and lice.

c) Malathion dip (weak solution 1.5 to 2.0%) is quite effective against goat lice. Gammaxene in 1:5 ratio with ash may also be used as powder.

d) Walls should be white washed with lime and copper sulphate.

e) General cleanliness of pens, phenyl and occasional spraying with malathion 2% solution on stall, goats will ward off the problems of ecto parasites.

Treatment in poultry :

Dust and spray the bird with Gammaxene, sodium fluoride or Malathion.

Use of lindane, BHC, DDT, aldrin, dieldrin, endrin, chlordane, heptachlor or toxaphene on poultry or in poultry house is prohibited in the United States.

B. Internal Parasites (Intestinal Helminthiasis)

1. Tapeworms

Cause : *R. tetragona* and other tapeworms.

Symptoms :

Loss of appetite; loss of weight; emaciation; diarrhoea; drop in wool and milk in sheep and goat and egg production in poultry.

2. Roundworms

Cause: *Ascaridiagali.*

Symptoms :

Loss of weight; drop in wool and milk in sheep and goat and egg production in poultry; emaciation.

3. Caecalworms

Cause : *Haerakisgalinae.*

Symptoms : Caeca inflamed and thickened; weakness; anaemia.

Treatment : Piperazin compounds for roundworm and Dicesland phenothiazine for tapeworm.

1. Perosis

Other name : Slipped Tendon, *Nutritional deficiency Disease.*

Cause : Manganese or choline deficiency in growing chicks.

Symptoms :

Swollen joints; bowing legs; a tendons slipped away from joints.

Birds walk on the hock joint; many birds may be affected at one time.

Diagnosis : Characteristic symptoms.

Treatment : Rations carrying adequate levels of manganese, choline, biotin, niacin, folic acid and vitamin B12 are recommended. Manganese deficiency may result in poor hatchability.

POULTRY

Treatment with a vaccine to produce immunity against a disease is called as vaccination..

Disease	Primary Vaccination	Booster Injection	Repeat vaccination
1. Peste-des-Petitis Ruminants (PPR)	At 3 months of age	Not required	Every 3 years
2. Foot & Mouth Disease (FMD)	At 3-4 months of age	3-4 weeks after 1 st Injection	Every 6/12 month interval*
3. Goat Pox (GP) **	At 3-4 months of age	3-4 weeks after 1 st Injection	Every 12 month interval*
4. Enterotoxaemia (ET)	At 3-4 months of age	3-4 weeks after 1 st Injection	Every 6/12 month interval*
5. Haemorrhagic Septicaemia (HS)	At 3-4 months of age	3-4 weeks after 1 st Injection (2 doses at 1 month interval)	Every 6/12 month interval*

Kids are naturally protected from diseases up to 3 months by proper feeding of colostrums immediately after birth.

For optimum benefits of vaccination, deworm your animals at least 15 days before vaccination

²² For sheep – replace goat pox vaccine with sheep pox vaccine

Diseases	Age groups	Treatment/period	Recommended as feed mix
1. Drenching Coccidiosis	1 – 6 months	Anti – coccidial drug for 5-7 days	Amprolium @50-100 mg / Kg body weight
2. Deworming Endoparasitic infection	3 months and above	Two dewormings annually (pre and post monsoon)	Fenbendazole @7.5 -10 mg / Kg body weight. Additional deworming may be needed in cases of heavy parasitic load or extended rainy season
3. Dipping* [†] / Ectoparasitic infestation	Any age	Pre & Post winter	Cypermethrin 2% solution or Deltamethrin 2% solution.

*Avoid cold, cloudy and rainy days for dipping. Preferred time for dipping – 9am To 11am.

Diseases	Period	Recommendations
1. Brucellosis+	Once in a year	Positive animals need to be euthanized and buried
2. John's Disease*	6 months/ Once in a year,	Positive animals are to be removed from herd/ flock
3. Mycoplasmosis	Once in a year	Treatment with specific drugs
4. Mastitis	Early milking stage	Treatment with specific drugs
5. Endo- parasites	Regular screening of fecalsamples	Monitor worm load (EPG/OPG) of the animals to decide time of deworming.

+ Screening of adult goats especially breeding bucks and breedable females. From aborted animals submit 2 serum samples (Zero day i.e., day of abortion / still births and 21 days after abortion / still birth). *Preferably one month after kidding

A. Record Keeping: Accurate records are important to any herd-health program to monitor progress and serve as a valuable reference. Records are extremely helpful when making management decisions concerning vaccination, parasite-control, and nutrition programs. Medical history and treatment dates, including vaccination and deworming type and dates, weaning weight, breeding dates, kidding dates, and the number, sex, and viability of the kids are all important pieces of information to keep in the records.

B. Sanitation: Good sanitation is necessary to prevent disease. Keep kidding areas especially clean and dry and avoid overcrowding as it will concentrate disease-causing pathogens. Feed and water frequently are contaminated by goats defecating in the troughs.

C. Colostrum: Colostrums management is extremely important to the health of the newborn kid. Colostrum contains protective immunoglobulins to fight disease. Keep frozen colostrum (preferably from a doe from your herd) or colostrum replacements available for emergencies.

D. **Nutrition:** Good-quality forages are the cornerstone of goat nutrition. Supplement grain based on the body condition and reproductive and growth stage of the animal. Provide clean, fresh water and a complete mineral salt at all times. Most goats should be able to thrive on pasture and hay. Over-conditioned (overweight) goats are more likely to have problems with pregnancy toxemia and dystocia (trouble giving birth).

E. Parasite Control: Parasites are one of the leading causes of death among goats. A good parasite control program is not simply deworming, but also management practices to reduce the number of parasites the animals are exposed to. The drug class of the dewormer should be rotated yearly and/or as needed to help reduce drug resistance, which is a serious problem for goat producers. The FAMACHA is a system to monitor the parasite level of each individual animal so that it can be dewormed as needed rather than on a set schedule. The FAMACHA monitors for anemia (low red blood cell count) due to the parasite *Haemonchus contortus*. Other parasites may be a problem in some areas so it is important to have fecal samples checked regularly. Checking egg counts and monitoring animals for anemia will help you determine when a dewormer is needed. Using dewormers only as needed is the key to preventing resistance to dewormers. The exception to this is

that you should always treat does for internal parasites 3 weeks before kidding. For more information on the FAMACHA scoring system, you can visit

F. Disease Resistance: Decreasing stress, along with good nutrition, parasite control, and vaccination programs will increase resistance to disease.

G. Prebreeding Exam: Your veterinarian can perform a thorough breeding soundness exam on the bucks, which can help avoid open does or a prolonged breeding season. Bucks should be culled if granulomas are palpated. The scrotal circumference should also be measured. Mature bucks should have a scrotal circumference of 25 cm or greater, depending on the breed size. If it is less, they are considered a questionable breeder.

H. Foot Care: You should do foot trimming as needed, depending on the environment. Trim the toes so the hoof wall is even with the sole. Start at the heel bulb and work forward; this will help avoid quicking (trimming too short and causing bleeding) the toe. Remove any excess at the bulb of the heel. After trimming, soak the feet in a footbath of 10 percent zinc sulfate solution to help control foot associated diseases.

I. Culling: Proper culling will increase productivity. Cull chronically injured, sick, or open does to increase profitability.

Vaccination scheduled of Poultry birds :

Animal	Diseases	Age and Booster dose	Route	Remark
Broilers	Ranikhet disease (Newcastle disease)	1-7 days	Spray /occulonasal drops	Strain F or B1 or Lasota.
	Infectious bronchitis	3-4 weeks	Spray / drinking water.	Strain Lasota.
	Infectious bursal disease	18-21 days	Spray / drinking water	If maternal antibody is low.
	Marek's disease	5-10 days or 18-21 days	Drinking water.	-
	Marek's disease	day-1	i/m	If the bird s are to be kept for more than 60 days. Only during epidemic.
Broiler and layer breeders	RD	day-1 3 weeks	i/m	-
		1-7 days	Spray/ occulonasal drops.	If mesogenic strain.
		3-4 weeks	Spray/drinking water i/m	If lentogenic strain (Lasota)
		8 weeks	Drinking water	Killed vaccine/ mesogenic strain
		16-18 weeks 40th week	i/m. Drinking water	-
Broiler and layer breeders	Fowl pox	6-8 weeks 18-20 weeks	Wing web or i/m	Cell culture vaccine
	Fowl cholera	6 weeks Adult repeat annually	0.5 ml s/c 1 ml s/c	-
	Infectious bronchitis	3 weeks 8 weeks	Drinking water/spray i/m	Killed vaccine.
	Infectious bursal disease	14-16 weeks 3 weeks 16 weeks	Drinking water i/m	Chicks between 5-7 days can be vaccinated

Commercial layers	Marek's disease	Day 1	i/m	If required with highly attenuated strains. Killed vaccine
Ranikhet disease	1-7 days 3-4 weeks 8 weeks 16-18 weeks	spray/ occulonasal drops/drinking water spray/drinking water i/m or s/c Drinking water	-	If mesogenic spray/ ientogenic Killed vaccine/mesogenic La Sota strain
Infectious bursal disease	40th week	Drinking water	-	-
Infectious bronchitis	3 weeks	Drinking water	-	-
Infectious corza	3 weeks	Drinking water	-	Killed vaccine
EDS - 76	3 weeks	Drinking water/spray	-	-
ILT	16 weeks	i/m	-	-

Disease Prevention/Control :

1. Clean sanitary conditions of poultry sheds and equipment, balanced feed, fresh clean water, healthy chicks are essential to prevent diseases.
2. Avoid entry of visitors to farm, especially inside the sheds. If visitors come, ask them to dip their feet in a disinfectant solution, wash and clean hands and to wear apron/boots provided by the farm.
3. Use proper vaccination schedule
4. Use high quality vaccines purchased from reputed manufacturers. Keep vaccines in cool, dry conditions away from sunlight.
5. Any left-over vaccine should be properly disposed off. Vaccines should not be used after their expiry date is over.
6. Any dead bird should be immediately removed from the shed and sent to laboratory for post-mortem or buried/burnt suitably away from the poultry sheds.
7. The waste of farm should be suitably disposed off.
8. Any bird showing advanced signs of a disease, should be removed from the shed and culled. It can be sent to laboratory for diagnosis.
9. Birds showing advanced signs of a disease should be shown to a qualified veterinarian and suitable medication/treatment be given as per his/drug manufacturers recommendations.
10. Poultry manure, if infected, can spread disease, from one batch to another. Keep the litter dry, remove it after flock is sold and dispose the manure properly and quickly.
11. Keep proper records on mortality and its causes and the treatment given to birds. Dates of vaccination for each flock should be properly recorded.
12. Rats are important carriers of poultry disease. Avoid rats. Use suitable rat poisons/trap traps.
13. Many poultry medicines can be given in drinking water. When medication is to be given, remove the waterers in poultry sheds on the previous evening. Next morning give medicine in measured quantity of water, so that entire medicine will be quickly consumed and there will be no wastage of medicines.

OBJECTIVES OF SHEEP, GOATS AND POULTRY

1. Sammen breed of goat is called milk queen.
2. Pelt is obtained from Karakul breed of sheep.
3. Gestation period in goats is 150 days.
4. There are 20 recognized breeds of goat in India.
5. Vasectomized male used to detect the female in heat is called as Teaser ram.
6. Length of oestrous cycle in sheep is 14-20 days.
7. Angora is famous exotic breed of goat for mohair production.
8. Chromosome number of sheep is 54.
9. Goat meat is called as chevon.
10. Sheep are grazer while goats are browsers.
11. Clipping of wool around neck, chest and prepucce before breeding season in ram called as Ringing.
12. The act of giving birth to the young one in goat is called Kidding.
13. The act of giving birth to the young one in sheep is called Lambing.
14. Adult male in goat is called Buck.
15. Adult male in sheep is called Ram.
16. In goat weaning is done at the age of 35 months.
17. Gestation period in sheep is 150 day. Chromosome numbers of goats are 60.
18. Karakul sheep breed is famous for pelt production.
19. Wool of Deccani sheep breeds is used for making of blankets/Carpet.
20. Switzerland is the home tract of Sannen.
21. Goats are more prolific than cattle and buffaloes.
22. Pashmina fleece is produce from Kashmiri goats.
23. Bacillus anthracis is the causal organism of Anthrax.
24. Methionine, Cysteine, Alanine is the sulphur containing amino acids required for wool production.
25. Flushing is practiced in sheep for Synchronization of heat.
26. The sheep meat is called as Mutton.
27. The Black Bengal goat is famous for meat purpose.
28. The Black Bengal has smallest kidding interval. (151 days).
29. Jamunapari is tallest and famous for milch purpose.
30. One buck is sufficient for 30 does.
31. Karakul sheep breed is originated from Persia.
32. Sheep's are called as natural weed killers.
32. Act of mating in sheep is called as Topping

$$33. \text{Dressing percentage} = \frac{\text{Carcass wt.}}{\text{Live wt. of animal}} \times 100$$

34. Winter dew on grass is not healthy for Sheep.
35. Sheep are in its feeding habits - Non selective
36. Average age at first service in goat is months - 12-18
37. Length of estrous cycle observed in goat is 12-24 days.
38. Gestation period for sheep and goat is 150 days
39. Breeding life span for sheep is - 5-8 year.
40. Gaddi breed of sheep is found in north temperate region.

41. Chokla breed of sheep is originated from Rajasthan.
42. Deccani breed of sheep is found in Maharashtra, AP and Karnataka.
43. According to ISI standard of grading the wool of 34.4 micron and below considered as A grade quality wool.
44. Colostrum is fed to lamb within two hours after its birth.
45. Usually milk type goat consume dry matter - 5 to 7% of its body weight.
46. Milking type goat needs concentrate containing - 14 to 16 % protein.
47. Until the rumen is 2/3 full, the activity of regurgitation does not start.
48. Sheep in India generally shorn immediately after the end of winter season
49. The wool fiber diameter is varying from - 12-18 microns.
50. The difference of amount of clean wool and the grease fleece weight is called Shrinkage
51. Removal of tail from body in sheep and goat is called as Docking
52. In extensive system of rearing the goats are allowed for grazing for. 8-9 hrs / day
53. Intensive system of rearing includes feeding of goats under the stalls for complete day.
54. Dressing percentages is the weight of carcass in relation to the weight of the live animal.
55. Minimum floor space required for ram or buck in group is - 1.8 m².
56. Most Does come in heat in the month of September & march.
57. Genetic quality of indigenes non descript breed are increased by use of pure breed buck is called Grading up.
58. Buck may be used for mating when it attains maturity at about 15 month age.
59. Buck of 18 to 24 month age may be used by natural service for. 25-30 no. does.
60. Buck remains more sexually active in Winter & spring Season.
61. The average life span of goat is 12 years.
62. Age of maturity of ewe is 12 month.
63. Age of ewe for mating is 18-24 months.
64. The productive life of for breeding sheep is up to 5 years.
65. Flock mating system ram usually left loose with ewes to serve at will during mating season.
66. Goat has fastidious eating habit. by means of Mobile upper lips goats are able to graze on very short grasses.
67. Dressing percentage in sheep is 40-50 %.
68. Moisture content in wool is 12-17 %.
69. Fine quality wool have shrinkage 62-80 %.
70. Coarse quality wool have grease 13%.
71. Sulfur content of wool is 3-4 %.
72. Water requirement of sheep is 4-5 lit./day.

IMPORTANT QUESTIONS FROM QUESTION PAPERS

1. Write in detail the importance of sheep and goat in national economy.
2. Describe in detail the breeding seasons in sheep.
3. Write in detail the care & management of kids up to three months of age.
4. Explain the management practices followed to control parasites in sheep.
5. Enlist feeding systems and explain intensive feeding system in goats.
6. Write the economic significance of sheep and goat in India.
7. Discuss in detail care and management of lambs and kids.
8. Enlist the exotic breeds of sheep and describe the salient features of Merino sheep.
9. What do you mean by synchronization of heat? Describe the breeding season.
10. State the various systems of goat rearing and describe any one of it.
11. Enlist the exotic breeds of goat write in detail on any two.
12. Give etiology and control measures of following diseases
i) Black quarter (B.Q); ii) Hemorrhagic Septicemia (HS); iii) Blue tongue; iv) Mastitis
13. Describe following breeds giving physical and economic characteristics.
i) Chokla; ii) Magra; iii) Bannur; iv) Surti.
14. Explain the nature of housing followed in sheep and goat rearing and comment on stall-fed system in goat.
15. How you differentiate healthy animal from sick animal.
16. What is the vaccination schedule followed in sheep.
17. Write in detail about management practices for maintaining rams.
18. Explain about care and management of lactating sheep and goat.
19. Classify the sheep and goat with two example of each class.
20. Discuss about vaccination programme for important diseases of sheep and goat.
21. Write in detail the care and management of does and ewes.
22. Comment on the care and management of broilers.
23. Enlist various system of poultry housing and explain any one.
24. Define brooding. Explain in short types of brooding and types of brooder.
25. Write short notes on
a) Feeding pregnant ewes; e) Flushing; d) Tethering; e) Deccani Sheep; f) Osmanabadi goat; g) Saanen; h) Blue Tongue; i) Black Bengal; j) Vaccination of sheep and goat; k) Housing of sheep and goat; l) Care and management of breeding buck; m) Deworming schedule for sheep and goats; n) Control of ectoparasites; o) White Leghorn; p) Rhode Island Red; q) Deep litter system
26. Definitions:-
1) Docking 2. Offal 3) Foster mother 4) Pashmina 5) Dipping 6) Sprayed 7) Ringing
8) Creep feeding 9) Tupping 10) Buck 11) Steaming up 12) Flock 13) Wether 14) Chevon 15) Kidding 16) Shearing 17) Incubator 18) Moulting 19) Brooding

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