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LIVESTOCK AND POULTRY PRODUCTION MANAGEMENT

LECTURE NOTES

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UNIT I: INTRODUCTION TO LIVESTOCK MANAGEMENT

LIVESTOCK IN INDIA

Livestock farming is an integral part of crop farming and contributes substantially to household nutritional security and poverty alleviation through increased household income. Indian agriculture is an economic symbiosis of crop and livestock production with cattle as the foundation. Dairy animals produce milk by converting the crop residues and by products from crops which otherwise would be wasted. Dairy sector contributes by way of cash income, draught power and manure.

India has vast resource of livestock and poultry, which play a vital role in improving the socio-economic conditions of the rural masses. There is no other country in the world having varied domestic animal biodiversity like India. India has the largest livestock populations in the world.

Salient Features of 19th Livestock Census

- The total livestock population consisting of Cattle, Buffalo, Sheep, Goat, pig, Horses & Ponies, Mules, Donkeys, Camels, Mithun and Yak in the country is 512.05 million numbers in 2012. The total livestock population has decreased by about 3.33% over the previous census.
- Livestock population has increased substantially in Gujarat (15.36%), Uttar Pradesh (14.01%), Assam (10.77%), Punjab (9.57%) Bihar (8.56%); Sikkim (7.96%), Meghalaya (7.41%), and Chhattisgarh (4.34%).
- The number of milch animals (in-milk and dry), cows and buffaloes, has increased from 111.09 million to 118.59 million, an increase of 6.75%.
- The number of animals in milk, cows and buffaloes, has increased from 77.04 million to 80.52 million showing a growth of 4.51%.
- The Female Cattle (Cows) Population has increased by 6.52% over the previous census (2007) and the total number of female cattle in 2012 is 122.9 million numbers.
- The Female Buffalo population has increased by 7.99% over the previous census and the total number of female buffalo is 92.5 million numbers in 2012.
- The exotic/crossbred milch cattle increased from 14.4 million to 19.42 million, an increase of 34.78%.
- Indigenous milch cattle increased from 48.04 million to 48.12 million, an increase of 0.17%.
- The milch buffaloes increased from 48.64 million to 51.05 million with an increase of 4.95% over previous census.

- The total sheep in the country is 65.06 million numbers in 2012, declined by about 9.07% over census 2007.
- The Goat population has declined by 3.82% over the previous census and the total Goat in the country is 135.17 million numbers in 2012.
- The total pigs in the country have decreased by 7.54% over the previous census and the total pigs in the country are 10.29 million numbers in 2012.
- Horses & Ponies population has increased by 2.08% over the previous census and the total Horses & Ponies in the country is 0.62 million numbers in 2012.
- The total Mules in the country have increased by 43.34% over the previous census and the total Mules in the country are 0.19 million numbers in 2012.
- Camel population has decreased by 22.48% over the previous census and the total Camels in the country is 0.4 million numbers in 2012.
- The total Donkey population in the country have decreased by 27.22% over the previous census and the total donkeys in the country are 0.32 million numbers in 2012.
- The total poultry population in the country has increased by 12.39% over the previous census and the total poultry in the country is 729.2 million numbers in 2012.
- The total Mithun and Yak in the country has registered a growth rates of 12.98% and -7.64% respectively over the previous census and the Mithuns and Yaks in the country is 0.29 million and 0.07 million in numbers respectively.

ALL INDIA LIVESTOCK CENSUS (in thousands)			
CATEGORY			
	2007	**2012**	**% Change**
Cattle			
Exotic/Crossbred			
• Male	6,844	5,971	-12.75
• Female	26,216	33,760	28.78
Total Exotic/Crossbred	33,060	39,732	20.18
Indigenous			
• Male	76,779	61,949	-19.32
• Female	89,236	89,224	-0.01
Total Indigenous	1,66,015	1,51,172	-8.94
Total Cattle	1,99,075	1,90,904	-4.10
Buffalo			
• Male	19,597	16,103	-17.83
• Female	85,745	92,599	7.99
Total Buffalo	1,05,342	1,08,702	3.19
Yaks			
• Male	38	35	-7.62
• Female	45	42	-7.65

Total Yaks	83	77	-7.64
Mithuns			
• Male	127	129	1.57
• Female	137	169	23.36
Total Mithuns	264	298	12.88
Bovine			
• Male	1,03,385	84,187	-18.57
• Female	2,01,379	2,15,794	7.16
Total Bovines	3,04,764	2,99,981	-1.57
Sheep			
Exotic/Crossbred			
• Male	1,144	1,207	5.51
• Female	2,586	2,574	-0.46
Total Exotic/Crossbred	3,730	3,781	1.37
Indigenous			
• Male	16,730	13,916	-16.82
• Female	51,098	47,372	-7.29
Total Indigenous	67,828	61,288	-9.64
Total Sheep	71,558	65,069	-9.07
Goat			
• Male	40,793	37,617	-7.79
• Female	99,744	97,556	-2.19
Total Goat	1,40,537	1,35,173	-3.82
Horses & Ponies			
• Male	336	350	4.17
• Female	276	275	-0.36
Total Horses & Ponies	612	625	2.12
Mules			
Total Mules	137	196	43.07
Donkey			
• Male	227	186	-18.06
• Female	211	133	-36.97
Total Donkeys	438	319	-27.17
Camels			
• Male	243	191	-21.40
• Female	274	210	-23.36
Total Camels	517	400	-22.63
Pigs			
Exotic/Crossbred			
• Male	1,209	1,283	6.12
• Female	1,180	1,174	-0.51
Total Exotic/Crossbred	2,389	2,456	2.80
Indigenous			
• Male	4,134	3,681	-10.96

• Female	4,610	4,156	-9.85
Total Indigenous	8,744	7,837	-10.37
Total Pigs	11,133	10,294	-7.54
TOTAL LIVESTOCK	**5,29,696**	**5,12,057**	**-3.33**

Livestock population in Tamil Nadu

The contribution of livestock sector to the Gross State Domestic Product (GSDP) is 4.34% and that to the Agriculture and allied activities is 36.26%. During 2006-07 the gross value of output of livestock which was Rs.11, 535.23 crore in the State has increased to Rs.47,659.71 crore during 2015-16. The estimated milk production, which was 54.74 lakh Metric Tonnes (LMT) during 2005-06 in Tamil Nadu, has increased to 75.56 LMT during 2016-17. Likewise, the estimated egg production which was 62,225 lakh numbers during 2005-06 has increased to 1, 66,824 lakh numbers during 2016-17. The per capita availability of milk per day has increased from 231 gm during 2005-06 to 3 266 gm. during 2016-17 and the per capita availability of eggs per annum has increased from 100 numbers during 2005-06 to 214 numbers during 2016-17. Apart from these, the estimated meat production (including poultry meat) which was 1, 18,600 MT during 2005-06 has increased to 5, 72,939 MT during 2016-17.

Comparison of State Livestock and Poultry Population with National Livestock Population (19th census)

Species	Population in India (In lakhs Nos.)	Population in Tamil Nadu (In lakhs Nos.)	% population available in Tamil Nadu
cattle	1909.04	88.14	4.62
Buffaloes	1087.02	7.81	.72
Sheep	650.69	47.87	7.36
Goat	1351.73	81.43	6.02
Pigs	102.94	1.84	1.79
Others(Horses, Donkeys and ponies)	9.44	0.14	3.74
Total livestock	5110.86	227.23	4.44
Total poultry	7292.09	1173.49	16.09

Tamil Nadu ranks 1 st in respect of Poultry, 4 th in Sheep, 7th in Goats, 13th in Cattle and 14th in Buffalo population in the country.

DAIRY DEVELOPMENT DEPARTMENT IN INDIA

India produced 155.491 Million Tons (4144 lakh litres per day) of milk in 2015-16, which is 18.5% of the world production.Tamil Nadu ranks among the top ten milk producing States of the country with a daily production of 193 lakh litre per day and fourth among the Co-operatives in India with a daily procurement of 28.50 lakh litre per day (LLPD).

LIVESTOCK AND ROLE IN ECONOMY

Role/Significance of Livestock in Indian Economy

Livestock 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 4.11% GDP and 25.6% of total Agriculture GDP.

Contribution of livestock to people

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

1. **Food:** The livestock 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 137.7 m. tones of milk in a year. Similarly it is producing about 74.75 billions of eggs, 8.89 million tonnes of meat in a year.
2. **Fibre and skins:** The livestock 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 47.9 million Kg of wool per annum.
3. **Draft:** Bullocks are the back bone of Indian agriculture. Despite lot of advancements in the use of mechanical power in Indian agricultural operations, the Indian farmer especially in rural areas still depend upon bullocks for various agricultural operations. The bullocks are saving a lot on fuel which is a necessary input for using mechanical power like tractors, combine harvesters etc.
4. **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. In addition it is also used as fuel (bio gas, dung cakes), and for construction as poor man’s cement (dung).

5. **Storage:** Livestock are considered as “moving banks” because of their potentiality to dispose off during emergencies. They serve as capital and in cases of landless agricultural labourers 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.
6. **Weed control:** Livestock are also used as Biological control of brush, plants and weeds.
7. **Cultural:** Livestock offer security to the owners and also add to their self esteem especially when they are owning prized animals such as pedigreed bulls, dogs and high yielding cows/ buffaloes etc.
8. **Sports / recreation:** People also use the animals like cocks, rams, bulls etc for competition and sports. Despite ban on these animal competitions the cock fights, ram fights and bull fights (jalli kattu) are quite common during festive seasons.
9. **Companion animals:** Dogs are known for their faithfulness and are being used as companions since time immemorial. When the nuclear families are increasing in number and the old parents are forced to lead solitary life the dogs, cats are providing the needed company to the latter thus making them lead a comfortable life.

Role of livestock in farmers’ economy

The livestock 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.

1. **Income**: Livestock is a source of subsidiary income for many families in India especially the resource poor who maintain few heads of animals. Cows and buffaloes if in milk will provide regular income to the livestock farmers through sale of milk. 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.
2. **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.

3. **Food:** The livestock products such as milk, meat and eggs are an important source of animal protein to the members of the livestock owners.
4. **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; Bulls and Cows are worshipped during various religious functions. Many owners develop attachment to their animals.
5. **Draft :** The bullocks are the back bone of Indian agriculture. The farmers especially the marginal and small depend upon bullocks for ploughing, carting and transport of both inputs and outputs.
6. **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).

Livestock development for rural development

The role of livestock in the lives of small farmers and village poor is many fold as shown below,

1. It buffers the risks due to crop failure, un and under employment
2. Enhances family nutrition status, allows some domestic consumption of essential nutrients
3. Provides regular cash income
4. Render services-draft, manure and fuel
5. Helps enhance socio-economic status

Different Livestock Development Programmes Of Government of India

Centrally-sponsored Dairy Development Schemes

- Dairy Entrepreneurship Development Scheme
- Intensive Dairy Development Programme

Centrally-sponsored Animal Husbandry Schemes

- Fodder And Feed Development Scheme
- Pig Development Scheme
- Poultry Venture Capital Fund
- Establishment And Modernization Of Rural Slaughter Houses
- Salvaging And Rearing Of Male Buffalo Calves
- Utilization Of Fallen Animals

- Integrated Development Of Small Ruminants(sheep And Goat) And Rabbits
- Conservation Of Threatened Breeds Of Small Ruminants, Rabbits,Pigs,Pack Animals And Equines
- Livestock Insurance Scheme

Other schemes

- NABARD venture capital fund scheme for Dairy /Poultry
- Government of india scheme-dairy entrepreneurship development scheme
- Government of india scheme-small ruminants and rabbits
- Uttarakhand regional economic development programme

Scheme Activities Of Tamil Nadu

State Sponsored Schemes

- Kalnadai Padhukappu Thittam
- Capacity Building for Poverty Reduction scheme
- Scheme for free distribution of milch cows
- Scheme for free distribution of sheep/goats
- State fodder development scheme
- Centrally-sponsored fodder Development Schemes

World Bank Assisted projects

Tamil Nadu Irrigated Agricultural Modernization and Water Bodies Restoration and Management (TNIAMWARM project)

Centrally-sponsored Schemes

- Rural Backyard Poultry Development
- Hill Area Develoment Programme(HADP)
- National Agricultural Development Programme(NADP**)**
- National Mission for Protein Supple Mentation (NMPS)
- Accelerated Fodder Development Programme
- National Project On Rinderpest Eradication Programme(NPRE)
- Foot And Mouth Disease Control Programme
- Natioanl Animal Disease Reporting System(NADRS)
- National Control Programme Of Peste Des Petits RUMINANTS(NCP PPR)
- National Control Programme For Brucellosis(NCPB)
- Assisted To States For Control Of Animal Diseases(ASCAD)

Poultry development

- Assistance To State Poultry /Duck Farms
- Rural Backyard Poultry Development
- Establishment Of Poultry Estates
- Livestock Insurance
- Conservation Of Threatened Livestock Breeds

SYSTEMS OF LIVESTOCK PRODUCTION

Livestock production systems:

In general, husbandry systems are usually classified as **intensive, semi-intensive and extensive.**

Meat and dual production systems which is common in the tropical countries can be classified as,

1. Extensive (migratory, free range, pasture or range grazing).
2. Semi-intensive (pasture or range grazing, use of supplementary feeding mainly on crop residues and conserved roughage)
3. Intensive (grazing on improved pastures, zero grazing, conserved forage, crop residues and increased use of concentrates).
4. Tethering (small size flocks of 2-10 animals). This is a subsistence family system and the animals live on kitchen remnants crop residues, grazing near inhabited areas and other supplementary feed.

I. Extensive system:

In this system, the livestock are kept on grassland, all the operations are in open place. Small shelters are made for young animals during extreme weather conditions.

1) Nomadic and transhumant system are the most difficult to improve, because they involve continuous movement, not only of the whole flock, but also of all its owners. There is, therefore, no possibility of dividing the flock by age, sex or stage of reproductive cycle, and it is very difficult to provide supplementary feeding. Nomadic flockers know where to find the best pasture and browse, as well as drinking water, at different seasons. The women, children and old people usually stay in the village throughout the year, and may cultivate some crops.

2) Sedentary systems:

Extensive systems are most appropriate where large areas of pasture land can provide grazing and browse for goats with a minimum of labour or capital investment.

Extensive farming is usually large in comparison with the numbers working and money spent on it.

i. Oldest method
ii. Requires extensive land
iii. Availability of fodder varies with season so variation in intake.
iv. Cost of feeding is nil or negligible.
v. Currently not followed except in place where there is grazing land.

Reason : a) Reduction in grazing land

b) Tremendous pressure on cultivable land

High yielding animal : This system is not suitable due to

i) Temperature
ii) Loss of energy
iii) Average fodder availability

Advantages:

1. Less labour per unit areas is required to farm large areas.
2. Mechanization can be used more effectively over large, flat areas.
3. Animal welfare is generally improved because animals are not kept in stifling conditions.
4. Lower requirements of inputs.
5. Local environment and soil are not damaged by overuse of chemicals.

Disadvantages

1. Yields tend to be much lower than with intensive farming in the short term.
2. Large land requirements limit.

II. Semi intensive system:

In this system the animals are confined during part of a day under roof and allowed to graze during day time. During confinement, concentrate feeding is done. This system of rearing is more suitable for dairy, goat and some extent sheep.

Tethering of goats. Goats are usually tethered singly. Where tethering is used, care must be taken that there is no possibility of strangulation by entanglement with vegetation, etc., or with other goats. It is essential to change the place of tethering every day for obtaining fresh herbage and a variety of different feed plants by the animal.

III. Intensive System:

In intensive system all the operations are confined in one place and animal movement is restricted. Poultry, pig, rabbit are more suitable for this system. In developed countries dairy also maintained by intensive system. Intensive production systems involve either grazing on crops or cultivated pastures at a very high stocking density or zero-grazing. The control of goats by fencing is both difficult and expensive. Fences need to be at least 1.5m high and made of strong wire netting, closely placed taut wires or wooden rails.

IV. Mixed Farming:

Along with crop husbandry one or more component of livestock or poultry maintained. Mixed farming is the economical rearing of different types of livestock & poultry in the farm along with

- Better utilization of farm by products.
- Utilization of unconventional feed and fodder
- Recycling : Farm Yard Manure – Dung – Gas – Slurry – Soil fertility
- Bring constant income to the family throughout the year
- Indirectly enhances standard of living.

Integrated farming system – (IFS)

IFS defined as integration of more than one different types of agriculture and allied enterprises based on the sound principles of scientific agriculture for optimum utilization and management of available resources, recycling of waste/bi-products, engagement of family labours, decrease the cost of cultivation and increase in input use efficiency to maximum production, productivity ,income generation and provide gainful employment from nuit land area over stipulated time period

In the integrated farming system the defects of mixed farming is overcome by

- ❖ Proper planning,
- ❖ Monitoring and
- ❖ Execution of work according to size of the farm, farm resources, Agro climatic etc.

In this type, the type of livestock species or poultry enterprises are selected based on the availability of feed, fodder, water resources of the farm.

- ➢ Dairy + Crop+ Poultry
- ➢ Crop+ Dairy+ Poultry + Fish
- ➢ Crop + Dairy+ Poultry+ Fish+ Duck
- ➢ Crop + Dairy + Poultry + Fish + Duck + Sheep/Goat

Advantage

- •Productivity improvement
- •Net profit growth and fixed income
- •Sustainable growth in agriculture
- •Balanced diet
- •Pollution free Environment
- •Recycling of farm residues
- •Increase in employment
- • High standard of living

Constraints

1. Heavy investment at initial stage
2. Involvement of multi disciplinary activities like animal husbandry
3. Lack of marketing
4. Lack of knowledge of preparation of own feed
5. Non availability of new variety

V. Specialized farm

1. Sole income is derived from one species – Cattle, Buffalo, goat, pig or poultry

- White cattle
- Black cattle
- Sheep
- Goat
- Poultry

2. Pure Breed

- Breeding policy
- Income from sale of breeding bulls (eg.) Work Bullock (Kangayam)

COMMEN TERMS USED IN ANIMAL HUSBANDRY

Abomasum: Abomasum is the forth compartment, or true stomach, of the ruminant animal

Artificial insemination : Artificial insemination is the placing of sperm in the female reproductive tract by other than natural means

Bitch : An adult female dog

Boar : An adult uncastrated male pig used for breeding

Bobby calf : A male calf about 1 week old

Bos indicus : Bos indicus is humped cattle found in tropical countries

Bos Taurus : Bos taurus is the domestic cattle originating from either the Aurochs or the celtic shorthorn

Bovine : Bovine is a generic name for cattle

Breed : Breed is a group of animals with distinct shapes and colors which produce offspring with similar shapes and colors

Breeding Bull or Stud Bull : An adult male used for breeding

Broken-mouth : Broken-mouth is a mouth having teeth missing. Usually applied to sheep or goats and occurs with old age

Browse : Browse is the shoots, twigs, and leaves of brush plants found growing on rangeland. Browse is a fodder obtained from eating leaves and twigs of bushes

Buck : Buck is a male of such species as goats, deer, rabbits, etc, Buck is an intact mature, male goat

Buckling : Buckling is an intact, immature male goat

Buffalo bull calf : A male young one

Buffalo calf : A young one of either sex

Buffalo heifer calf : A female young one

Bull : Bull is a male of bovine of any age that has not been castrated

Bull calf : A male young one under 1 year of age

Buller : A female which is always in heat or estrus. It is also known as a nymphomanic animal.

Bullock or Steer : An adult castrated male used for carting and tillage

Burdizzo : Burdizzo is an instrument used for bloodless castration which clamps off the tissue connecting the testis to the rest of the body
Calf : Calf is a beef animal under one year of age, Calf is a young bovine of either sex
Calving: The act of giving birth to a young one
Calving interval: Calving interval is the length of time from one calving to the next
Cannibalism: Cannibalism is the act of eating another member of the same species. Seen in poultry and swine
Capon: Capon is a male chicken whose reproductive organs have been removed or rendered inactive while the individual is still young
Caponization :A process in which the testes are removed from the adult male. This is done to make a good table bird (for eating purpose).
Carcass : Carcass is the dressed body of an animal or deal animal
Carpet : Carpet wool is a coarse wool used for making carets
Carrying capacity : Carrying capacity is the number of animals that can be grazed on a pasture during the grazing season
Cast : Cast is to make the animal fall on the ground
Castrate : Castrate is to remove the testes of the male or to render them inactive; alternatively, an animal whose testes have been removed or rendered inactive
Cattle : Cattle is the animals of the family bovine, genus bos
Chevon : Chevon is the meat from goats
Colostrums : Colostrums is the milk produced the first few days after parturition
Concentrate : Concentrate is the feed containing less than 18 percent crude fiber when dry; grains and protein supplements are concentrates
Conception rate : Conception rate is the percentage of a group o animals that become pregnant when bred
Cow : Cow is a female bovine that has had one or more calves; or an older female that has not had a calf but has matured
Creep : Creep is an enclosure to which only the young of the species have access so they may be fed separately from the adult stock

Creep feed : Creep feed is used to provide special feed for the young; also, the feed provided for the young within a special enclosure
Crisscrossing : Crisscrossing is the mating crossbred females to a sire belonging to one of the parent breeds of the female; also called backcrossing
Crone : An old broken mouthed ewe which has been retained in a breeding flock because of her excellent breeding performance.
Cud : Cud in ruminants, a ball-like mess of feed that is brought up from the stomach to be rechewed
Cull : Cull is used to dispose of the poorer animals in a herd or flock
Dam : Dam is the mother of an animal
Deadweight : Deadweight is the weight of an animal after it has been slaughtered and the offal, head and hide removed
Dehorn : Dehorn is used to remove chemically or mechanically the horns of livestock
Dewlap : Dewlap is a hanging fold of skin under the neck of animals, especially some breeds of cattle and goats
Disbud : Disbud is used to remove or prevent growth of the horn buds in young livestock
Dock : Dock is used to remove all or part of the tail
Doe: Doe is a female of those species in which the male is called a buck; for example; goats, deer, rabbits, etc . Doe is a female goat, rabbit or antelope
Double rig: Both the testicles are retained in the abdomen. It is also known as or **double ridgling** “Cryptorchid”
Draft animal : Draft animal is an animal used for pulling loads
Drench : Drench is the medicine in a liquid form administered to the animal through the mouth
Elastrator : Elastrator is an instrument used to place strong rubber bands over, the scrotum or tail for castration or docking, respectively
Estrus : Estrus is the time during which the female will accept the male for copulation; also referred to as being “in heat”
Ewe : Ewe is a female sheep or lamb ;Ewe is a mature female sheep
Ewe lamb :A female young one

Feed efficiency : Feed efficiency is the ratio of units of feed needed per one unit of production
Feeder calf : Feeder calf is a weaned calf that is under one year of age and is sold to be fed for more growth
Fertilization : Fertilization is the union of a sperm cell with an egg cell
Fleece : Fleece is the total wool coat of a sheep
Flock: Flock is a group of animals (sheep, goats, birds).
Flushing : Flushing increasing the amount of feed to an animal for a short period of time, usually just prior to breeding
Free martin: When twin calves of different sexes are born the bull calf is usually sexually normal but the heifer calf is always sterile, and the external genitalia are abnormal in structure.
Gimmer :A female sheep which is between 1 and 2 shearing
Goatling :A female goat over 1 year but not exceeding 2 years of age
Haylage : Haylage is the low-moisture grass silage
He-buffalo : An adult male buffalo
Heifer : Heifer is a female bovine that has not had a calf or has not matured as a cow
Heterosis : Heterosis improvement in the offspring resulting from favorable combinations of gene pairs; some times called hybrid vigor
Inbreeding : Inbreeding is the mating of related animals
Kid : Kid is a goat under one year of age
Kidding : The act of giving birth to a young one
Lamb : Lamb is a young sheep
Lambing : The act of giving birth to a young one
Livestock: Livestock means stocks that are live and are used for production of items for commercial and for domestic consumption. The term livestock includes all animals, birds and all living creatures used for producing items for the use of man. The term livestock production or animal production is used to indicate farm animal production.
Mohair : Mohair is the fleece of the Angora goat
Ovulation : Ovulation is the release of the egg cell from the ovary

Ovum : Ovum see egg
Parturition : Parturition is the act of giving birth
Pedigree : Pedigree the record of the ancestors of an animal
Pelleting : Pelleting is the grinding a feed into small particles and then forming it into a small, hard form called a pellet
Phenotype : Phenotype is the physical appearance of an animal
Placenta : Placenta in mammals, the structure by which the fetus is nourished in the uterus
Polled : Polled is not having horns
Puberty : Puberty is the age at which sexual maturity is reached
Ram lamb :A male young one
Ram or Tup : An adult male sheep used for breeding
Rectum : Rectum is the last part of the large intestine
Rumen : Rumen is the first and largest compartment of the ruminant stomach
Repeatability : Repeatability in dairy cattle, a measure of the confidence that can be placed on the predicted difference being a true measure of a bull's ability to transmit genetic characteristics
Reproduction : Reproduction is the production of offspring
Roughage : Roughage is a feed containing more than 18 percent crude fiber when dry; examples, hay, silage, and pasture
Ruminant : Ruminant is an animal that has a stomach divided into several compartments; for example, cattle, sheep, goats
Rumination : Rumination in ruminants, the process of chewing the cud
Scrotum : Scrotum is the saclike part of the male reproductive system outside the body cavity that contains the testicles and the epididymis
Semen : Semen is the mixture of the seminal and prostate fluid and the sperm
Shearing : Removal of wool
She-buffalo : An adult female buffalo
Slink calf : An aborted calf
Steer : Steer is a male bovine animal that was castrated before reaching sexual maturity

Teat : Teat is the outlet for milk produced in the udder
Testicles : Testicles is the male organs that produce the sperm cells
Testosterone : Testosterone is the male hormone that controls the traits of the male animal
Udder : Udder is the milk producing gland of mammals such as cows
Urine : Urine is the liquid waste collected in the bladder
Uterus : Uterus is the part of the female reproductive system where the fetus grows; also called the womb
Veal : Veal is the calves younger than three months of age sold for slaughter
Wattle : Wattle is a projection of skin hanging from the chin or throat, especially in poultry and some breeds of goats
Wedder or Wether : An adult castrated male sheep.
Yearling :A horse over 1 year and under 2 years of age
Yearling bull : An uncastrated male between one and two years
Yeld or Eild : A barren or non lactating animal

ZOOLOGICAL CLASSIFICATION OF LIVESTOCK

CLASSIFICATION	ZEBU CATTLE	EXOTIC CATTLE	BUFFALO	GOAT	SHEEP	PIG
Kingdom	Animalia	Animalia	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia
Sub-Class	Eutheria	Eutheria	Eutheria	Eutheria	Eutheria	Eutheria
Order	Ungulata	Ungulata	Ungulata	Ungulata	Ungulata	Ungulata
Sub - Order	Artiodactyla	Artiodactyla	Artiodactyla	Artiodactyla	Artiodactyla	Artiodactyla
Family	Bovidae	Bovidae	Bovidae	Capridae	Ovidae	Suidae
Genus	Bos	Bos	Bubalus	Capra	Ovis	Sus
Species	indicus	taurus	bubalis	Hircus	aries	domesticus

Animal Husbandry Terms					
Details	**Cattle**	**Buffalo**	**Sheep**	**Goat**	**Pig**
Species	Bovine	Bovine or Bubaline	Ovine	Caprine	Swine
Groups of animals	Herd	Herd	Flock	Flock or band	Drove or herd or stock
Adult male	Bull	Buffalo bull	Ram or tup	Buck	Boar
Adult female	Cow	She buffalo or buffalo cow	Ewe	Doe	Sow
Young male	Bull calf	Buffalo bull calf	Ram lamb or Tup lamb	Buckling or male kid	Boarling
Young female	Heifer calf	Buffalo heifer calf	Ewe lamb or gimmer lamb	Goatling	Gilt
New born	Calf	Buffalo calf	Lamb	Kid	Piglet or pigling
Castrated male	Bullock or steer	Buffalo bullock	Wether or wedder	Castrated	Hog or stag or barrow
Sterilized female	Spayed	Spayed	Spayed	Spayed	Spayed
Female with its offspring	Calf at foot	Calf at foot	Suckling	Suckling	Suckling
Act of parturition	Calving	Calving	Lambing	Kidding	Farrowing
Act of mating	Serving	Serving	Tupping	Serving	Coupling
Cry	Bellowing	Bellowing	Bleating	Bleating	Grunting
Chromosome number	60	50	58	60	38

UNIT II: DAIRY CATTLE MANAGEMENT

CATTLE AND BUFFALO BREEDS

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

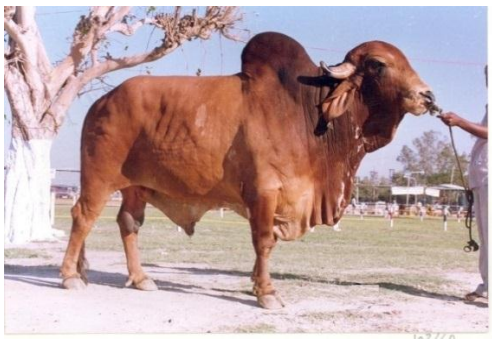
S.No	Type of Breed	Breeds	Salient characters
I	Milch breeds	1.Gir	Ponderous in build, pendulous dewlap and sheath have lateral or curved horns, predominantly red with varying colour pattern
		2.Red Sindhi	
		3.Sahiwal	
		4.Deoni	
II	Draught breeds	5.Nagori	Short horned white or light grey colour, with long coffin shaped skull and slightly convex profile
		6.Bachur	
		7.Kenketha	Lyre horned grey with wide forehead, prominent orbital arches, flat dished profile
		8.Malvi	
		9.Kerigarth	
		10.Hallikar	Mysore type – prominent fore head with long pointed horn raises closer at poll, coffin shaped skull. Grey colour
		11.Amirthamahal	
		12.Khillari	
		13.Kangeyam	
		14.Bargur	
		15.Ponwar	Short horned or slightly lyre horned small black, red, dun colour
		16.Siri	
III	General utility breeds	17.Gaolao	Short horned white or light grey colour, with long coffin shaped skull, convex profile
		18.Krishna valley	
		19.Tharparkar	Lyre horned grey with wide forehead prominent orbital arches, flat or dished profile
		20.Kankrej	
IV	Exotic breeds	21.Shorthorn, 22.Ayrshires, 23.Jersey, 24.Brown Swiss 25.Red Dane, 26.Guernsey 27.Holstein– Friesian	

V	Buffalo Breeds	28. Murrah, 29.Bhadawari, 30.Jaffarabadi, 31. Surti, 32.Mehsana, 33. Nagpuri or Ellichpuri 34. Nili – Ravi 35. Toda

CHARACTERISTIC FEATURES OF DIFFERENT BREEDS

MILCH BREEDS

GIR



Origin : Gir Forests of south Kathiawar in Gujarat

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

<u>The typical characteristics of Gir breed are:</u>

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

<u>Performance parameters</u>

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

RED SINDHI:

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

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

The typical characteristics of the breed is

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

Performance parameters

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

SAHIWAL

Origin : Montgomery district in present Pakistan.

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

The typical characteristics of the breed is

i. The Sahiwal is a heavy bred with symmetrical body and loose skin. Animals are long, deep, fleshy and comparatively lethargic.
ii. Horns are short and stumpy.
iii. Dewlap is large and heavy.
iv. Hump in males is massive and frequently falls on one side.
v. Naval flap is loose and hanging. Sheath in males is also pendulous.
vi. Tail is long and fine with a black switch reaching almost to the ground.

Performance parameters

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

KANGAYAM

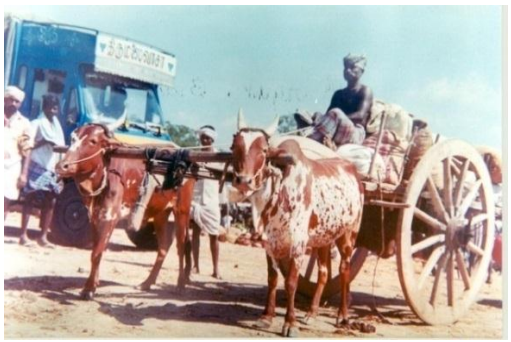
Origin : Kangayam, Dharapuram, Perundurai, Erode, Bhavani and part of Gobichettipalayam

taluk of Erode and Coimbatore district. The kangayam breed was developed by the efforts of the late Pattagar of Palayakottai, Sri N. Nallathambi Sarkarai Manradiar.

The typical characteristics of the breed is

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

BARGUR



The typical characteristics of the breed is

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

UMBLACHERRY

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

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

The typical characteristics of the breed is

i. Umblacherry calves are generally red or brown at birth with all the characteristic white marking on the face, on limbs and tail.

ii. The colour changes to grey at about 6 months of age. In adult females, the predominant coat colour is grey with white marking on the face and legs.

iii. All the legs below hocks have white marks either socks or stockings.

iv. Horns are very small, curving outward and inward an sometimes spreading laterally.

v. The practice of dehorning bullocks is peculiar in Umblacherry cattle. Horn buds are removed at 6 months of age by singing with red hot iron.

vi. Ears are pruned and hot iron branding is done.

PULIKULAM / JELLICUT BREED

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

organic manure for agricultural crops. This breed can only be conserved in the agro-eco system where forest grazing is available.

ALAMBADI

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

D. Exotic breeds of Cattle:

In order to improve the milk yielding capacity of the indigenous cows, exotic cattle breeds have been extensively used in India.

Important foreign breeds are described below:

Jersey

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

Holstein Friesian:

i. This breed was developed in the northern parts of Netherlands, especially in the province of Friesland.

ii. They are ruggedly built and they possess large udder.

iii. They are the largest dairy breed and mature cows weigh as much as 700kg.

iv. They have typical marking of black and white that make them easily distinguishable.

v. This is by far the best dairy breed.

vi. The average production of cow is 6000 to 7000 kg per lactation. However, the fat content in their milk is rather low (3.45 per cent).

Brown Swiss

i. The mountainous region of Switzerland is the place of origin of Brown Swiss breed. It is rather less refined than other dairy breeds, but is famous in its home tract for its rugged nature and good milk production.

ii. In India excellent crossbred cattle have been obtained by crossing this breed with recognized Indian breeds of cattle; the *Karanswiss* cattle of NDRI, Karnal.

E. Breeds of Buffaloes

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

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

MURRAH

i. It is the most important breed of buffaloes whose home is Rohtak, Hisar and Jind of Haryana and Nabha and Patiala districts of Punjab.

ii. **Synonyms** : Delhi,

iii. The colour is usually jet black with white markings on tail and face and extremities sometimes found.

iv. The tightly curved horn is an important character of this breed.

v. The body size is massive, neck and head are comparatively long. Head of females is short, fine and clear cut.

vi. Hips are broad and fore and hind quarters are drooping.

vii. The buffalo cows of this breed are one of the most efficient milk and butter fat producers in India. Butter fat content is 7% Average lactation yield is vary from 1500-2500 kg.

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

SURTI

i. The breeding tract of this breed is Kaira and Baroda district of Gujarat.

ii. Coat colour varies from rusty brown to silver-grey. Skin is black or brown.

iii. The body is well shaped and medium sized; the barrel is wedge shaped.

iv. The head is long with prominent eyes.

v. The horns are sickle shaped, moderately long and flat.

vi. The colour is black or brown

vii. The peculiarity of the breed is two white collars, one round the jaw and the other at the brisket.

viii. The milk yield ranges from 900 to 1300 kg.

TODA

i. Toda breed of buffaloes is named after an ancient tribe, Toda of Nilgiris of south India.

ii. Coat colour of the calf is generally fawn at birth. In adult the predominate coat colours are fawn and ash-grey.

iii. These buffaloes are quite distinct from other breeds and are indigenous to Nilgiri hills.

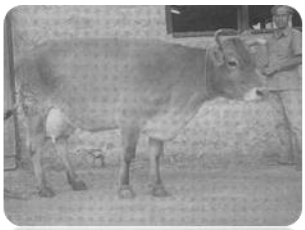
iv. The animals have long body, deep and broad chest, and short and strong legs.

v. The head is heavy with horns set well apart, curving inward outward and forward.

vi. Thick hair coat is found all over the body. They are gregarious in nature.

NEW CROSSBRED CATTLE STRAINS

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



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

BREEDING - CROSS BREEDING- UPGRADING

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

Systems of breeding have been broadly divided as

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

Inbreeding:

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

***b. Line breeding*:**

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

Out breeding:

It consists of outbreeding, cross breeding and Up grading.

a. Out Crossing:

Mating of unrelated pure bred animals within the same breed.

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

Methods of cross breeding:

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

2. ***Triple crossing*****:** In this system three breeds are crossed in a rotational manner. It is also known as rotational crossing.

3. ***Back crossing*****:** Back crossing is mating of a crossbred animal back to one of the pure parent races which were used to produce it. It is commonly used in genetic studies, but not widely used breeders.

Advantages of cross breeding:

1. It is valuable as a mean of introducing desirable charaters into a breed in which they have not existed formerly.

2. It serves a good purpose in evolving a new breed owing to the fact that it disturbs the balance and brings about recombination in the germ to cause variations.

3. It is an extremely handy tool to study the behavior of characteristics in hereditary transmission.

4. The cross bred animals usually exhibit an accelerated growth and vigour or heterosis.

Disadvantages:

1. It has tendency to break up the established characters and destroy combinations of that characters.

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

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

Non-descript cow x Jersey Bull

F_1 50% ND + 50% Jersey x Jersey Bull

F_2 25% ND + 75% Jersey x Jersey Bull

F_3 12.5% ND + 87.5% Jersey x Jersey Bull

After 5-6 generations the off springs will have 96.9 & 98.3% of the hereditary characters of 'Pure Breed'. So grading is a process by which a few 'Pure Breed' sires can rather quickly transform local variety of animals into a 'Group' resembling the pure breed.

ECONOMIC TRAITS OF CATTLE AND BUFFALOES

Criteria **Economic traits**

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

Comparison of Economic Traits between Local, Exotic and Crossbred cattle

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

CULLING OF DAIRY ANIMALS

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

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

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

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

CULLLING METHODS

The Tandem Method

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

For example, a breeder that is pleased with the muzzle length, muzzle shape, and eye placement in the breeding stock, but wishes to improve the eye shape of progeny produced may determine a minimum level of improvement in eye shape required for progeny to be returned into the breeding program. Progeny is first evaluated on the existing quality thresholds in place for muzzle length, muzzle shape, and eye placement with the additional

criterion being improvement in eye shape. Any animal that does not meet this level of improvement in the eye shape while maintaining the other qualities is culled from the breeding program; i.e., that animal is not used for breeding, but is instead spayed/neutered and placed in a pet home.

Independent levels

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

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

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

Total Score Method

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

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

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

Culling in dairy animals 10 points

- Do not move non-ambulatory animals to market under any circumstances.
- Make the decision to treat, to cull, or to euthanize animals promptly. Sick and injured animals should be segregated from the herd
- Delay transport of an animal that appears to be exhausted or dehydrated until the animal is rested, fed, and dehydrated.
- Milk all cows that are still lactating just prior to transporting to a packing or processing facility.
- Use a transportation company that is knowledgeable about your animal care expectations and provides for the safety and comfort of the animals during transport.
- Do not transport animals to a packing or processing facility until all proper treatment withdrawal times have been followed.
- Do not transport animals with a poor body condition, generally a Body Condition Score of less than 2 (1-5 scale).
- Do not transport animals that require mechanical assistance to rise and are reluctant or unable to walk, except for veterinary treatment. When using any handling device, abuse must not be tolerated.
- Do not transport animals with bone fractures of the limbs or injuries to the spine. Animals with a recent fracture unrelated to mobility should be culled and transported directly to a packing or processing facility.

- Do not transport animals with conditions that will not pass pre-slaughter inspection at a packing or processing facility. If unsure, consult with your veterinarian before transporting an animal to a packing or processing facility.

ESTRUS CYCLE

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

Oestrus cycle is divided into

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

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

Metoestrum (4 days): Implantation of the embryo takes place and Corpus Luteum (CL) will be formed and prevents the growth of graffian follicle thereby arrests oestrus cycle. This is the period when the organ returns to normal non congested condition. During this period the cavity of the GF from which ovum has been expelled becomes recognized and forms a new structure known as C.L.

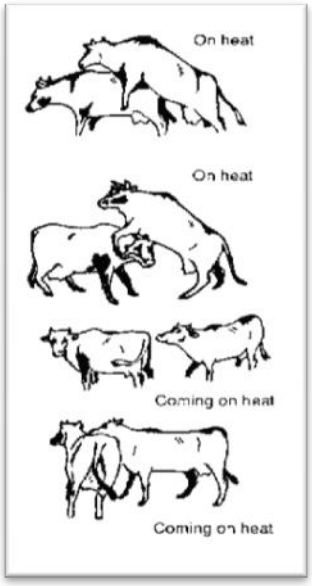
Diestrum (14 days): Further development of uterus takes place. If the animal has not conceived involution of uterus take place. Longest part of estrus cycle. Implantation of embryo and secretion of uterine milk takes place, which is used for the nourishment of the embryo prior to implantation. In case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

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

Signs of estrus / heat in cattle

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

Signs of heat



The signs of heat that may be shown will be described for each stage.

a. Early heat period

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

b. Standing heat period

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

c. Late heat period

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

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

Right time for breeding a cow

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

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

METHODS OF BREEDING IN CATTLE

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

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

ARTIFICIAL INSEMINATION

Introduction

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

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

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

TYPE OF ARTIFICIAL INSEMINATION (AI)

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

ADVANTAGES:

1. Increases usefulness of superior sires to extra ordinary degree.
2. Services of Superior Sires are greatly extended.
3. No need to maintain Breeding Bull. The frozen semen can be stored in the Liquid Nitrogen-196^{0}C.
4. Semen can be quickly and easily transported by air to different continents.
5. Spreading of diseases is absolutely- NIL.
6. Overcomes the difficulty of size and weight between Dam and Sire.
7. Increase the rate of Conception because in the artificial insemination the semen is being deposited in the mid cervix.
8. Outstanding animals located apart can be mated.
9. Helps in better record keeping.
10. Old and heavy sizes bulls, injured / disabled sires can be used.
11. If the sires are used for Natural Service the animal can serve only 50-60 animals/year but under Artificial Insemination the amount of semen secreted by the animal can be used to satisfy the requirements of 1000 animals per year
12. Semen can be stored in the frozen state , so progeny can be obtained even after the transfer, WHY even after death of bull-15-20 years.(atomic, radioactive, X-ray unit)
13. Semen is expanded and no. of animal can be crossed.
14. Frozen semen can be transported to destination once in a month from the semen bank.

DISADVANTAGES.

1. Some bull's semen may not freeze well.
2. If inferior bull semen is frozen and used –Extensive damage is caused.
3. Maintenance of frozen semen bank is not economical for a small area of operation.
4. Requires well trained technical personnel's and special equipments and hygienic measures are to adapted in preparation.
5. Improper cleaning of instruments and unsanitary condition may lead to lower fertility and may be nucleus for the spreading of diseases.

EMBRYO TRANSFER TECHNOLOGY IN CATTLE

- Embryo transfer was first performed and recorded by Walter Heape in 1890.
- He transferred two Angora rabbit embryos into Belgian doe. She went on to produce a mixed litter of Belgian and Angora bunnies.

- Embryo transfer in food animals began in the 1930s with sheep and goats, but it was not until the 1950s that successful embryo transfers were reported in cattle and pigs by Jim Rowson at Cambridge, England.

COMPONENTS OF ET PROGRAM

- **Donor (Animal that donates embryos)**
  - ❖ Have good reproductive performance and progeny performance.
  - ❖ Have regular estrus cycles.
  - ❖ Select 60-90 days of post calving.
- **Recipient (Animal that receives embryo from donor)**
  - ❖ Good healthy, body condition, vaccinated for all the reproductive diseases.
  - ❖ Animal should have completed two estrous cycles.

PROCEDURE

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

FLUSHING OF EMBRYOS

- ❖ To collect the embryos non surgically, a small synthetic rubber Foly catheter is inserted through the cervix of the donor cow
- ❖ A special medium is flushed into and out of the uterus to harvest the embryos seven or eight days after estrus.
- ❖ This collection procedure is relatively simple and can be completed in 30 minutes or less without harm to the cow.

EVALUATION

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

The major criteria for evaluation include:

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

- ❖ Overall diameter of the embryo

EMBRYO TRANSFER-Types

- Same day transfer of embryo (Success rate= 70-80%)
- Transfer of frozen embryo (Success rate= 50-60%)

Calf Birth at 280 days

Advantages

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

Disadvantages

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

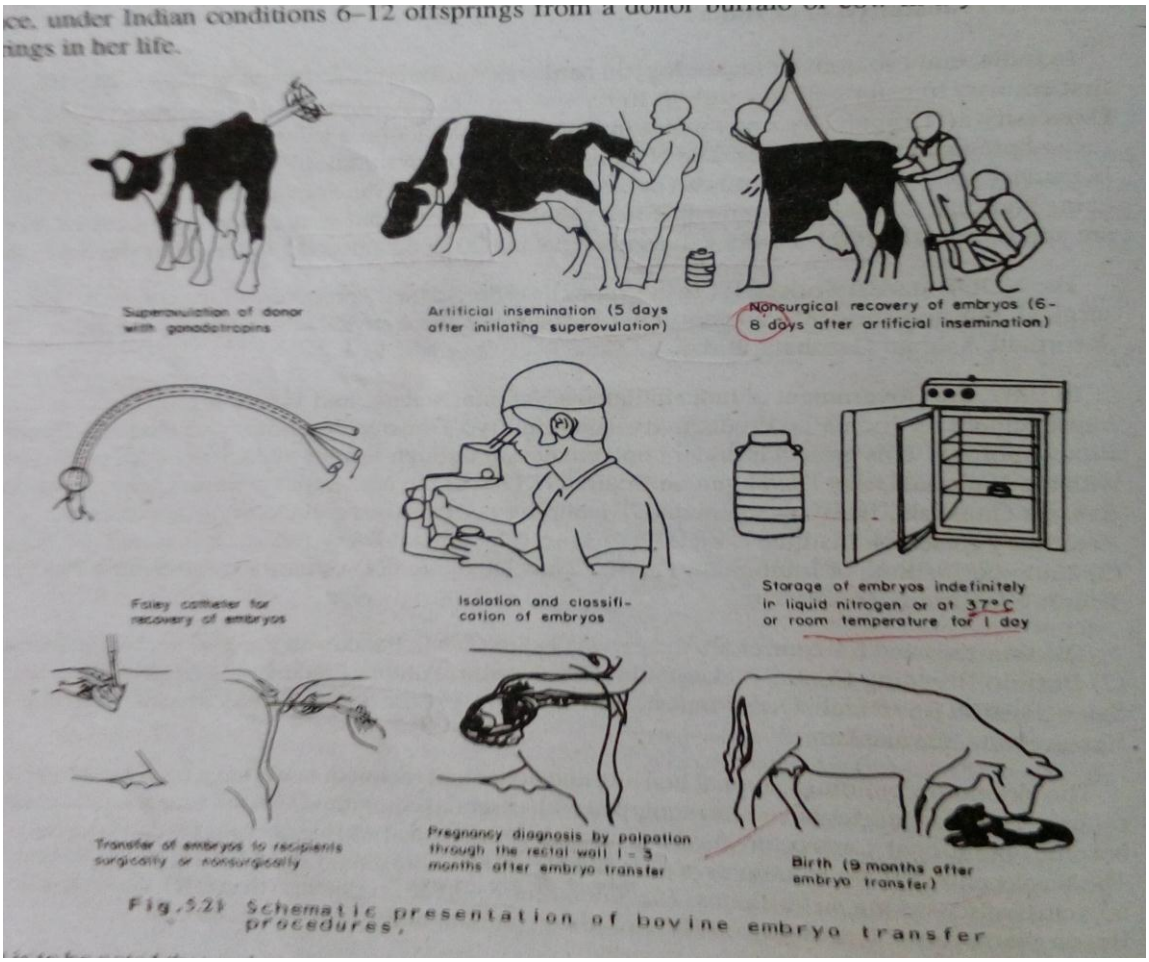


Fig. 5.2) Schematic presentation of bovine embryo transfer procedures.

HOUSING OF DAIRY CATTLE AND BUFFALOES

SELECTION OF SITE FOR FARM BUILDINGS

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

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

1. Type of soil
2. Availability of land
3. Electricity
4. Availability of water
5. Protection from wind and solar radiation
6. Away from noise and other pollution sources
7. Availability of market facility
8. Transport facilities
9. Drainage system
10. Miscellaneous like, telephone, school, post office and shopping centre etc.,

HOUSE LAYOUT

1. Orientation

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

2. Length of building

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

3. Height of the building

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

4. Width of buildings

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

5. Roof

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

6. Floor

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

HOUSING

In India, a great diversity exists in the design of dairy animal shelters. Efficiently designed sheds can help lessen the thermal stress thereby increasing feed intake, milk production and reproductive efficiency. Under varied climatic, geographical and economical conditions prevailing in India, designing an ideal set of building for dairy animals throughout the country is impossible. Hence, practically there are two systems of housing for dairy animals viz.,

i) Loose housing and
ii) Conventional barns

The former being widely followed in our country.

i. LOOSE HOUSING

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

Advantages

1. Cost of construction is cheaper.
2. Future expansion is possible.
3. The animals will move freely so that it will get sufficient exercise.

4. The animal can be kept clean.
5. Common feeding and watering arrangement is possible.
6. Clean milk production is possible because the animals are milked in a separate milking barn.
7. Oestrus detection is easy.
8. At least 10-15 per cent more stock than standard can be accommodated for shorter period.

Disadvantages

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

ii. CONVENTIONAL BARNS OR STANCHION BARNS

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

Advantages

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

Disadvantages

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

Milking barn

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

i) Single row system.

ii) Double row system: head to head or face–in; tail to tail or face–out.

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

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

Advantages

Tail to tail system

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

Head to head system

1. Getting animals into the shed is easy.
2. Feeding of animals is also easy.
3. Disinfection of gutter will be more due to the direct fall of sunrays over the gutter.
4. Animals are better exhibited to visitors.

Disadvantages

1. Milking supervision is difficult.
2. Possibilities of transmission of disease are more.

Floor space requirements

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

Young – calves	1.0	2.0	30	areas.
Old – calves	2.0	4.0	30	

Feeding and watering space requirements

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

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

Care and management of new born calf

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

As soon as the calf starts breathing, observe as to whether the navel cord is still attached. The navel cord should be disinfected. The navel cord of the calf is tied about 2.5 cm away from the body and cut about one centimetre below the ligature. Apply tincture of iodine to the cut end and repeat it 2-3 days. This will prevent infection. Then, if the cow does not lick the calf dry, or if the weather is cold, the herdsman should wipe the calf to clean and dry.

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

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

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

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

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

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

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

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

Removal of supernumerary teats is also important and this has to be carried out before development begins. This is usually done in the first month of age with the help of a short pair of sterile scissors. If the extra teat is at the base of the normal teat, veterinary help may be resorted to remove it.

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

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

To teach a calf to drink from an open pail, place your fingers in its mouth and after it starts to nurse lower its head into a pail of warm milk or milk replacer. It may be necessary to repeat the process several times. A stubborn calf may need to be backed into a corner and restricted by standing aside its neck. Maintaining the temperature of the milk as removed from the cow is not necessary. However, it should be aimed to feed the milk at this temperature itself. However, cold milk at 35^0 to 40^0 F may cause calves to shiver and chill. At any rate, calves should not be overfed.

CARE AND MANAGEMENT OF HEIFERS.

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

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

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

Foot and Mouth disease	: Once in 4 months.
Rinderpest	: 1-3 years.
Haemorraghic Septicaemia	: 1 year.
Anthrax	: 1 year.
Black Quarters	: 1 year.

10. Housing :

a. Outdoor system / Grazing method

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

b. Indoors

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

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

Training of heifers

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

Control of Parasites – Dewormed periodically at 3 –4 months intervals

Grooming is to be practiced to avoid ecto- parasites.

CARE, MANAGEMENT OF PREGNANT ANIMALS

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

Signs of approaching parturition

i. Cow will leave the herd and seek isolation
ii. Loss of appetite and distress
iii. Distention of teat and udder, considerable milk appears in the udder and there may be dripping of milk
iv. Relaxation of pelvic ligament one day before calving, the ligament on the sides of the tail head is loosened so that hollows appear on either side of the backbone and the tail head is raised and the quarters are dropped.

v. The vulva become enlarged and flabby

vi. Animal will be restless and will pace about often trying to kick or scratch the flank region.

vii. The parturition process has three stages,

a. preparatory stage (uterine contraction and dilatation of cervix)

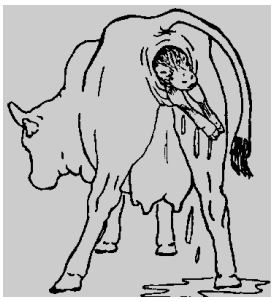
b. active expulsive stage

c. expulsion of foetal membrane.

viii. Cow will deliver the calf within 12 hours after commencement of first stage.

ix. Care must be taken to observe expulsion of placenta (after birth). It should be removed immediately so as to avoid cow eating it.

Normal calving



Management immediately after calving

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

CARE AND MANAGEMENT OF LACTATING ANIMALS.

The animals must be protected against inclement weather. Hygiene and sanitation of cattle shed and animals grooming, washing, disinfection etc must be carefully followed. Feeding must have: a) concentrate b) Roughages – Green fodder which include leguminous

(1/3) and non-leguminous fodder (2/3) and dry fodder. Thumb rule for concentrate feeding is 450 –500 g Concentrate / Kg. milk production. The concentrate must contain DCP 15%: TDN 75%. The model feed formula may contain maize 33%, groundnut oil cake - 25%, Wheat Bran - 40%, Mineral Mixture- 1% and Salt 1%.

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

Feeding of dairy cow at different stages of lactation

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

Early lactation

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

Feeding during mid and late lactation

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

During the late lactation, intake ability of the cow exceeds nutrient needs. This is the time when the cow starts needing extra allowance for the growing foetus. This is also the period when the cow can readily replenish the already depleted body reserve and gain weight very fast. From 7 ½ month to 10 months of lactation, cow may be fed 1-2 kg concentrate feed

in addition to their nutrient requirement for maintenance and milk production to replenish the condition lost in early lactation.

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

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

CARE AND MANAGEMENT OF DRY COWS

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

Purpose of dry period

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

Ideal dry period

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

Dry period and udder health

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

- First, the dry period is a good time for the long-term treatment of cows with a high cell count.

- Second, many of the cases of mastitis in the first month after calving are the result of infections during the last weeks of the dry period.
- Third, the first few weeks after calving are a time of greatly reduced disease resistance for the cow: during this period most clinical diseases (including clinical mastitis) occur. The degree to which her resistance is lowered depends heavily on the cow's nutrition, hygiene and care during the dry period, transition period and fresh cow period.

Drying off

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

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

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

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

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

Feeding of dry cow

More than half of the calf's foetal growth takes place during the last quarter of pregnancy-the dry period. Feeding of cow during this period is often neglected because the

cow is not giving any income. Due to this reason, good fodder and concentrates are generally withheld from the dry cow. This will have adverse consequences on her future production.

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

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

	Quantity of green grass to be give (kg) for animal weighing			**Concentrate (kg)**
	250 kg	**300 kg**	**350 kg**	
Dry cow	25	30	35	• For non-pregnant cows no concentrate is required. • Pregnant cows should be fed additional quantity of 1.5 kg of concentrate from 7th month of gestation • In case of dry cow, allowance up to 1 kg concentrate can be given if the condition of cow is poor or the fodder quality is inferior.

CARE AND MANAGEMENT OF WORK BULLOCKS

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

Maintenance – 1.5Kg. Concentrate

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

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

NUTRITION

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

Nutrients are defined as the substances which can sustain or aids in the support of the life. **Lavoiser** - French, a scientist is referred as father of Nutrition. There are two aspects in Animal Nutrition

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

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

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

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

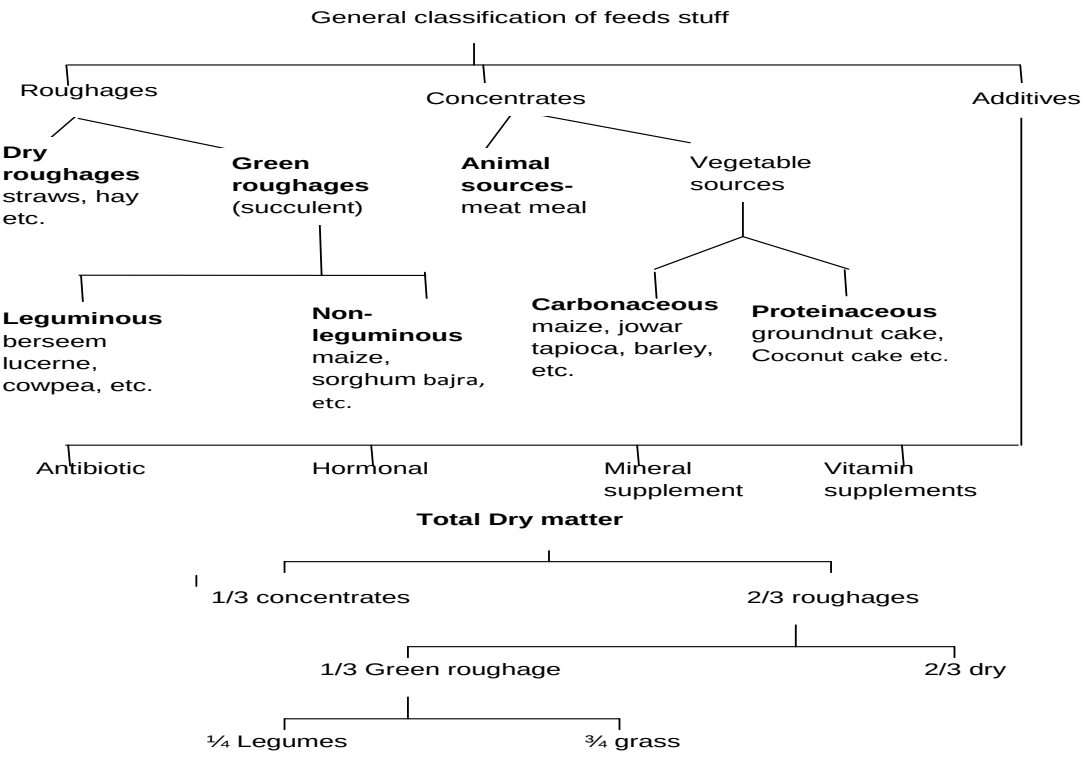
Balanced Ration: Balanced ration which provides essential nutrients to the animals in such proportion and amount that are required for the proper nourishment of the particular animal.

Desirable Characters of a ration.

1. Liberal feeding; Satisfy all the physiological status +waste in preparation + Feeding. NOT over feeding-Doubly Wasteful.
2. Individual Feeding: Avoid Competition; adequate –individual feeding is always better.
3. Properly Balance: Concentrate; Roughage. A. green fodder (Leguminous and Non Leguminous fodder) B. Dry fodder.

4. Palatable & Variety: Better and balanced mixture of protein, vitamins and other nutrients.
5. Good and Sound: Low quality-unwholesome ingredients, may contain toxic components-poor quality –reduce feed value.
6. Mineral Mixture: Every Kg milk- 0.7%.-Deficit –depletion cause metabolic disease. Milk contains eg. Ca 3 g and 2.7 g in milk and 3 grams in egg shell.
7. Laxative: otherwise food will be incompletely digested constipation-digestive disorder-utilization –nutrients affected-reduction in production.
8. Bulky: Capacious and satiety.
9. Green Fodder: Source of vitamin-'A'-reproduction-Bulky- laxative-cost wise cheap-unidentified factors-easily digestible.
10. Avoid change in the diet: Bacterial digestion-Prevalence of specified species-sudden change – digestive disorder.
11. Maintain regularity: Glandular Secretion-essential for digestion.
12. Properly Prepared: Hard grain-Coarsely ground-Cottonseed soaked-coarse fodder – chaffed- sprinkled salt-molasses-increases consumption.
13. Labour and cost; ultimate –aim-profit; 70 % cost of production is attributed to feeding of animals.

Classification feed and fodder



Difference Between Concentrate & Roughage

Sl.No	Concentrate	Roughage
1.	10 % Moisture and 90% Dry matter	Dry fodder-10 % Moisture and 90% Dry matter Green Fodder-80-90 % Moisture and 10% Dry Matter
2.	Highly Digestible	Comparatively less digestible
3.	Crude fibre less than 18%	More than 18%
4.	Nutritive Value/unit mass is high	Low
5.	Compact in Nature	Bulky
6.	Keeping quality -High	Variable : Dry Fodder – High, Green fodder- Less/low

Common feed ingredients

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

MODEL COMPOSITION OF CONCENTRATE MIXTURE OF YOUNG AND ADULT STOCK

IMPORTANCE OF GREEN FODDER PRODUCTION

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

the low productivity of our livestock is malnutrition, under-nutrition or both, besides the low genetic potential of the animals.

IMPORTANCE OF GREEN FODDER

- Green fodder is the primary only source of vitamin A for lactation and vitamin A is present in the form of precursor.
- Maintenance& function of the mucous membrane
- is directly related to vision.
- is essential reproduction a. conception, b. early embryonic mortality, c. maintenance of pregnancy, d.shedding of placenta.
- is essential for the respiratory tract
- is essential in the Gastro intestinal tract/ digestive tract-deficiency causes diarrhoea, mal absorption of nutrients etc.,
- is essential for the urinary tract –deficiency causes stones in the kidney , ureter , bladder.
- During lactation 2000 I.U. of Vitamin 'A' is eliminated in every litre of milk-It is to replenished
- laxative in action
- cheap source of Vitamin 'A'
- source of minerals ,Crude protein, Total digestible nutrients and dry matter
- unidentified factors.
- Carotene Content of some fodder
    a. Agathi 18.3 mg / 100 dry matter
    b. Lucerne 15.6 mg / 100 dry matter
    c. Guinea grass-14.2 mg / 100 dry matter
    d. Desmodium 7.09 mg / 100 dry matter
- Feed should be available to cows at least 20 hours / day.
- Feed at least 60 % of ration during night in the hot weather (Summer)
- Cows will reduce feed intake by about 3.3% for every 2.2 rise in temperature over 24^0c
- High producing cows will eat up to 12 meals / day each averaging 23 minutes.
- Water should be available *at libitum.*

NUTRITIVE VALUE OF FODDER CROPS

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

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

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

VALUE OF TREE FODDER

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

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

- Have adequate forage production or be reliably vegetatively propagated and
- Have good nutritive value and reasonable palatability and acceptability to animals.

MILKING METHODS

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

PRINCIPLES OF REMOVING MILK:

3 PRINCIPLES

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

Natural Technique:

This method calf is able to draw the milk from the udder. To extract the milk the calf presses the teat with the tongue and pallet on the other side. The tongue encircles the teat and vacuum is created in the mouth by separating the jaws and retracting the tongue nearly 100-200 alternating cycles may be observed per minute. A calf's suckling is the best method of evacuating the milk with least damage to the delicate tissue of mammary gland .The art of milking is a cycle.

1. Active Phase

2. Restive Phase

ACTIVE PHASE:

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

RESTIVE PHASE:

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

In the mechanical milking pressure on the teat is with the range of 350 mm-400mm Hg. In the case of buffalo's 400mm of Hg of pressure is applied but in the case of cattle it can

be restricted to 360-380mm of Hg .It has been proved that cycling rate during nursing is twice as fast as hand or machine milking .Thus the difference along with increased cycling rate facilitates and explains the removal of milk from the udder at a faster rate by a calf when compared to hand or machine milking

Hand milking: It is commonly practiced in the harvesting of milk .In order of milking of various teats also differ.

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

STRIP CUP:

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

Prevention of Kicking of the cow:

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

Methods of milking

1. Hand milking 2. Machine milking

1. Hand milking

Hand milking is the most common practice in India. Cows are milked from left side. Stripping and Full hand milking are two commonly used methods of milking.

a. Wet hand milking

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

b. Dry hand milking

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

Different Methods of Hand Milking:

i. Full hand milking


FIG. 8.16 GOOD - FULL-HAND MILKING.

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

ii. Stripping

It consists of firmly holding the teat at its base between the thumb and the forefingers and drawing down the entire length of the teat pressing it simultaneously to force the milk to flow down in a string. The process is repeated in quick succession. Both the hands may be used, each holding a different teat stripping alternatively. Stripping is practised in cows with very small teats. It causes more irritation and teat injuries due to repeated sliding of the fingers. In spite of this few strippings are done to milk the cow completely especially at the end of the milking process. The last drawn milk is called stripping which is richer in fat.


FIG. 8.15 METHOD OF STRIPPING


FIG. 8.17 WRONG WAY OF MILKING ALSO KNOWN AS FISTING

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

iv. Fisting: This method is not normally practiced.

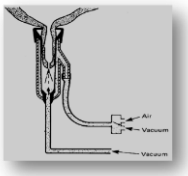
v. Pinching: This method is painful to the animal and hence not recommended

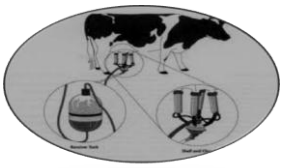
Knuckling

2. Machine milking

It is popularly used now-a-days in most of the western and industrialized countries. They use alternating negative and atmospheric pressure with the help of double chambered teat cup assembly, the continuous partial vacuum inside the inflatable

rubber tube that is teat cup liner into which teat is inserted. A partial vacuum and normal atmospheric pressure is alternated in the space between rubber liner and metal shelf of the teat cup by means of pulsator. When negative pressure is applied between the liner and shelf, milk flows from the teat. When atmospheric pressure enters the chamber, the rubber liner inflation collapses with the result the teat is compressed and massaged. The continuous vacuum would cause congestion and irritation of teats.





Ideal practices used in machine milking

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

HYGIENIC MILK PRODUCTION / CLEAN MILK PRODUCTION

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

STEPS IN CLEAN MILK PRODUCTION

1. The animal should be washed before milking.

2. If calf is allowed for sucking, udder may be moist, cleaned with weak disinfectant solution later with fresh, clean water and wiped dry with a smooth and clean cloth.

3. Hands of the milker -clean and dry.

4. Nails of hands of the milker -trimmed.

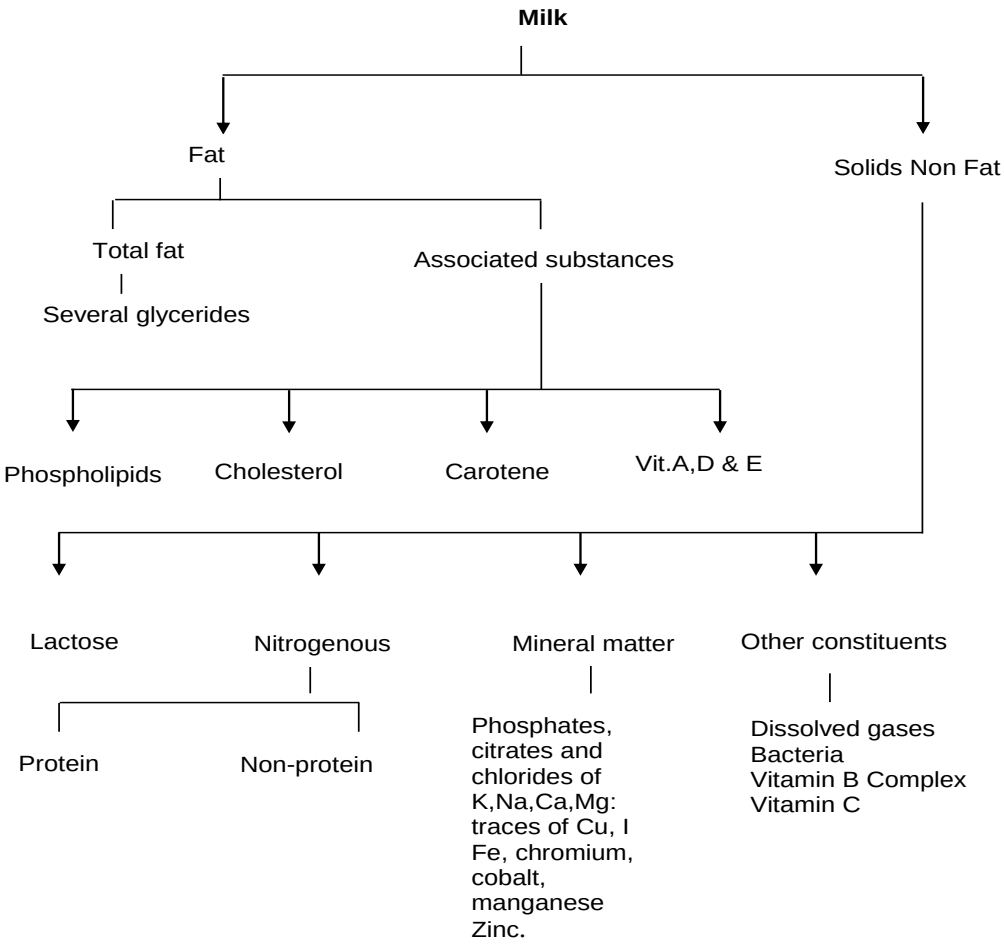
5. Milker -free from all diseases.
6. Dusty feed like Rice polish should not be fed to the animal at the time of milking.
7. Milking shed well ventilated free from flies.
8. Utensils used for milking should be clean, sanitized, smooth and copper free.
9. The hind legs knotted with milk man's rope at the time of milking.

10. Milk is kept in cool place to maintain the flavour and keeping quality.

11. Milk should be covered with lids to avoid dust, dirt, entry hot, or cold, day light or strong artificial light, all at which tend to decrease milk quality.

12. Raw milk with not exceeding 2,00,000 specific count in one ml of milk can be graded as very good raw milk

Milk Composition



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

Species	Water	Fat	Protein solids	Total	SNF	Lactose	Ash
Human	87.43	**3.75**	1.63	12.57	8.82	**6.98**	0.21
Cow	86.61	**4.14**	3.58	13.19	9.25	**4.96**	0.71
Buffalo	82.76	**7.38**	3.60	17.24	9.86	**5.48**	0.78
Goat	87.00	4.25	3.52	13.00	7.75	4.27	0.86
Sheep	80.71	7.90	5.23	19.29	11.39	4.81	0.90
Camel	87.61	5.38	2.98	12.39	7.01	3.26	0.70
Mare	89.04	1.59	2.69	10.96	9.37	6.14	0.51

Breed	Total solids	Fat	Protein	SNF	Lactose	Ash
Red Sindhi	13.66	4.90	3.42	8.76	4.81	0.70
Jersey	14.91	5.37	3.73	9.54	4.93	0.70
Friesian	12.26	3.40	3.13	8.86	4.86	0.67
Crossbred	13.13	4.50	3.37	8.63	4.92	0.67

FACTORS AFFECTING QUALITY OF MILK PRODUCTION

The milk from a individual cow is subject to variation in chemical composition and amount produced is not recognized. Some of the variations from day to day are called “Normal variations” and no causative factor has been associated to them.

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

Normal Variations

It is not uncommon for fat % to vary as much as % and for milk production to vary as much as %. Usually a low fat % accompanied a low milk production is accounted for failure of “Complete letting down” of milk, the later part of milk is rich in fat. The other constituents of milk also vary from day to day although the magnitude of variation is not so great as that of the milk fat and the amount of milk. In the order of the degree of variation, fat, protein are first, lactose next and salts are the least. The degree of variation for the various constituents is as follows.

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

Factors affecting milk composition

I. Genetic factors

a. Breed and individual cow

Milk composition varies considerably among breeds of dairy cattle: Jersey and Guernsey breeds give milk of higher fat and protein content than Shorthorns and Friesians. Zebu cows can give milk containing up to 7% fat.

b. Variability among cows within a breed

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

II. Environmental factors

a. Interval between milking

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

b. Stage of lactation

The fat, lactose and protein contents of milk vary according to stage of lactation. Solids-not-fat content is usually highest during the first 2 to 3 weeks, after which it decreases slightly. Fat content is high immediately after calving but soon begins to fall, and continues to do so for 10 to 12 weeks, after which it tends to rise again until the end of the lactation.

c. Age

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

d. Feeding regime

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

e. Disease

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

f. Completeness of milking

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

Pre requisites for good milking

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

Preparation for milking

1) Dairy cows and sheds

1. Milking barn should be thoroughly washed and scrubbed after each milking and kept clean and dry before the next milking starts.
2. Dusty feed and silage should be avoided in the milking barn.
3. The hindquarters, thighs and udder should be washed thoroughly before milking.
4. If more hair growth is seen in the udder region, it should be clipped periodically.
5. Buffaloes should be invariably washed before milking.
6. Just before milking udder should be wiped in dry cloth.

7. The teats should be dipped in weak antiseptic solution. In cold weather, warm antiseptic solution can be used.

2) Milkers and pails

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

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

Health

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

Disease

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

Control of Disease

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

Classification of disease

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

BACTERIAL DISEASES

ANTHRAX

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

Symptoms

- In peracute sepeticemia death occurs within 2 hours after animal collapsing with convulsions, sudden death in animals that appeared normal is common.
- In acute septicemia death occurs within 48 to 96 hours clinical signs include fever, anorexia, ruminal stasis, hematuria and blood tinged diarrhea.
- Pregnant animals may abort and milk production often abruptly decreases.
- Terminal signs include severe depression, respiratory distress and convulsions.

Diagnosis

- Examination of blood films from dead animals made by puncturing the superficial vein of the ear or in the region of the foot.

Prevention and Control

- Prevention of anthrax in animals is aided by active immunization. The organism is susceptible to penicillin-G, tetracyclines, erythromycin and chloramphenicol.

BLACK QUARTER

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

Symptoms

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

Diagnosis

- Based on Symptoms

Control and prevention

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

HAEMORRHAGIC SEPTECEMIA

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

Symptoms

- Fever, a sudden drop in milk yield, signs of abdominal pain, severe diarrhoea and dysentery, respiration becomes rapid and shortly before death the mucous membranes appear cyanotic.
- In less acute cases there will be odema development in the region of the head, neck and brisket. The nasal discharge may be blood stained or purulent. Death occurs within 2-4 days.

Diagnosis

- By symptoms and lesions

Control and prevention

- *Pasteurella* is amenable to Penicillin-G, streptomycin, chloramphenicol, chlortetracycline, sulpha and tripmethoprim, enrofloxacin and oxytetracycline.
- Vaccination

VIRAL DISEASES

FOOT AND MOUTH DISEASE

Causative agent - Members of the family Picornaviridae, genus Apthovius and species Foot and mouth disease virus. Foot and mouth disease (FMD) is the most contagious disease of

mammals and cause severe economic loss in susceptible cloven-hoofed animals (cattle, pigs, sheep, goats, and water buffalo).

- Smallest of the Animal virus : 7 types virus : O,A,C Asia I, SAT 1,2,3
- Transmission : Direct contact : Thro water : manure : Pasture and cattle attendant

Symptoms

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

Diagnosis

- Symptom and lesion

Treatment:

- Antibiotics may be administered to counter bacterial infections.

Prevention & Control:

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

METBOLIC DISEASES

MILK FEVER: (Parturient paresis)

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

Symptoms:

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

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

Treatment & Control:

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

KETOSIS: (Acetonaemia)

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

Causes:

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

Symptoms:

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

Diagnosis:

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

Control and Treatment:

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

BLOAT: (TYMPANY)

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

Cause:

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

Symptoms:

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

Diagnosis:

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

Control and Treatment:

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

ACIDOSIS

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

Cause

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

Symptoms

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

Sub-acute:

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

Treatment

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

Prevention

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

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

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

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

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

MASTITIS

Introduction

- Mastitis is an inflammation of the mammary gland. In which the milk undergo physical, chemical and microbiological changes whereas mammary glandular tissue undergo physical and pathological changes. In which infected milk colour, consistency change and contains more amount of leucocytes.

Etiology

- Mastitis is caused majorly by Staphylococcus, Streptococcus and coliform bacteria and less importantly by other organism such as other bacteria, viruses, and fungus.

Source of infection

- S.agalactiae and S.aureus resides primarily in the udder of infected cows.
- Exposure to uninfected quarters is limited to milking process.
- Strepoccus uberis, S.dysgalactiae and coliforms are normal inhabitants of the cows environment.

Transmission

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

Clinical signs

- Per acute form: Pyrexia, anorexia, respiratory distress, swollen, hot and painful udder. Cessation of milk production. Exudate are often blood stained. Mostly, Staph.aureus, Str. Dysgalactiae, Cory.pyogenes, E.coli, and P. aerugenosa.
- Acute form: Swollen udder, changes in quality of milk. Milk become curd like, yellow, brown fluid with flakes and clots.
- Subacute form: No changes in the udder tissue.

- Chronic form: Udder is haemorrhagic, and fibrotic. Swollen and palpable supra mammary lymphnode,. Udder is thick, firm, nodular and atrophic, yellowish or white fluid with clots and flakes.

Diagnosis

- Physical examination of the udder.

Treatment

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

Control:

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

UNIT III: SHEEP AND GOAT MANAGEMENT

INTRODUCTION TO SHEEP AND GOAT PRODUCTION AND MANAGEMENT

Sheep in India are mostly owned by nomads or semi-nomadic people who constantly move their flocks in search of good pastures and water. Sheep farming is a hereditary occupation with these people. The size of their flock varies from a few to hundreds. The husbandry practices are most primitive.

There are certain advantages connected with sheep farming and these are:

1. Sheep requires little concentrate food as compared to cattle. On an average sheep get 80-90 per cent of their protein from forages as against cattle which get about 60-65 per cent.
2. Sheep are an economical converter of grass into meat and wool.
3. Sheep are the best animal that can be raised on stubbles as well as on grasses and other plants growing between stubbles. In fact there is no substitute for sheep as a class of livestock for utilizing waste land or weed from the field.
4. Unlike goat, sheep do not damage the trees.
5. Sheep require less labour than other kinds of livestock and get along well with low-cost housing and equipment.

Domestication: Sheep and goats were perhaps the first ruminants to be domesticated around 10,000 B.C.

BREEDS OF SHEEP

Classification of Indigenous breeds based on utility

Apparel wool breeds	**Superior carpet Wool breeds**	**Coarse carpet Wool breeds**	**Hairy Meat breeds**
Hissardale	Chokla	Malpura	Nellore
Niligiri	Nali	Sonadi	Hassan
Kashmir merino	Marwari	Muzzafarnagri	Mecheri
Avivastra	Magra	Jalauni	Kilakarsal
Bharat Merino	Jaisalmeri	Deccani	Madras Red
	Pugal	Bellary	Trichy Black
	Pattanwadi	Coimbatore	Kenguri
	Tibetan	Chottanagpuri	Mandya
	Bonpala	Balangir	Vembur
	Gaddi	Ganjam	
	Rampur Bushari	Bhakarwal	
	Poonchi	Shahabadi	
	Karnah		
	Gurez, Changthangi		

Classification of sheep breeds based on agro-ecological regions in India

Northern temperate region	**North-western, central arid and semi-arid region**	**Southern region semi-arid central peninsular area and hot and humid along the coast**	**Eastern region**
Gaddi	Chokla	Deccani (Bellary)	Chottanagpuri
Rampur Bushair	Nali	Nellore	Balangir
Bhakarwal	Marwari	Hassan	Ganjam
Poonchi	Magra	Mandya	Tibetan sheep
Karnah	Jaisalmeri	Mecheri	Bonpala
Gurez	Pugal	Kilakarsal	Garole
Kashmir Merino	Malpura	Vembur	Shahbadi
Changthangi	Sonadi	Coimbatore	
	Pattanwadi	Nilgiri	
	Muzaffarnagri	Ramnad White	
	Jalauni	Madras Red	
	Hissardale	Tiruchi Black	
	Munjal	Kenguri	
	Avivastra		
	Bharat Merino		

Exotic breeds

Fine wool breeds	**Mutton breeds**	**Dual purpose**	**Pelt breeds**
Merino	Suffolk	Corriedale	Karakul
Rambouillet	Southdown		
Polworth	Dorset		

India can be divided on the basis of the agro-ecological conditions and type of sheep into 4 regions viz. I. North-Western, Central arid and semi-arid region II. Southern region, III. Eastern region and IV. Northern temperate region. There are about **44 descript breeds of sheep** available in India.

I. North-western, central arid and semi-arid region

Hissardale:

Hissar and hilly regions of Kulu in Haryana. It was evolved by crossing Bikaneri with Merino rams. Average body weight of rams and ewes are 54 and 34 kg respectively most

animals are polled. Colour is predominantly white, although some brown patches may be observed. Wool is of superior quality yield 2-3 kg per annum.

II. Southern region

Important breeds in this region are

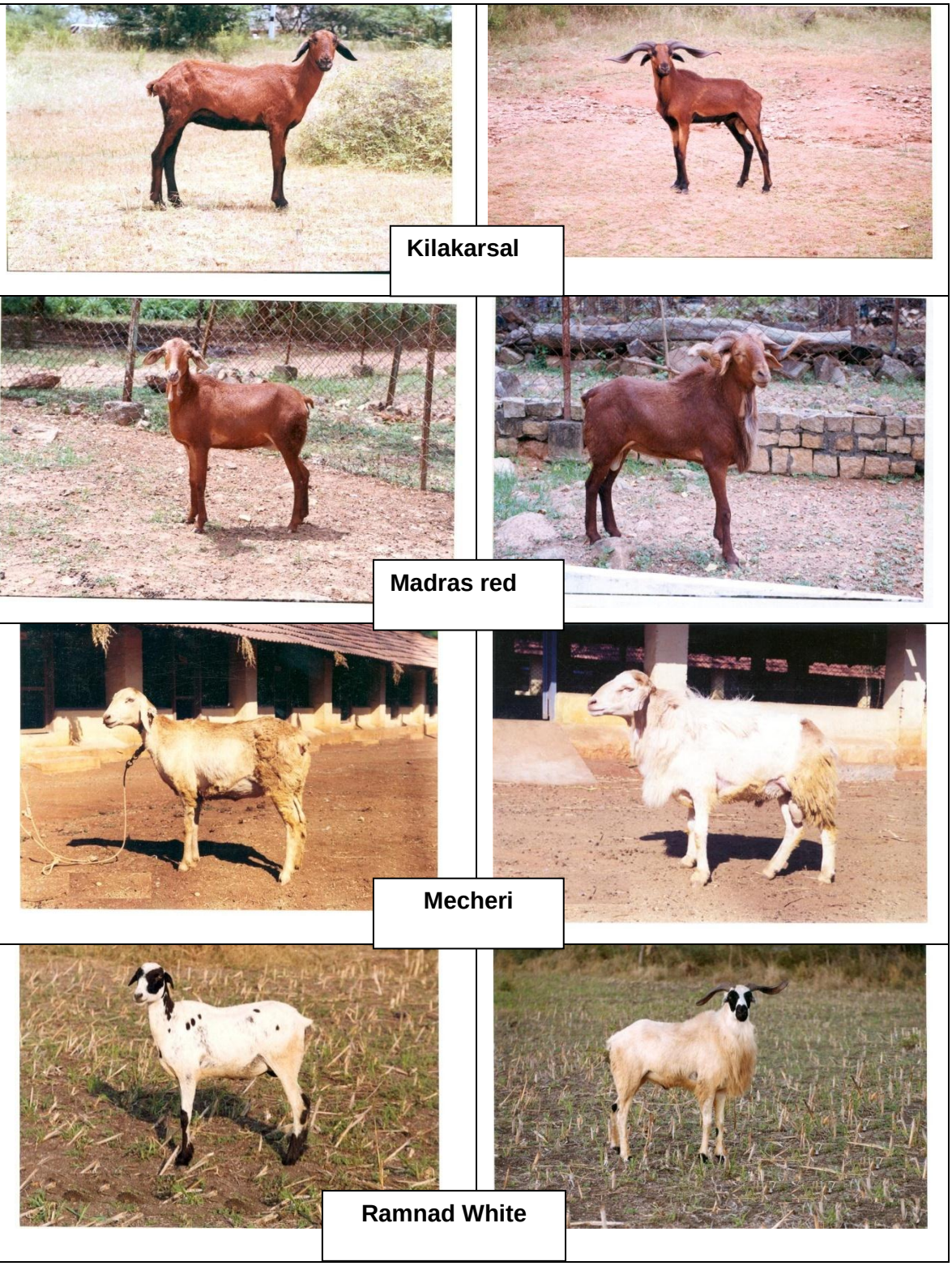
Nellore: Nellore, Prakasam and Ongole districts of Andhra Pradesh tall animals with little hair except at brisket, withers and breech. Rams are horned ewes are polled. Long and drooping ears; 86% of animals have wattles male: 36 kg female: 28 kg

Mandya: Mandya district of Karnataka. Relatively small animals colour white - sometimes face is light brown, which may extend up to neck. Compact body with typical "U" shaped conformation from the rear. Ears long, leafy and drooping. Both sexes polled. Coat extremely coarse and hairy adult male: 35 kg, female: 23 kg**.**

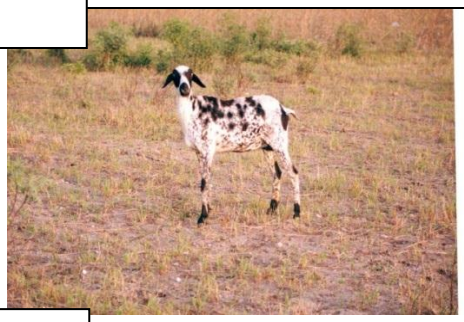
Best mutton type in Tamil Nadu.

1. **Mecheri:** Salem, Namakkal and Coimbatore districts of Tamil Nadu. Medium sized light brown in colour. Both sexes are polled. Body covered by very short hairs. Adult male: 35 kg, female: 22 kg
2. **Kilakarsal or Kilakarisal:** Ramnad, Madurai and Tanjore districts of Tamil Nadu Brown/ dark tan in colour with black spots on head belly and legs. Medium sized ears. Males have thick twisted horns. Most animals have wattle.
3. **Vembur:** Tirunelveli district of Tamil Nadu. Tall animals, coat colour is dark tan with black spots on head, belly and legs. Medium sized drooping ears. Males horned. Ewes polled. Body covered with short hairs. Adult male: 34 kg, female: 27 kg.
4. **Coimbatore:** Coimbatore and Salem districts of Tamil Nadu. Medium sized animals white with black or brown spots. 30% of males polled. Fleece white hairy and open. Adult male: 24 kg, female: 20 kg
5. **Ramnad White:** Ramnad and Sivagangai districts of Tamil Nadu. Medium sized predominantly white. Ears medium sized and directed outward and downward. Males have twisted horns. Ewes polled short and thin tail. Adult male: 31 kg, female: 22 kg
6. **Madras Red:** Chennai and Kancheepuram districts of Tamil Nadu. Body colour predominantly brown, the intensity varying from light tan to dark brown. Some animals may have white markings on forehead, inside the thigh and lower abdomen. Medium sized drooping ears. Tail short and thin. Rams have strong, corrugated and twisted horns. Ewes polled. Body covered with short hairs. Adult male: 35 kg, female: 23 kg

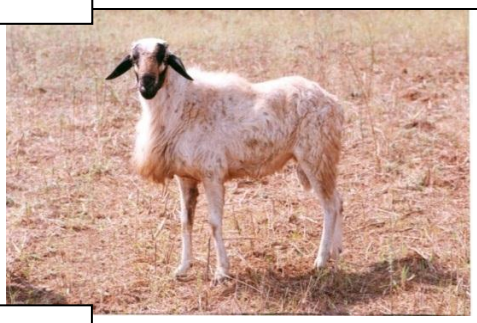
7. **Trichy black:** Trichy, Thiruvannamalai, Dharmapuri districts of Tamil Nadu. Small animals. Body is completely black. Males horned, ewes polled fleece extremely coarse, hairy and open. Ears and tail small. Adult male: 25 kg, female: 18 kg



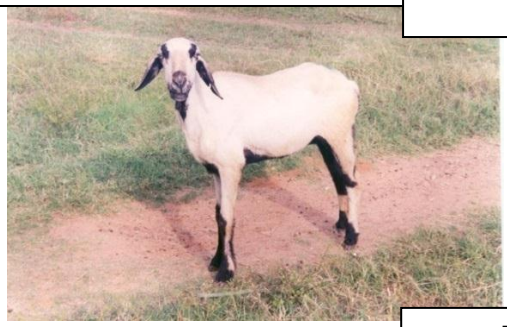
Trichy Black



Vembur



Coimbatore



Nellore

Mandya

III. Eastern region

This region consist Bihar, West Bengal, Orissa, Assam, Meghalaya, Arunachal Pradesh, Mizoram, Manipur, Tripura, Nagaland and Sikkim. Most of the wool produced in this region is suitable only for coarse carpets, blankets and kumblies. The important breeds are Shahabadi, Chhottanagpuri, Ganjam, Balangir, Bonpala and Tibetan.

IV. Northern temperate region

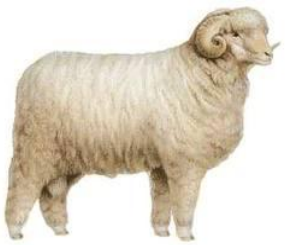
It comprises of Jammu and Kashmir, Himachal Pradesh and hilly regions of Uttar Pradesh. This region has 8% of the total sheep population. The largest population of crossbred sheep primarily developed for apparel wool is in this region. The important breeds are Rampur Bushair, Gaddi, Gurez, Karnah, Poonchi and Changthangi**.**

Exotic breeds of sheep

A. Fine wool breeds:

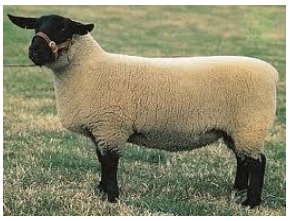
1. Merino: Native of Spain - origin for most of the wool breeds in the world. Colour-white. Fleece yield male: 4-5 kg and ewes 3-4 kg/annum. Merinos have large number of skin folds.

2. Rambouillet: Developed from Merinos in France. They are large, rugged, fast growing sheep and are good wool producers.Skin is pink. Ewes are good mothers, and prolific. Average wool yield is 4 5 to 5.5 kg.



B. Mutton breeds:

1. Native of U.K. large animals with black face, ears and legs. Head and ears are entirely free from wool. Average wool yield 2-3 kg. Mature rams weigh 100-135 kg and ewes from 70-100 kg.



2. Dorset: Native of U.K two types polled and horned Dorsets. Face, ears and legs white in colour and free from wool. Wool yield is 2.75 to 3.25

C. Dual purpose breeds

Corriedale: Native of New Zealand. The parent breeds involved in developing Corriedale are Lincoln, Leicester and Merino. Adult rams: 80 to 100 kg Ewes: 55 to 85 kg. Annual wool production: 4.5 to 5.5 kg. Both sexes are polled. Colour: White may have black spots.

BREEDS OF GOATS

There are as many as 23 well defined breeds of goats in India, though a few other are being identified in different agro-climatic regions. These breeds are adapted to harsh climate, long migration, tropical diseases, poor nutrition and shortage of water. Majority of the goats are mixed and non-descript in different states.

Indigenous Goat Breeds:

1. Classification Indian goat breeds based on utility:

Meat & Skin	**Meat, Milk & Skin**	**Meat, Hair & Skin**	**Meat, Pashmina & Skin**	**Milk, Meat & Skin**
Black Bengal	Barbari	Bakharwal	Chegu	Beetal
Ganjam	Tellicherry (or) Malabari	Gaddi (Chamba)	Changthangi	Jamnapari (Etawah)
Kannai Adu	Osmanabadi	Gohilwadi		
	Sirohi	Kangan		
	Surti	Kutchi		
	Mehsana	Marwari		
	Zalawadi	Sangamneri		
	Jhakhrana	Khasi (Assam hill goat)		

2. Classification of goat breeds based on agro-ecological regions in India

Northern temperate region	**North-western, central arid and semi arid region**	**Southern region semi arid central peninsular area and hot and humid along the coast**	**Eastern region**
Gaddi	Sirohi	Sangamneri	Ganjam
Changthangi	Marwari	Malabari	Bengal
Chegu	Beetal	Osmanabadi	
	Jhakrana	Kannaiadu	
	Barbari		
	Jamnapari		
	Mehsana		

	Gohilwadi		
	Zalawadi		
	Kutchi		
	Surti		

1. Jamnapari: Native of Uttra Pradesh


Coat Colour: White with tan or black markings at neck and ears; beard in both sexes; tuft of long hairs in the buttocks. **Body and legs:** Largest and most elegant of the long-legged goats of India. Pronounced Roman nose having a tuft of hair which results in parrot mouth appearance. **Ears:** Long and pendulous. Live weight: Average, buck 75 and doe 55 kg. Average birth weight is upto 4 kg **Milk:** Large udder and big teats: average yield is 280 kg / 274 days.

2. Beetal: Native of Rajasthan


Coat colour: Predominantly black; red, tan or black, heavily spotted on white also occur; males usually possess beard. **Ears:** Long pendulous drooping, beetal leaf shaped pinna. **Live weight:** Mature buck 70 and doe 46 kg: birth weight 3 kg. **Meat:** Good quality with desirable flavour. **Milk:** Average lactation yield 150 kg .Other qualities: Good quality skin.

3. Sirohi: Native of Rajasthan


Coat colour: Brown, white, and admixture off colours in typical patches; hair coarse and short. **Live weight:** Average, buck 50 and doe 23 kg; birth weight 2.0 kg. **Meat:** Good meat. **Milk:** Average lactation yield 71 kg; lactation length 175 days.

4. Black Bengal: Native of Bengal

Coat colour: Predominantly black, brown/grey and white, soft, glossy and short hairs.

Body and legs: Dwarf in size, legs short, straight back; beard in both sexes.

Live weight: Average, buck 15 and doe 12 kg.

Kidding: Most prolific among Indian breeds. Multiple births is common, two, 3 or 4 kids born at a time. Kidding is twice a year. Average litter size 2.1.

Meat: Excellent and palatable, quality chevon.

Other qualities: Fine skin. There is great demand for high-class shoe making.

5. Malabari or Tellicherry: Native of Kerala

Coat colour: Varies from white to complete black; black and white, black and brown, and white with coloured patches occur; both long and shorthaired varieties available.

Body and legs : Head medium sized, face flat and sometimes with Roman nose; bucks bearded; wattles present.

Ears: Medium in size, directed outward and downward. Horns; Mostly horned; small, slightly twisted and pointed. Liveweight: Average, buck 39 and doe 31 kg; birth weight 1.6 kg. Kidding: Once a year, average age at first kidding is 19-21 months. **Meat:** Average. **Milk:** Average milk yield 65 kg/lactation: average lactation length 172 days. **Other qualities:** Good skin.

6. Kanni Adu: Native of Thirunelveli area, Tamil Nadu


Coat colour: Predominantly black or black with white or brown spots and hence called as palkanni and chenkanni respectively. **Body and legs:** Tall and stout. Ears: Medium. **Horns:** Bucks horned and does polled. **Live weight:** Average, buck 36 and doe 29 kg. **Kidding:** Twice in 18 months, single or twins; age at first kidding 15 months. **Meat:** Good. **Milk:** Enough for kids.

7. Kodi Aadu:


Distribution: Part of Tuticorin and adjoining areas of Ramanathapuram, Tanjore and Pudukottai districts. They are tall, long animals with slender body. White in colour with splashes of black or red colour. Based on the colour they are classified as Karum Porai (Blakish) and Chem Porai (Reddish brown). Both sexes are horned. Suitable for coastal areas. Used as leader in sheep flock while grazing. Adult body weight: Buck: 39.5kg and Doe 32.2 kg.

8.Salem Black: Native of Salem area, Tamil Nadu

Home tract: Salem, Dharmapuri and Vellore district of Tamil Nadu. Salem Black goats are tall animal with a lean body and a completely black coat. The head is medium in length with a medium to broad forehead. The ears are leaf like and pendulus. Both male and female are horned. The tail is thin, medium in length and curled upwards. The adult body weight is 38.5 (male) and 29.5(female) kg.

Pashmina goats:

1. Chegu:

Predominantly white but greyish red and mixed colours seen. Long hair below which under coat of delicate fibre (cashmere or pashm). Average, buck 39 and doe 26 kg. Birth weight 2.0 kg.

2. Changthangi

Predominantly white (50) and rest brown, grey and black. Undercoat white/grey; yields warm delicate fibre, pashmina (cashmere, pashm). Average, buck 30 and doe 20 kg; average birth weight 2.1 kg.

Exotic goat breeds

1. **Toggenberg:** It originated in the Toggenberg Valley in north-eastern Switzerland. The breed is usually, but not always, hornless. The doe weigh more than 80 kg. The average milk production is 5.5 kg per day; the butter-fat content of milk is 3.4 per cent.

2. **Saanen:**

This breed originated in the Saanen Valley of Switzerland. The goats of this breed are white or light cream. Doe Weigh 65 kg. Bucks weigh 95 kg or more. The average milk yield ranges from 2 to 5 kg per day during a lactation period of 8 to 10 months. The average butter-fat content of milk is 3.5 per cent.

3. **Alpine:** This breed originated in the Alps Normally does not weigh less than 85 kg. French Apline females are excellent milkers and have horns. The butter- fat content of milk is 3 to 4 per cent.

4. **Nubian:** This breed originated in Nubia (north-eastern Africa), but is also found in Egypt and Ethiopia. Anglo-Nubian is a big animal with fine skin and glossy coat, pendulous ears and Roman nose. Butter-fat percentage is decidedly higher. Anglo-Nubian is known as the **Jersey cow** of the goat world. Bucks weigh 65 kg to 80 kg and does 50 kg to 60 kg. The peak milk production in a day is more than 6.5 kg. The breed average for butter-fat content of milk is 4.5 per cent.

5. **Angora:** This breed originated in Turkey or Asia Minor. This produces valuable textile fibre commercially known as mohair. The average weight of fleece is about 1.2 kg. A good specimen yields upto 6 kg.

6. Boer

Native to South Africa. Boer goat is large, long-legged goat. White with a reddish-brown head and neck. White blaze. Body sometimes has brown patches. Powerful head with compressed nose. Well developed broad brisket and well sprung ribs. The average weight of male ranged between 80-90 kg and female 50-70 kg.

ECONOMIC TRAITS OF SHEEP

1. Tupping percentage: Number of ewes covered to the number of ewes put to a ram

2. Lambing percentage: No of ewes lambed to the number of ewes put to a ram (or) Number of ewes lambed to the number of ewes covered.

3. Weaning percentage: Number of lambs weaned to no of lambs born alive (or) Number of lambs weaned to the number of ewes put to a ram

4. Twinning percentage: Number of twin births to the total number of births

5. Lambing rate: Number of lambs born to number of ewes lambing

6. Lambing interval: Interval in days between two successive lambing.

7. Birth weight: Weight of a lamb in kg measured within 24 hours after birth.

8. Weaning weight: Weight of a lamb in kg at the time of weaning (90 days).

9.Weight at market age: Weight of the lambs in kg at the age (6, 9 and 12 months).

10. Pre weaning weight gain: Rate of daily gain in weight (gm/day) from the date of birth to weaning period

11. Post weaning weight gain: Rate of daily gain in weight (gm/day) from the date of weaning to one year

12. Pre weaning mortality: Number of lambs died during the period 0-90 days to the Number of lambs born alive.

13. Post weaning mortality: Number of lambs died during the period 90-365 days to the Number of lambs at 90 days

14. Adult: Number of adult sheep died to the number started at one year

ECONOMIC TRAITS OF GOAT

1. Tupping percentage: Number of does covered to the number of does put to a buck

2. Kidding percentage: Number of does kidded to the number of does put to a buck (or) Number of does kidded to the number of does covered

3. Weaning percentage: Number of kids weaned to the number of does put to a buck (or) Number of kids weaned to no of kids born alive

4. Twinning percentage: Number of twin births to the total number of births

5. Kidding rate: Number of kids born to number of does kidding

6. Kidding interval: Interval in days between two successive kidding

7. Birht weight: Weight of a kid in kg measured within 24 hours after birth

8. Weaning weight: Weight of a kid in kg at the time of weaning (90 days)

9. Weight at market age: Weight of the kid in kg at the age of 6, 9 and 12 months of age

10. Pre weaning weight gain: Rate of daily gain in weight (gm/day) from the date of birth to weaning period

11. Post weaning weight gain: Rate of daily gain in weight (gm/day) from the date of weaning to one year

12. Pre weaning mortality: Number of kids died during the period 0-90 days to the number of kids born alive

13. Post weaning mortality: Number of kids died during the period 90-365 days to the number of kids at 90 days

14. Adult mortality: Number of adult sheep died to the number started at one year

SYSTEM OF PRODUCTION

I. Extensive: Mentioned in the system of production

II. Semi- intensive: Mentioned in the system of production

III .Intensive production systems:

Intensive production systems involve either grazing on crops or cultivated pastures at a very high stocking density or zero-grazing.

1. Concrete / Solid floor

It is a common floor with solid surface made out of different materials such as cement concrete, vitrified paving brick, building brick, stones and gravel. Such solid floors should be laid properly for good drainage. A slope of 1/40 to 1/60 is desirable towards the dung channel. Proper cleaning and disinfection are essential to control diseases.

2. Slatted floor

Floor set with wood and reinforced concrete bars provide a required gap between them and are used in house for intensive animal production. It has the great advantage of controlling disease by breaking the contact between animals and excreta. The excreta, both liquid and solid passes downward from the wooden floor immediately after it is voided through the gap provided. The excreta collected underneath the floor are suitably disposed by mechanical means. The slatted, floor is ideal for raising animals in germ free condition. The distance between two planks (slat) is known as slot and it should be 1 to 1.5 cm. The plank width 7.5 to 10cm and thickness 2.5 to 4cm. Slatted floor should be raised 1meter above the floor level.

HOUSING

Space allowance

Adult goat : 1.25 – 1.5 m^2

Pregnant doe and bucks : 2 m^2.

Kids – 3 – 6 months : 0.7 to 0.9 m^2

6month -1 year : 1m^2

HOUSING OF SHEEP AND GOATS

- Not expensive
- Adequate space
- Proper ventilation
- Good drainage
- Plenty of light
- Protection from predators and adverse climate
- Dry floor.
- Shed should be in east west direction

SHEEP

Normally sheep do not require elaborate housing facility, but minimum provisions require to increase productivity especially protection against inclement weather conditions

(sun, rain, winds). Shed could be built along the wall of the house. Further protection could be provided with thatched material and bamboos.

Minimum floor space requirement per animal (BIS standard)

S. No	Type of animals	Minimum floor space per animal (m^2)
1	Ram or buck in groups	1.8
2	Ram or buck individual	3.2
3	Lamb or kids in group	0.4
4	Weaner in groups	0.8
5	Yearling or goatlings	0.9
6	Ewe or doe in groups	1.0
7	Ewe with lamb	1.5

Essential appliances required:

- Feeders .
- Water troughs

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

CARE AND MANAGEMENT OF YOUNG AND ADULT STOCK:

Pregnant, parturient and lactating ewes/does

1. The ewes/does in advanced stage of pregnancy should be separated from the flock and effective care should be taken in their feeding.
2. Extra feed during the later part of pregnancy (3-4 weeks before parturition) will be beneficial for the condition of the pre-parturient ewes which will help in improving milk production of ewes and birth weight and growth of lambs.
3. Ewe/doe in advanced stage of pregnancy should be kept in a separate lambing corals or shed 4-6 days before partition and maximum comfort like soft clean bedding and individual lambing pen should be provided.
4. The ewe/doe should be protected from chilly weather condition.

Care at lambing/kidding

A ewe/doe about to lamb prefers to leave the flock if she is restless. The udder is often distended and external genitals are in flushed and flaccid condition. Generally in a healthy ewe partition is normal.

1. New born lambs after being licked by the mother generally stand on their leg and start seeking for teats and suckle milk. If they are not able to do so after sufficient time, provide help to them in suckling colostrum, the first milk, which is very essential for health and survivability of lambs.
2. The new born should be protected from cold, wind and rain.
3. Artificial milk feeding or arrangement of foster mother should be done for disowned or orphan lambs. Goats can serve as excellent foster mother, but ewes which have lost their lambs early after birth may also be utilized.
4. Ligate, cut and antiseptically dress the naval cord or the lamb.
5. The lambs/kids should not be handled too frequently immediately after birth and let the dams lick and recognize them properly. The first 1 to 2 hours after birth is the vital period for establishment of bond between the newborn and the mother. Hence the dam should be kept in a calm place without disturbance from stray dogs and other animals.
6. Allow newborn lambs to be with their mother all the 24 hours for first week or so.
7. Feed sufficient quantity of good quality hay and concentrate to the lactating ewes for meeting nutritional requirements for early lactation.

Care of lambs/kids

The lambs should be taken care to the maximum extent during early period of life.

1. Kid/lambs should be ensured of taking sufficient colostrum with in 1 hour after birth to more resistance against diseases.
2. Take care of indifferent mothers and arrange suckling of lambs/kids by restraining such type of ewes.
3. If possible, make available green leguminous fodders or fresh tree leaves to lambs to nibble during sucking period.
4. Lambs/kids may be ear-tagged or tattooed on the ear for identification.
5. During castration keep the lambs on perfectly dry, clean and hygienic site so as to minimize the risk of losses from tetanus and other infection.

6. Salt lick or mineral block should be kept in the lamb pen to avoid licking of soil/floor.

Weaning and care of weaners

The management of weaners plays an important part in good sheep/goat husbandry.

1. Weaning should preferably be done at 90 days, although in breeds with low milk production or where re-breeding is desired it can be done around 60 days.
2. Supplementary feeding and good clean pasture for growing weaners should be provided.
3. Weaned lambs should be drenched against gastro-intestinal parasites by first month and vaccinated against enterotoxaemia and sheep pox.
4. They should be protected against vagaries of climate and predation.

BREEDING MANAGEMENT OF SHEEP AND GOAT

Selection of ewe and ram for breeding

Breeding ewe of indigenous breeds should be 18 to 24 months depending upon their body condition. Females should be mated only when they reach 70 per cent of the average adult body weight. The libido of the ram is very important to achieve desirable breeding.

Sex ratio

In India the rams are usually turned out in the flock during mating season at the rate of 2 to 3 per cent of the ewes all through day and night under optimum breeding conditions. The males should be replaced or exchanged once in two years to avoid inbreeding.

Preparation of ewe or ram for breeding

Flushing

Flushing is feeding of extra concentrate to ewes/goats prior to onset of breeding season, normally 3 or 4 weeks before breeding. This increases the ovulation rate of ewes, so that the number of twins and triplets increase. Flushing can be done by supplementing 250 g of concentrate daily or 500 g of good quality legume hay per head per day. Flushing increases the lambing/kidding rate by 10 to 20 per cent.

Estrous cycle

Ewes and does will exhibit estrus or heat at regular intervals during the breeding season. Estrus is the fertile period and if the female does not conceive, it is repeated every 16-17 days on average in ewes (range 14-19 days) and 19-21 days in does (range 17-24

days). These intervals may be 1-2 days shorter in young animals. The estrus period lasts for about 24-36 hours in ewes and 34-38 hours in does.

Estrus /signs of estrous

The signs of estrous are much more marked in the doe than in the ewe. The outward signs are:

- Reddening of the vulva and discharge from vulva
- Tail wagging
- Mounting over other animal
- Seeking male
- Frequent bleating
- Standing for mating
- Generally the young females don't show aggressive estrous behavior

The males are attracted by smell, sight and sound and exhibit following behavior

- Sniffing the vulva
- Extending neck with curling of upper lip
- Biting the side of the ewe/doe and wool pulling
- Paw the ewe – raising and lowering of one front leg in a stiff legged striking motion
- Mount and mate

SYSTEM OF MATING

1. Natural mating

Hand mating

In this system the ewes or does in heat are mated with desired ram or buck. The females are allowed to mate one by one. In this system a ram or buck may not be allowed to mate more than three ewes/does a day. This method of hand mating ensured the expected time of lambing.

Pen mating

In this mating system the ewes / does are divided into batches varying from 20-25 ewes/does. Males are turned into the flock only during the night time and separated during day time, which gives enough rest for the male. This system of mating also prevents the disturbance ewes by the male during grazing hours.

Flock mating

This system of mating is practiced normally by the farmers. In this system males are allowed to run along with the females throughout the day and night. The male may lose its most of its body reserve in chasing the ewes and they may lose their body condition

II. ARTIFICIAL BREEDING

Artificial insemination

Artificial insemination offer the best means of distributing germplasm from nucleus breeding flock to may small flocks within each eco system. Fresh as well as frozen semen is used. The speculum method of insemination is used for ewes and does.

FEEDING MANAGEMENT

FEEDING MANAGEMENT OF SHEEP

Sheep have small muzzle and split upper lip helping them to nibble small blades of grass on pasture. At present, extensive grazing on marginal grasslands is widely practiced. The animals will graze on crop stubbles, weeds and grasses on fallow as well as rangelands. This will meet the requirements of the animals only partially. Their diet may be supplemented with cultivated fodders, grains and oil cakes, especially during the critical period of production cycle when the nutrient supply is inadequate.

Feeding the Breeding Ewe

The feeding of the ewe will be discussed under the following headings,

1. Flushing: Already discussed in breeding management

2. Feeding during breeding season: The ration provided during flushing will continue during breeding season also.

3. Feeding during early and mid-pregnancy: Good feeding during gestation is the keystone for a healthy strong lamb crop. If feeding is inadequate or defective, weak or dead lambs will result

4. Feeding during late pregnancy: Their ration must be supplemented with available green fodder fed at the rate of 5 kg per head per day. During the last one month of pregnancy concentrate may be fed at the rate of 225 g per head per day.

5. Feeding at lambing time: As lambing time approaches or immediately after lambing, the grain allowance should be materially reduced but good quality dry roughage be fed free choice. In general, bulky and laxative feedstuffs may be included in the ration during the first few days. A mixture of wheat bran and barely or oats or maize at 1: 1 proportion is excellent.

6. Feeding lactating ewes: Ration for ewes must be supplemented to maintain adequate milk production, which is necessary for rapid growth of lambs. If they are provided good pasture, the requirements are more or less met.

7. Feeding of ewes from the time lambs are weaned until flushing time: Ewes may be maintained entirely on pasture. Poor quality pastures and other roughages of low quality can be advantageously utilized during this period.

8. Feeding rams for breeding: The common practice is to allow the rams to graze with the ewes, which will allow the rams to get the same ration as the ewes. If separate feeding is practiced for the ram, it may be given 300-500 g of concentrate mixture consisting of three parts oats or barely, one part maize and one part wheat per day.

Lamb Feeding

1. Feeding suckling lambs: This is the early part of a lamb's life in which it is dependent on its mother's milk to a considerable degree for its nutrition. This period ends when the lambs are weaned.

2. Feeding early-weaned and orphan lambs: Lambs are usually weaned at three months of age. Similarly, some lambs may be orphaned due to the death of ewe or due to disowning by the mother. If legume hay or good quality pasture is not available and if only poor roughage is fed their grain ration should be supplemented with a protein cum vitamin supplement with approximately 12 per cent digestible crude protein.

Complete pelleted ration consisting of roughage and concentrate, both mixed and made into pellets has been found to be advantageous. Recommended rations for the creep feeders and early weaners are (i) Maize 40 per cent, oats 30 per cent, barley 30 per cent plus lucerne hay fed *ad libitum*

Concentrare Mixtures for Supplementing Lamb Grazing

During summer:	
Groundnut cake	20 per cent
Wheat bran	35 per cent
Crushed gram	10 per cent
Oats/Barley	35 per cent
During winter:	
Wheat bran	25 per cent
Oats/Barley/Jowar	50 per cent
Groundnut cake	25 per cent

Rate of feeding concentrate per day:

S. No.	Body weight	When legume fodder is available	When non legume fodder is available
1.	Up to 12 kg	25-50 g	200-300 g
2.	12-15 kg	50 g	300 g
3.	15-25 kg	100 g	400 g
4.	25-35 kg	150 g	600 g

Sheep grazing

Grazing lands in India are over-grazed and generally in very poor condition. There is very little attention paid at present to develop the pastures. Pasture should be divided into compartments for rotational grazing. It should be managed to support 10 to 12 ewes and their lambs, per acre. It will be desirable to change the pasture for grazing periodically as sheep consume less due to the monotony of grazing if they have to graze on the pasture continuously.

FEEDING MANAGEMENT OF GOATS

Feeding Habits

1. Goats are sensitive animals with peculiar feeding habits (browsing). 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.
2. 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 a wall or from a branch of a tree.
3. Double-sided portable hay-racks are the most suitable
4. 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.
5. Goats are ruminants. They are very fond of leguminous fodders. They do not relish fodders like sorghum (*sorghum vulgare pers*) and maize (*zea mays* L.), 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 crop.
6. Some of the common green roughages liked by the goats are: Lucerne, berseem, Napier grass, cowpea, cabbage, cauliflower leaves, shrubs and weeds of different kinds;

7. Leaves of trees such as babul, neem, subabul, glyricidia, agathi, malbari and dry leaves of trees are most liked by the goat.

1. Nutrients required

The nutrients needed may be divided into maintenance, production (for milk, meat and hair production) and pregnancy requirements.

2. Maintenance ration:

Goats have higher basal metabolic rate than cattle; therefore, their maintenance requirements are higher than those of cattle. The requirement by weight is calculated and an additional feed of about 25 to 30 per cent for maintenance is allowed. For its size the goat can consume substantially more feed than cattle or sheep, viz. 6.5 to 11 per cent of its body weight in dry matter when compared with 2.5 to 3 per cent for cattle or sheep. This means that the goat can satisfy its maintenance requirement and produce milk from forage alone.

3. Production ration:

The nutritional requirements of a goat weighing 50 kg and yielding 2 litres of milk with 4 per cent fat may be met by feeding 400 g of concentrate mixture and 5 kg of leguminous fodder. The ration should have 12 to 15 per cent protein content.

4. Pregnancy 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. After this period the feeding should be done at a normal rate.

5. Feeding of young stock:

Feeding schedule for kids should be such that a weekly growth rate of 0.6 kg is obtained. The kid should be fed 50 to 100 ml of colostrums, four to five times a day, depending on its birth weight for three days. The composition of concentrate mixture (in parts) should be: gram, 20: maize, 22; groundnut-cake, 35; wheat bran, 20; mineral mixture, 2.5; and common salt, 0.5.

Mineral mixture:

Goats require slightly larger quantities of calcium than sheep. The mineral mixture may be included in the concentrate ration at the rate of 0.2 per cent.

Common salt:

The provision of salt licks is very important for goats as they secrete a good amount of sodium and chloride ions in milk. Salt to the extent of 2 per cent may also be mixed with the daily grain ration of goats.

Vitamins:

Goats need particularly vitamins A, D and E. The microbes in the rumen synthesize most of the other needed vitamins. Synthetic vitamins A and D may be included in the ration of growing kids.

DISEASES OF SHEEP AND GOAT

ENEROTOXAEMIA

Causative Agent: ***Clostridium perfringens* type D**

Symptoms

- Sudden death mostly lambs with good body condition followed by monsoon.
- It damages vascular endothelium (including blood vessels in the brain) leading to fluid loss, edema, off feed, grinding of teeth, bloody diarrhea.

Diagnosis

- Based on symptom and lesions.
- Large numbers of Gram-positive rods are suggestive of *C.welchii.*

Control and Prevention

- Before the lambing season the ewes are vaccinated.
- Lambs can also be vaccinated at 4 weeks of age.

PESTE DES PETITS RUMINANTS

Peste des petits ruminants (PPR), also known as goat plague, is caused by a paramyxovirus of the Morbillivirus genus. PPR is an acute or subacute viral disease of goats and sheep characterized by fever, erosive stomatitis, conjunctivitis, gastroenteritis, and pneumonia. Goats are usually more severely affected than sheep (hence called goat plague).

SYMPTOMS

Fever (40° to 41°C), watery discharge is from the eyes, nose and mouth, the mucous membranes of the mouth and eyes become much reddened. Pin-point greyish areas on the gums, dental pad, palate, lips, inner aspects of the cheeks and upper surface of the tongue, diarrhoea and difficult to breath

DIAGNOSIS

- Based on clinical, pathological, and epizootiological findings.

CONTROL

- Control of PPR outbreaks relies on movement control (quarantine) combined with the use of focused ("ring") vaccination and prophylactic immunization in high-risk populations.
- There is no treatment for PPR. However, mortality rates may be decreased by the use of drugs that control the bacterial and parasitic complications.

SHEEP AND GOAT POX

Sheep pox and goat pox are viral diseases of sheep and goats characterised by fever, generalized papules or nodules, vesicles (rarely), internal lesions (particularly in the lungs), and death. Both diseases are caused by strains of the genus Capripoxvirus.

SYMPTOMS

Fever, depression, polypnoea, conjunctivitis, lacrimation, rhinitis, oedema of eyelids and photophobia. The cutaneous eruption begin with erythematous areas especially noticeable in hair or wool-free parts of the body, papules and nodules formation. Animals may recover within 20-30 days. Death is frequent when complications like abortion and secondary infections.

DIGNOSIS

- Based on the characteristic symptoms and pox lesions in the hairless parts of the animal.

BLUE TONGUE

- Bluetongue (BT) is a non-contagious, athropod-borne viral disease of sheep and other domestic and wild ruminants, such as goats, cattle and deer.
- The infection in animals is transmitted through the bite of Culicoides insects.
- . The incubation period of BT in sheep is usually 7-10 days.
- **Sheep**
    - Rise in temperature to 40-42°C., excessive salivation and frothing at the mouth, hyperemia and swelling of the buccal and nasal mucosa followed by erosions and ulcerations. Extensive ulcerations on the dental pad and dorsal surface of the tongue. Hyperemia is also observed around the coronary bands of the hooves and lameness. Swelling and bluish discolouation of tongue. Signs include abortions, stillbirths, and weak “dummy lamb” live births.
- **Goats**
    - Bluetongue infection of goats is an inapparent infection similar to that described for cattle.

DIAGNOSIS

- Based on the characteristic symptoms and lesions.

PREVENTION ANDCONTROL

- Control is mainly aimed at vector control-water management (reduction of Culicoides breeding sites), use of insecticides and larvacides (spraying breeding areas), and insect repellents in which animals are dipped.
- Vaccination should be practiced only in endemic areas.

UNIT IV: SWINE MANAGEMENT

The advantages of the pig farming are:

- The pig has got highest feed conversion efficiency than any other class of meat producing animals except broilers.
- The pig can utilize wide variety of feed stuffs viz. grains, forages, damaged feeds and garbage and convert them into valuable nutritious meat.
- They are prolific with shorter generation interval. A sow can be bred as early as 8-9 months of age and can farrow twice in a year. They produce 6-12 piglets in each farrowing.
- Pig farming requires small investment on buildings and equipments
- Pigs are known for their meat yield, which in terms of dressing percentage ranges from 65 - 80 in comparison to other livestock species whose dressing yields may not exceed 65%.
- Pork is most nutritious with high fat and low water content and has got better energy value than that of other meats. It is rich in vitamins like thiamin, Niacin and riboflavin.
- Pigs manure is widely used as fertilizer for agriculture farms and fish ponds.
- Pigs store fat rapidly for which there is an increasing demand from poultry feed, soap, paints and other chemical industries.
- Pig farming provides quick returns since the marketable weight of fatteners can be achieved with in a period of 6-8 months.
- There is good demand from domestic as well as export market for pig products such as pork, bacon, ham, sausages, lard etc.

Comparison between desi Vs. Exotic

	Desi (Local)	**Exotic**
Litter size at birth	7.5	10
Birth weight (Kg.)	0.91	1.4
Weaning weight (kg.)	4.1	13.5
Weaning percentage	54	78.5
Dressing percentage	66	68

Maturity (Months)	14	8 - 10
Growth rate (gm)	70-100	over 300 gm.
Back fat thickness – (cm)	3-7	4-5

Nomen cloture/ Terminology

Species : Sus scrofa vittatus

Sus scrofa indicus

Group : Stock / Drove

New Born : Piglets (Last born piglet- Runt)

Young male : Boarling

Yong female : Gilt

Adult Male : Boar

Adult female : Sow

Castrated male: stag / Hog

Parturition : Farrowing

Mating : Coupling

Sound : Grunting

Breeds: Large white Yorkshire, Chester white, Middle white Yorkshire, Tamworth, Berkshire, Landrace, Poland china, Spotted Poland china, Duroc , Hampshire

1. **Large white Yorkshire : UK**

- White, occasionally black spots
- Erect ears and dished fore head
- Long and deep body
- Snout length is medium
- Mature body weight : Male : 300-400 Kg.
- Female : 230 – 320 Kg.

2. **Middle white Yorkshire : UK**

- Developed from crossing Small and Large White Yorkshire
- Extensively used to upgrade desi pigs as it is smaller in size
- Early maturity, rapid growth and can be raised on pasture
- But not prolific as that of Large white Yorkshire

- mature body weight Male : 250-350Kgs.
- Female-180-270Kgs.

3. <u>Land race : Denmark – Bacon Breed</u>

- White with blackspot,
- Long snout
- Excellently suited for upgrading desi pigs as it needs less feed resources for their maintenance and efficient converter of feed.
- Suitable for breeding smaller desi pigs
- Mature body weight : Male : 270 – 360 Female : 200-300

HOUSING OF PIGS

- The house should give adequate protection against direct sunlight and rain. Hogs are sensitive to heat and cold.
- The floor and wall should be strong to withstand the rooting habits of pigs. Concrete flooring is durable and easy to clean. The walls may be of bricks, finished smoothly and doors of strong wooden planks or iron.
- Feed troughs and water troughs may be placed along the front to facilitate feeding from outside.
- Pigs thrive well in temperature range of 20-25^{o}C. Provide shade, wallowing tank, cooling devices such as sprinkling of water, washing etc. to maintain thermal comfort.
- Design should be such that all animals are observable easily from outside and the labour requirement is less.
- Boars, pregnant and dry sows, gilts and growing pigs are usually kept in open yards with partially sheltered area. Farrowing sows are housed in completely enclosed houses or pens.
- Simple low cost houses constructed with locally available materials as per above guidelines are preferred in rural areas. Multipurpose pens, which can be used, for all categories of pigs can also be designed meeting the floor space requirement.
- Individual or group housing in cages made up of vertical G.I. pipes/M S rods and also farrowing crates can be adopted in large high-tech farms.
- Uncastrated males and females should not be housed together beyond the age of four months.

Housing of Boars

Boar pen should have covered area of 6.25-7.5 m2 and open area of 8.8-12 m2 for exercise. The walls should have a minimum height of 1.5 m.

Housing of Female

Open yard type with partial roofing as in the case of boar may be provided. A total of 10-15 females can be grouped in a pen. An area of 2 m2 per animal may be provided.

Housing of Farrowing sows

Farrowing sows may be housed individually in a farrowing pen of 2.5 x 4.0 = 10.0 m2 having guard rails, creep area, feed and water troughs.

Space requirement of pigs

Type of animal	**Floor space requirement (m^2 /animal)**		**Maximum number of animals per pen**
	Covered area	**Open paddock**	
Boar	6.0-7.0	8.8-12.0	Individual pens
Farrowing pen	7.0-9.0	8.8-12.0	Individual pens
Fattener (3-5 months old)	0.9-1.2	0.9-1.2	30
Fattener (above five months)	1.3-1.8	1.3.1.8	30
Dry sow/gilt	1.8-2.7	1.4-1.8	3-10

Housing of growing and finishing pigs

A covered concrete yard for feeding and resting having feed and water trough arranged in the front side and an open yard in the rear will suffice for fatteners. The total space requirement may be 2 m2 per grower/fattener pig.

FEEDING MANAGEMENT

- Pigs are monogastric animals and can utilize fibrous food only to a limited extent. Adult pigs can utilize fibrous food better than young stock.
- Part of the protein in the diet of pigs should come from animal source such as fish, meat etc.

- Pigs should be fed at regular intervals.
- Fresh feed should be put only after removal of the previous feed from the feed trough.
- Pig rearing based on commercial pig feed is not economical and hence feeding based on swill is recommended. On an average, pig requires 4-8 kg swill per day.
- All categories of pigs can be given small quantity of fodder or may be sent to pasture.
- Ad libitum feeding using an automatic feeder (which can be fabricated using 200 litre oil drum) may be practiced for weaned pigs to avoid post-weaning weight depression

Feeding of boars

A breeding boar requires 2-2.5 kg concentrate per 100 kg weight depending on the age, condition and breeding demand. Feed allowances should be so adjusted that the pig is neither fatty nor run down. Greens should be provided if kept indoors. Year-round pasture is excellent if it could be provided from the stand point of providing both the needed exercise and valuable nutrients.

Feeding of female

The demands resulting from pregnancy and need for conserving nutrients for ensuing lactation are accelerated during the later stage of pregnancy. The increased needs are for proteins, vitamins and minerals.

Mature sows gain 30-35 kg and gilts 40-45 kg during pregnancy. Feed should be so regulated that sows and gilts are never over fat or thin. Individual feeding is preferred. Flushing is a practice of giving extra feed to sows and gilts from 1-2 weeks prior to mating and returns to normal feeding after mating.

Feeding of Farrowing Sow and Litter

Feed lightly with bulky laxative feed immediately before and after farrowing. Bring the sow to full feeding in 10 days. Plenty of greens may be provided. Feed allowance may be calculated as 2.5-3 kg/100 kg body weight plus at the rate of 0.2 kg feed per piglet with the sow. Thus, a sow weighing 100 kg with 8 piglets should receive 4.6 kg feed per day. The piglets may be provided with special nourishing diet called creep feed separately.

Creep feeding:

The practice of self-feeding concentrates to young piglets in a separate enclosure away from their mother is known as creep feeding. Creep feed should be given when piglets are two weeks old. Each active and healthy piglet may consume about 10 kg feed before reaching the age of 8 weeks and two-third of this consumed between 6-8 weeks.

SWILL FEEDING

Swill (kitchen waste including left over of human food, vegetables, meat and fish cuttings): Composition and quantity vary so greatly that it is difficult to indicate feeding values. It has been observed that pigs weighing 30 kg reached a body weight of 70 kg in 70 days when fed exclusively on kitchen waste. Ensure that swill feed is not old and putrified. On an average 4 – 8 kg swill is needed per pig per day.

Feeding of growing and finishing pigs:

The pigs may be given complete feed they can consume to attain maximum growth. Alternatively, they may be fed a fixed quantity twice or thrice a day. Yet another method that they may be fed all the quantity they consume within a fixed time of 30-45 minutes or so. On an average, the post-weaning feed conversion efficiency till market weight may be about 4 i.e. this much quantity of feed would be used by the pig to gain one kg of weight. However, it varies considerably with age and ambient temperature. Protein requirements are greater during early life. As fattening progresses, protein per cent in the ration may be decreased.

This period may be considered from weaning (9-10 kg) to the slaughter weight of 90-100 kg. Entire males, castrates and females can be fattened for meat purposes. The entire males and females may have higher feed conversion efficiency than castrates. Castration if required may be done at the age of 3-6 weeks. Castrates are more docile and put on slightly more fat. Growers may be grouped according to sex, size and weight as uniformly as possible. The difference in weight between the small and large pig in a lot should not be more than 20%. Up to 15 pigs may be conveniently put together in a pen. In summer, sprinklers, wallowing tanks etc. may be provided in addition to shades to cool pigs. Poor growers may be identified, culled and removed from the lot at the earliest. Deworming may be done two weeks after weaning and may be repeated once in two months if necessary.

Orphan pigs:

When a sow dies or fails to produce milk or does not claim her pigs, the piglings should be promptly shifted to a foster mother. Some sows may refuse to suckle alien piglings. Care should be taken to simulate the conditions including the odour and body size of piglings when admitted to a foster mother or another suckling sow. If a suckling sow is not available, hand feeding would be necessary. Cow's milk is the best substitute for sow's milk. Buttermilk or sweet skim milk can also be used. Each pigling may consume 300-500 ml milk per day. Best results may be secured by feeding 5-6 times a day for the first few weeks and thereafter the frequency may gradually be reduced to 2-3 times. Any standard vitamin preparation two or three times the quantity used for infants may be administered to the piglings until they start taking feed. Injectable iron preparation (e.g. Imferon) may be given as usual. A 60-Watt electric bulb may provide enough warmth for the piglings during the early days of life.

Ration formulation: Requirement

Age	**Preweaning**	**Grower (20 – 90Kg.)**	**Adults**
CP%	22%	18-13	14-15%
ME (k.cal/kg.)	3500	3500-3800	3300

Ca : 0.5 – 0.8%,P : 0.4 – 0.6%,Salt : 0.5%.

Model composition

	Creep mixture	**Grower**	**Adult**
Maize	53	53	50
Cakes	22	16	7
Wheat Bran	7.5	17	35
Fishmeal	15	12.5	6.5
Mineral mixture	2	1	1
Salt	0.5	0.5	0.5

Allowance

Creep mixture : 0.2 – 0.6 kg, Grower : 0.6 – 2.0kg, Adult : 2 – 3kg

MANAGEMENT PRACTICES

Breeding care

- Pigs are highly prolific in nature and two farrowings in a year should be planned by adopting optimal management conditions.
- For every 10 sows one boar must be maintained for maximum fertility.
- Breed the animals when it is in peak heat period (i.e. 12 to 24 hours of heat).

Care during Pregnancy

Give special attention to pregnant sows one week before farrowing by providing adequate space, feed, water etc. The sows as well as farrowing pens should be disinfected 3-4 days before the expected date of farrowing and the sows should be placed in the farrowing pen after bedding it properly.

Care of Piglets

- Take care of new born piglets by providing guard rails.
- Treat / disinfect the navel cord with tincture of iodine as soon as it is cut with a sharp knife.
- Feed on mothers' milk for first 6-8 weeks along with creep feed.
- Protect the piglets against extreme weather conditions, particularly during the first two months.
- Needle teeth should be clipped shortly after birth.
- Vaccinate the piglets as per recommended vaccination schedule.
- Supplementation of Iron to prevent piglet anemia is necessary.
- The piglets meant for sale as breeder stock must be reared properly.
- Male piglets not selected for breeding should be castrated preferably at the age of 3-4 weeks which will prevent the boar odour in the cooked meat thus it enables production of quality meat.
- Additional feed requirements of lactating sow must be ensured for proper nursing of all the piglets born.

Care and management of sow:

Care and management of sows are very essential since they are retained in the herd mainly for breeding. Good management and feeding will minimize problems related to

breeding. Sows should be looked after with particular care so that the piglets are delivered normally and nursed properly.

Farrowing Sow and Litter:

- Clean and disinfect the farrowing pen with a solution of 2 % of phenyl lotion and keep it vacant for a week.
- The pregnant female may be dewormed 2-3 weeks before farrowing and prior to admitting into the farrowing pen. Spray with external parasiticide (1% solution of malathion/cythion, butox. 0.05 %). Scrub the under surface, sides, interdigital space and udder to remove dirt, eggs of parasites, disease germs etc. with soap and water just before moving into the farrowing pen.
- Move the clean animal to the clean pen 10 days before farrowing.
- Provide light bedding of chopped straw 2-3 days before farrowing.
- Appearance of milk in teats when pressed indicates the approach of farrowing time.
- Attend the farrowing throughout. It may last up to 24 hours.
- Wipe the piglets clean with towel/straw. Disinfect the naval cord with tincture of iodine. Normal healthy piglets suckle teats within 10-30 minutes. Help small piglets to suckle.
- Placenta, dead piglets, soiled bedding etc. may be removed and buried in time with least delay. The placenta will be expelled generally within a short while.
- Provide 50 mg iron (Imferon 1 ml) on the second day intra-muscularly to prevent piglet anaemia. Oral administration of iron solution (1 g Ferrous sulphate in 25 ml of water) 1 ml per piglet once a week can be tried. A second injection may be given at 5 weeks of age.
- Keep the farrowing pen warm, dry and clean.
- Needle teeth may be removed carefully.

The time taken for expulsion of litter vary from 1 hour to 5 hours. The interval between the birth of the first and that of successive piglets vary from a few minutes to 3 hours. About 30 per cent of piglets are usually born in posterior presentation. Generally placenta is shed only after all the piglings are born. Expulsion of placenta is usually within 3 hours after expulsion of foetus. Piglets start suckling within 10-15 minutes after birth. Artificial heat may be provided by using an infrared lamp / ordinary electric bulb during cold and rainy season to avoid death due to chilling.

Breeding management: The sows come to heat once in about 21 days. Good feeding and management induces heat (estrus) makes breeding easy, and larger litter size. Along with grains, fish meal. skim milk or butter milk may be given 2-3 weeks prior to breeding to allow a body weight gain of 200-300 gm/day.

Mating:

The average gestation period of sow is about 112-115 days the normal litter size is 8-10 piglets. Older sows as larger litter size with high birth weight.

Care at farrowing time:

The pregnant sow should be shifted to farrowing pen 3-4 days before farrowing to avoid disturbances and to settle down in new Surroundings. The forrowing pen should be dry, well ventilated and lighted. Bedding material should be provided in the farrowing pen.

Prior to farrowing time, the ration of sow should be reduced to half and should contain laxative ingredient like wheat bran. The sow should be left undisturbed at farrowing and may be helped during emergencies. Remove piglets from a nervous sow and allowed to suckle under supervision. As soon as the piglets are born, they are dried with a cloth and placed in warm enclosure pig brooder.

Brood sows should be given well-balanced rations. Feeding should be started in small quantities of concentrate mixtures along with laxatives like wheat bran.

Care and management of sucking sows:

A sow gives about 150-200 kg of milk during 8 week suckling period. Sows milk is more concentrated than cows milk hence sow require more feed. Allow 1.5kg of feed for the sow and add 0.5 kg of feed per piglet to a maximum of 5-6 kg of total ration. Plenty of Lucerne hay and succulent fodder may be provided.
A few days prior to weaning, the quantity of feed is gradually reduced to restrict milk flow and dry the udder.

Care and management of boar

The boar should be maintained in a separate pen. They should neither be overfed nor underfed, since both will affect its breeding capacity. It should be fleshy, and thrifty but not too fatty. The feed requirements include both the demands for maintenance and reproduction.

During off-season the boar should be given plenty of grasses and legume hay and 2kg of concentrate mixture. An additional 0.5 kg of concentrate may be given 2 weeks prior to breeding season.

Boars should not be used for breeding earlier than 8 months of age. A young boar can be used for 15-20 sows in a season and older ones may be used for about 25-45 sows. A boar can be allowed to serve before being fed. Not more than one service per day is allowed during breeding season. Older sows may be used for breeding season. Older sows may be used for breeding with younger boars.

Gilts Exposed to Boar

Boar should have free access to water and boar pen is kept clean and dry. Dampness should be avoided. The boar should be scrubbed and washed daily and kept clean. Trimming of boar's feet periodically will prevent lameness in boars. The bolt cutters can be used to remove tusks of boars to avoid injuries to sows and attendants.

Newly purchased boars should be kept separately for 2-3 weeks to avoid risk of introducing any disease into the farm.

Care and management of piglets

- The piglets are removed as they are farrowed and kept warm in creep space until farrowing is complete.
- Each piglet is cleaned of all mucous to ensure that the breathing passage is clear
- The navel card should be tied 2.5 cm away from the navel, remaining portion is removed hygienically and stumps are painted with iodine.
- Piglets should be nursed after birth. They nurse 8-10 times in a day.
- Piglets are born with 4 pairs of sharp teeth (2 pairs on each jaw) which may injure udder or teats. Hence clip these teeth soon after birth.
- Piglet anemia (Thumps) : Since sows milk is deficient in iron and copper piglets suffer from serious deficiency resulting in anemia. Affected piglets become weak, dyspeptic, and have distressed breathing.

Milk Feeding

This disease is also called thumps because of their difficulty in breathing. To prevent piglets anemia udder of sow may be swabbed daily with a saturated solution of ferrous sulfate for 4-6 weeks so that piglets can get these minerals while suckling the milk. Another effective method is injection of iron - dextran compounds available commercially.

- **Creep feeding:** Piglets take dry feed at 2-3 weeks. Provision of additional nutrients at this time is essential to have maximum growth and development. Creep feed is also called as pig starter for vigorous growth the thriftiness, sows milk alone .is not sufficient for piglets. Creep feed contains 25-30% CP.

Creep is a device by which piglets are allowed access to the concentrate mixture. It may be arranged of the corner of farrowing pen. Creep feed is' fed from 14-56 days. The composition is as follows.

Ingredient	**Parts**
Maize	65
GNC	14
Molasses	5
Wheat bran	10
Fish meal	5
Mineral mixture	1
Antibiotics	-

- **Weaning of piglets:** Usually weaning is done at 7-8 weeks. The sow should be separated from the piglets for a few hours each day to prevent stress of weaning and its feed is reduced gradually.

- **Orphan piglets :** Can be raised either with a foster sow or the use of milk replacer

Manure disposal

The dry solid dung may be collected morning and evening and stored in the dung shed. The liquid part of urine and washings may be taken to settling tanks.

Integration

Pigs can be effectively integrated to a biogas plant for meeting the cooking /lighting demand of the farmers. It can also be integrated to agriculture and fish culture thereby increasing the overall economic efficiency of the system. The pig dung is good organic manure in dried form or as compost.

SWINE DISEASE:

Classical swine fever

Classical swine fever (CSF) is a contagious viral disease of pigs. CSF is caused by a virus belonging to the family Flaviviridae and the genus **pestivirus.**

SYMPTOMS

- **Acute infection**
    - In acute form the pigs appear sick, inactive and drowsy with arched back. Some pigs stand with droopy head and straight tail. Huddling, vomiting, high fever anorexia and constipation. Conjunctivitis, staggering gait, posterior weakness and purple discoloration of abdominal skin
    - In last stage of the infection, pigs will become recumbent, and convulsions may occur shortly before death. Sever diarrhoea will also occur during last stages.
- **Chronic form**
    - Dullness, capricious appetite, pyrexia and diarrhoea for up to 1 month. Weight loss, hair loss, dermatitis and discoloration of abdomen or ears are the other symptoms. A chronically infected pig may have a disproportionately large head relative to the small trunk.

Diagnosis

- Based on high morbidity and mortality, high fever, diarrhoea. Kidney and lymph node lesions will help in field diagnosis.

Treatment & Vaccination

- Modified live vaccines (MLV) are used to control CSF.

SWINE INFLUENZA

- Swine influenza is a highly contagious respiratory viral infection of pigs caused by swine influenza vius, characterized by coughing, sneezing, nasal discharge, elevated rectal temperatures, lethargy, difficult breathing, depressed appetite and rarely associated with reproductive disorders such as abortion.

- The first clinical signs are fever (40.5-41.5ºC), puffy eyes, anorexia leading to loss of weight, depression, prostration and huddling leading to weakness. These signs are followed by sudden onset of acute respiratory signs, which include paroxysmal coughing, sneezing, irregular abdominal breathing and ocular and nasal discharges.

- In breeding stock, abortions, infertility, production of small weak litters and increased stillbirths.

PREVENTION AND COTROL

Good husbandry practices including All-in/All-out to limit the spread of the disease, provision of fresh clean drinking water, avoiding ducks and turkey contamination's/contact including staff and proper use of disinfectants to clean infected buildings.

FOOT AND MOUTH DISEASE

Viral disease of pigs caused by FMD virus of the genus Aphthovirus. Characterized by fever (40-40.6ºC), anorexia, reluctance to move, and scream when forced to move. These signs are followed by vesicles on the coronary band, heals, inter digital space and on the snout. Mouth lesions are not too common and when they occur are smaller and of shorter duration than in cattle and tend to be a "dry"-type lesion. There is no drooling. Sows may abort. Piglets may die without showing any clinical sign.

DIAGNOSIS

- Based on symptom and lesions

Control and eradication program

- Prevention of movement of animals and animal products in the area affected.
- Destroy carcasses
- Disinfect vehicles leaving the infected area.

- Perform vaccination.

PIGLET MORTALITY

The major task in pig husbandry is avoiding piglet mortality and raising piglets successfully up to weaning. After weaning the mortality is comparatively less Pre-partum death may be due to deficiency of iron, which can be prevented by injection of sow with iron. Intrapartum death is due to anoxia induced by lack of placental blood flow associated with uterine contraction or premature rupture of umbilical card. This intra-partum death occurs mostly in aged sows.

Pre-weaning mortality

The pre-weaning mortality ranges between 12-30%.

Causes of mortality

Sl. No	Reasons	%
1	Still birth	17.4
2	Eaten by the sow	0.50
3	Genetic defect	1.60
4	Over laid (crushing by mother)	66.30
5	Enteritis	2.20
6	Pneumonia	0.50
7	Unknown	11.50

Starvation and overlying by the pig

70% of death is due to starvation and overlying by the sow, which can be avoided by

1. Improving birth weight and vigor of newborn piglets
2. Minimizing risk of chilling or hypothermia
3. Minimizing agalactia

MMA (Mastitis Metritis Agalactia).

It is a part of complex condition of **MMA** (M= mastitis, M= metritis & A=agalactia). The MMA syndrome can involve metabolic, bacterial and hormonal factor with stress plays a part. Since its main effect is loss of milk in the first three days after farrowing, the condition contributes to piglet loss from starvation.

Reason and control of MMA

- Elevated temperature of sow is associated with this condition, hence regular monitoring of sows rectal temperature and treatment with antibiotic and oxytocin is

essential to avoid this condition. Such conditions which are not detected earlier, it can be noticed by loss of body condition of piglets and it is very difficult to recover the condition quickly. In refractory case prompt provision of an alternative source of food for piglet by foster sow or artificial feeding will minimize the loss

- The udder and teat of sow should be dry and kept hygiene to avoid such problem

Piglet anemia

The newborn piglet has only limited reserve of iron in the liver for hemoglobin synthesis. This is due to poor placental transfer of iron to foetus. The sow milk is very low in iron and the suckling pig should be supplemented with iron during first few days to prevent piglet anaemia.

Symptom

- Pale in the region of ears and belly
- Listlessness
- Rapid breathing
- Often exhibit diarrhea

Control

- Placing fresh, clean earth in the piglets pen each day
- Using soil drenched with a solution made from 500 gm ferrous sulphate, 75 gm copper sulphate and 3 litter of water
- Daily administration of 4 ml of 1.8 percent ferrous sulphate solution
- The daily painting of the mother's udder with ferrous sulphate solution and sugar [0.5 kg of ferrous sulphate in 10 liter of water]
- All these methods are labour intensive and the safest and easiest method of combating piglet anaemia is to inject the piglet with 100-150 mg of iron in the form of iron dextron 3 days after birth. If necessary a second and slightly smaller injection can be made some 3 weeks later

UNIT V: POULTRY MANAGEMENT

POULTRY PRODUCTION

The term "Poultry" indicates all domesticated avian species such as chicken, ducks, turkeys, Japanese quail, guinea fowls, geese, pigeons, ostrich, emu etc. Although very often used as synonymous to chicken.

Common terms used in Poultry

Species	Young	Adult	
		Male	Female
Chicken	Chick	Cock	Hen

Definitions

Bill: The beak of duck.

Broiler / Fryer: It is a bird of about 5 weeks of age of either sex (straight-run chicks) with an average body weight of 1.8 to 2.0 kg with a flexible breast bone cartilage, pliable and tender meat.

Brooder: Metallic or wooden equipment used for artificial brooding of baby chicks.

Candling: The process of visual examination of an intact egg, by holding between the eye and a lighted candle or other source of light to determine the interior quality, shell soundness or stage of embryonic development.

Capon: Surgically castrated male less than 10 months of age.

Clutch: Eggs laid by a hen on consecutive days without break are referred as 'Clutch'.

Cull: Unproductive hen.

Culling: Elimination of unproductive or undesirable bird.

Debeaking / Beak trimming: Removal of a portion of beak

Desi fowl: Indigenous or native fowl.

Desnooding: Removal of snood in turkeys

Down time: Period between culling of one batch and introduction of new batch of birds in the shed.

Dubbing: The process of removal of comb and wattles at day-old age with the help of scissors.

Egg tooth: Small horny protrusion on the tip of chick's beak used to pip the egg shell when hatching. It drops off soon after chicks' escapes from the egg.

Green Duck: Ducks used for meat production which are marketed from 9 to 16 weeks of age.

Hatchery: A building where incubators are kept for hatching purpose.

Layer: A mature female fowl kept for egg laying purpose.

Livability: Ability of individual bird to live and remain vigorous and productive.

Moulting: Molting is the act or process of shedding and renewing feathers.

Pause: Interval between clutches.

Photoperiod: Period of illumination by both natural and artificial means.

Pipping: The act of pecking the shell and shell membrane by the chick in order to break the shell and hatch out of the shell.

Roaster: A broiler grown upto the age of 9 – 11 weeks to a body weight of 2.5 to 3.0 kg

Snood: A small muscular structure hanging from the base of beak in turkeys is called "Snood"

CLASS, BREEDS, VARIETIES AND STRAINS OF POULTRY

Class: In poultry it is used to designate group of birds that have been developed in certain geographical areas or regions

For example: American, English, Mediterranean and Asiatic

Breed: It refers to group of birds with common ancestors and having similarity in shape, confirmation, growth, temperament, shell colour of eggs etc.

For example: *Leghorn, Rhode Island Red, Australorp, Aseel etc.*

Variety: A variety is a subdivision of a breed, distinguished either by colour, comb type feather pattern etc from other group of the same breed.

For example: *White Leghorn, Brown Leghorn, White Plymouth Rock,*

Barred Plymouth Rock, Black Minorca etc.

Strains: Strains are closely related inbred flocks with definite economic characters. A strain is the name given by a breeder who has done breeding on the birds and introduced certain economic characters in the birds. A breed or a variety may have several strains and may be phenotypically alike but often differ on their production performance depending upon breeding history.

For example: *Babcock, Bovans, Hyline, Hisex, Lohmann (Layer strain)*

Cobb, Hubbard, Ross, Hybro (Broiler strain)

BREEDS OF POULTRY

Class	Breed	Variety
American class 1. Clean shank	Plymouth Rock	Barred White

2. Yellow skin 3. Red ear lobe 4. Dual purpose bird 5. Medium size 6. Brown shelled eggs		Buff Patridge Silver penciled
	Rhode Island Red	Single comb Rose Comb
	New Hamp Shire	Single comb
Asiatic class 1. Feathered shank 2. Yellow skin 3. Red ear lobe 4. Meat purpose 5. Massive size 6. Brown shelled eggs	Brahma	Light brahma Dark brahma
	Long shan	Black White
	Cochin	Black White Buff Patridged
Mediterranean class 1. Clean shank 2. Yellow/white skin 3. White ear lobe 4. Egg purpose bird 5. Small size 6. White shelled eggs	Leghorn	Single & Rose comb (white) Single & Rose comb (Light brown) Single & Rose comb (Dark brown) Single comb (Buff)
	Minorca	Single & Rose comb (white) Single & Rose comb (Black)Single comb (Buff)
English class 1. Clean shank 2. White skin 3. Red ear lobe 4. Dual purpose bird 5. Medium size 6. Brown shelled eggs	Australorp (Black Shank)	Black
	Cornish (Yellow skin and Pea comb)	White Dark

Indian chicken breeds:

1. Kadaknath (Block coloured meat)

2. Aseel (Used for fighting purpose)

3. Chittagong and 4. Busra

Note:

1. *Araucana* is an American breed, which lays blue or green coloured eggs.
2. *Aseel* is an Indigenous game fowl used for fighting purpose.
3. *Frizzle* is an asiatic breed, which is notable for its curved feather formation. Each feather is curled towards the head of the bird.
4. *Silkie* is an Asian breed, which has persistent broody character.
5. *White Leghorn* is the most popular egg type breed.

Commercial layer strains developed by private sectors in India:

S.No.	Breeder Name	Commercial strains	Remarks
1	Babcock	B300 / ISA white	70% of Indian share
2	Hendrix	Bovans white	10% of Indian share
3	Hy-Line	Hy-Line Brown Hy-Line White	Popular strain in world; The egg size is smaller
4	Dekalb	Dekalb XL (white)	USA bird;Largest selling white egg bird in the world.
5	Lohmann	1) Lohmann White 2) Lohmann Brown	10% of Indian share

Commercial broiler strains developed by private sectors in India:

S.No.	Breeder Name	Commercial strains	Remarks
1	Cobb	1) Cobb 100 2) Cobb 400	40-50% of Indian market
2	Hubbard	Hubbard Hi-Y	
3	Ross	Ross 308	Next to cobb in India; 35-40% of Indian market.

POULTRY HOUSE CONSTRUCTION

Need for poultry house

1) To protect birds from adverse climatic conditions

2) To ensure easy and economic operation
3) To ensure scientific feeding in a controlled manner
4) To facilitate proper micro-climatic conditions in a near vicinity of bird
5) For effective disease control measures
6) To ensure proper supervision

Different types of poultry houses

1) Brooder / chick house

It is used to brood and rear egg-type chicks from 0 to 8 weeks of age.

2) Grower house

It is used to grow egg-type birds from 9 to 18 weeks of age.

3) Brooder cum grower house

Here, the birds are reared from 0 to 18 weeks of age (entire brooding and growing period of egg-type chicken).

4) Layer house

In which birds over 18 weeks of age are reared, usually up to 72 weeks of age.

5) Broiler house

In which broilers are reared up to 6 weeks of age.

6) Breeder house

In which both male and female breeders are maintained at appropriate sex ratio.

7) Environmentally controlled (EC) house

In which, entire environment is manipulated in such a way that is optimum for the birds growth.

Optimal environmental conditions for rearing broilers

Temperature	- 22-30^{0}C (70-85^{0}F)
Relative Humidity	- 30-60 %
Ammonia level	- Less than 25 ppm
Litter moisture	- 15-25%
Air flow	- 10-30 metres/minute

Location

1) Poultry house should be located away from residential and industrial area.
2) It should have proper road facilities
3) It should have the basic amenities like water and electricity.
4) Availability of farm labourers at relatively cheaper wages.
5) Poultry house should be located in an elevated area and there should not be any

water-logging.

6) It should have proper ventilation.

Layout of poultry farm

The basic principles to be observed for layout are,

1) The sheds should be so located that the fresh air first passes through the brooder shed, followed by grower and layer sheds. This prevents the spread of diseases from layer houses to brooder house.

2) There should be a minimum distance of 50-100 feet between chick and grower shed and the distance between grower and layer sheds should be of minimum 100 metre.

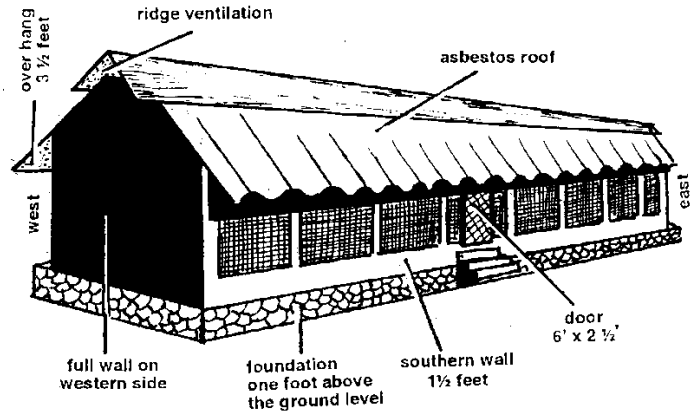
3) The egg store room, office room and the feed store room should be located near entrance to minimize the movement of people around the poultry sheds.

4) The disposal pit and sick room should be constructed only at the extreme end of the site.

DETAILS OF OPEN-SIDED POULTRY HOUSE CONSTRUCTION

1) House Orientation (Direction)

The poultry house should be located in such a way that long axis is in east-west direction. This will prevent the direct sunshine over the birds.



A model poultry house

2) Size

Each broiler require one square foot of floor space while a layer requires two square feet of floor space under deep-litter system of rearing. So the size of the house depends on the number of birds to be reared.

3) Length

The length of the house can be of any extent. The number of birds reared and availability of the land determines the length of poultry house.

4) Width

The open sided poultry houses in tropical countries should have a width not more than 22 to 25 feet in order to allow ample ventilation and aeration at the mid-portion. In environmentally controlled poultry houses, the width of the house may be even 40 feet or more since the ventilation is controlled with the help of exhaust fans.

5) Height

The height of the sides from foundation to the roof line should be 6 to 7 feet (eaves height) and at the centre 10 to 12 feet. In case of cage houses, the height is decided by the type of cage arrangements (3 tier or 4 tier).

6) Floor

The floor should be made of concrete with rat proof device and free from dampness. The floor of the house should be extended 1.5 feet outside the wall on all sides to prevent rat and snake problems.

7) Doors

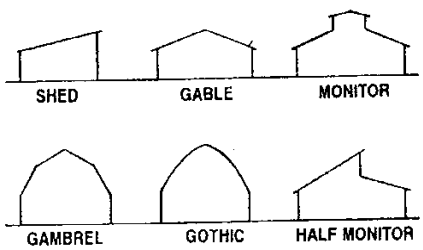
The door must be open outside in case of deep-litter poultry houses. The size of door is preferably 6 x 2.5 feet. At the entry, a foot bath should be constructed to fill with a disinfectant.

8) Side walls

The side wall should be of 1-1.5 feet height, and generally at the level of bird's back height. This side wall protects the bird during rainy days or chill climate and also provides sufficient ventilation. In case of cage houses, no side wall is needed.

9) Roof

The roof of the poultry house may be thatched, tiled, asbestos or concrete one depending upon the cost involvement. Different types of roofs are Shed, Gable, half-monitor, full-monitor (Monitor), Flat concrete, Gambrel, Gothic etc. Gable type is mostly preferred in tropical countries like India.



10) Overhang

The overhang of the roof should not be less than 3.5 feet in order to prevent the entry of rain water into the shed.

SYSTEMS OF POULTRY HOUSING

Poultry can be housed under different systems based on following factors,

1) Availability of land
2) Cost of land
3) Type of farming activity
4) Climatic condition
5) Labour availability

Broadly, poultry housing systems are classified into three systems:

1) Free range or extensive system
2) Semi-intensive system
3) Intensive system
    a) Deep-litter system
    b) Cage system

1) Free range system

This system is adopted only when adequate land is available to ensure desired stocking density by avoiding overcrowding. We can rear about 250 adult birds per hectare. Foraging is the major source of feeding for birds. Shelter is usually provided by temporary roofing supported by ordinary poles. This system is most preferred for organic egg production.

Advantages

1) Less capital investment
2) Cost of housing is least.
3) Feed requirements are less since birds can consume fairly good amount of feed from grass land.
4) Fertility of soil can be maintained.

Disadvantages

1) The scientific management practices can not be adopted.
2) Eggs are lost when laid inside the dense grasses unless special nests are provided.
3) Losses due to predatory animals are more.
4) Wild birds may bring diseases unless proper care is taken.

2) Semi-intensive system

As the name indicates birds are half-way reared in houses and half-way on ground or range, i.e. birds are confined to houses in night or as per need and they are also given access to runs. The houses are with solid floors while runs are fields only. The stocking density rate on an average for adult birds is 750 per hectare. The feeding and watering facilities are provided in the pen.

Advantages

1) More economical use of land compared to free range system
2) Protection of birds from extreme climatic conditions
3) Control over scientific operation is some extent possible

Disadvantages

1) High cost for fencing.
2) Need for routine cleaning and removal of litter material from the pen.

3) Intensive system

Birds are totally confined to houses either on ground / floor or on wire-netting floor in cages or on slats. It is the most efficient, convenient and economical system for modern poultry production with huge numbers.

Advantages

1) Minimum land is required for farming.
2) Farms can be located near market area.
3) Day-to-day management is easier.
4) The production performance is higher as more energy is saved due to restricted movements.
5) Scientific management practices like breeding, feeding, medication, culling etc. can be applied easily and accurately.
6) The sick birds can be detected, isolated and treated easily.

Disadvantages

1) Birds' welfare is affected. They can not perform the natural behaviour like roosting, spreading wings, scratching the floor with legs etc.
2) Since they are not exposed to outside sunlight and feed sources, all the nutrients should be provided in balanced manner to avoid nutritionally deficient diseases.
3) Chances for spreading of diseases are more.

DEEP LITTER SYSTEM

In this system the birds are kept inside the house all the time. Arrangement for feed, water and nest are made inside the house. The birds are kept on suitable litter material of about 3" to 5" depth. Usually paddy husk, saw dust, ground nut hulls, chopped paddy straw or wood shavings are used as litter materials. The litter is spread on the floor in layers of 2" height every fortnightly till the required is achieved.

Advantages

1) Vit B2 and Vit B12 are made available to birds from the litter material by the bacterial action.
2) The welfare of birds is maintained to some extend
3) The deep litter manure is a useful fertilizer.
4) Lesser nuisance from flies when compared to cage system.

Disadvantages

1) Because of the direct contact between bird and litter, bacterial and parasitic disease may be a problem.
2) Respiratory problems may emerge due to dust from the litter.
3) The cost of litter is an additional expenditure on production cost.
4) Faults in ventilation can have more serious consequences than in the cage system

Litter management

Qualities of good litter material

1) It must absorb moisture from droppings quickly
2) It must release moisture and dries up rapidly
3) It must have least tendency to form cakes
4) It must be free from mould growth
5) It must be free from sharp objects and other objectionable materials.
6) It must be non-toxic, inert and compressible.
7) It should possess good insulating properties and protect chicks from extremes of climate.
8) It must be cheap and locally available
9) It must be biodegradable, supply some nutrients to the birds and form a good quality manure later.
10) It must have medium particle size, soft and light in weight.

Quality of a litter material is tested by picking a hand full of litter material and presses it tightly. A good litter material is the one which breaks up when hand is open and the litter material with more moisture will form a ball in the hand. Too much dried litter material causes dustiness in the farm.

A concrete floor is advised for a perfect disinfection at the end of each batch. About 3-5" of litter should be put into the house initially and more should be added till a depth of about 8-12" is reached. Before adding fresh litter material, remove the caked up and wet litter material. At the beginning the litter contains only 12% moisture. If the moisture level exceeds 30% due to poor ventilation, too many birds, irregular stirring or damp floor, the litter will cease to function efficiently. Some time many birds will bear "balls" made of litter materials at their claw tips. Ball formation is a sign of bad litter management. Built-up litter has a very important role in providing warmth to the birds in winter. In winter the litter depth can be increased to 10-12" while in summer it may be reduced to 2.5-4".

CAGE SYSTEM

This system involves rearing of poultry on raised wire netting floor in smaller compartments, called cages, either fitted with stands on floor. It has been proved very efficient for laying operations, right from day-old to till disposal. At present, 75% of commercial layers in the world are kept in cages. Feeders and waterers are attached to cages from outside except nipple waterers, for which pipeline is installed through or above cages. Auto-operated feeding trolleys and egg collection belts can also be used in this rearing system. The droppings are either collected in trays underneath cages or on belts or on the floor or deep pit under cages, depending on type of cages.

Advantages

1) Minimum floor space is needed
2) More number of eggs per hen can be received
3) Less feed wastage
4) Better feed efficiency
5) Protection from internal parasites and soil borne illnesses
6) Sick and unproductive birds can be easily identified and eliminated.
7) Clean eggs production
8) Vices like egg eating, pecking is minimal.
9) Broodiness is minimal
10) No need of litter material
11) Artificial Insemination (AI) can be adopted.

Disadvantages

1) High initial investment cost.
2) Handling of manure may be problem. Generally, flies become a greater nuisance.
3) The incidence of blood spots in egg is more
4) Problem of cage layer fatigue. (It is a condition, in which laying birds in cages develop lameness. It may be due to Ca and P deficiency but the exact reason is not known)
5) In case of broilers, incidence of breast blisters is more, especially when the broilers weight is more than 1.5 kg.

Types of cages

Based on the number of birds in a cage, it is classified as

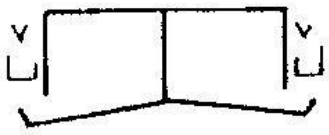
1) Single or individual bird cage (Only one bird in a cage)
2) Multiple bird cage (From 2 to 10 birds, usually 3 or 4 birds per cage)
3) Colony cages (Holding birds more than 11 per cage)

Based on the number of rows

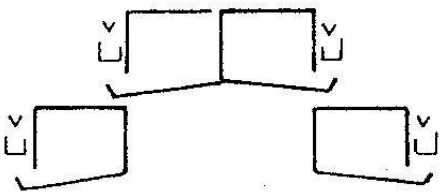
1) Single-deck
2) Double-deck
3) Triple-deck
4) Four-deck
5) Flat-deck

Based on arrangement of cages

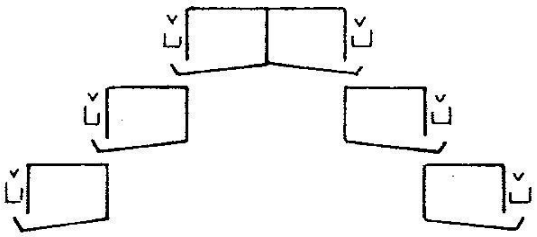
1) Stair-step cages
    a) M-type cages
    b) L-type cages
2) Battery cages (Vertical cages)



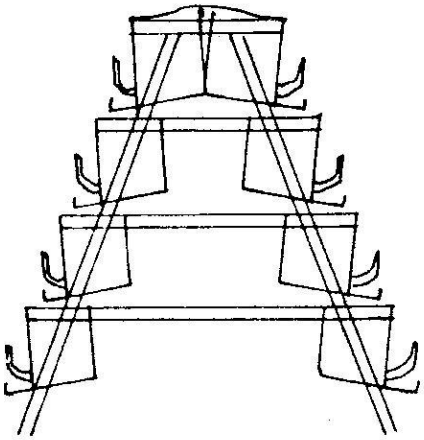
SINGLE DECK



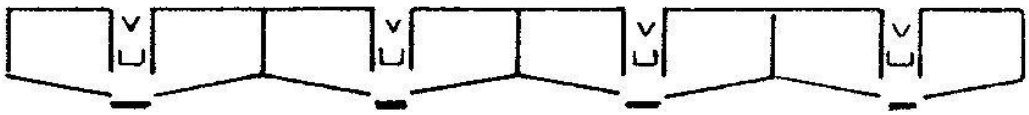
DOUBLE DECK
STAIR STEP



TRIPLE DECK
STAIR STEP



FOUR DECK
REVERSE CAGE



FLAT DECK
AUTOMATIC EGG PICKUP

Based on the type of bird reared

1) Brooder / chick cages
2) Grower cages
3) Layer cages
4) Breeder cages
5) Broiler cages

1) Brooder cage / chick cage

Specifications: Front feeding length : 60 inch
Front & Back height : 12 inch
Depth : 36 inch

No. of chicks (0-8 weeks) accommodated per box : 60

Chick cages are arranged either as single deck or double deck system. The feeders and waterers are arranged on outside. Now-a-days nipple drinker system is followed from day-old itself. Newspaper may be spread over the cage floor for first 7 or 10 days. Feed is usually provided inside the cage during the first week of age.

2) Grower cage

Specifications: Front feeding length : 30 inch
Front & Back height : 15 inch
Depth : 18 inch

No. of growers (9 to 18 weeks) accommodated per box : 10

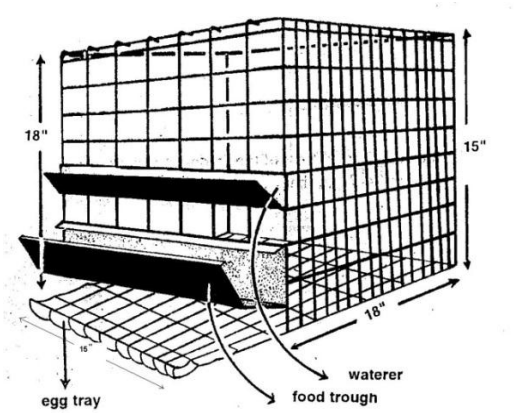
3) Layer cage

Two types of stair-step layer cages are commonly used in open-sided poultry houses

a) Conventional cages

b) Reverse cages (Californian cages)

a) Conventional cages



Specifications for each box: Front feeding length : 15 inch
Front height : 18 inch
Back height : 15 inch
Depth : 18 inch

b) Reverse cages

Specifications for each box: Front feeding length : 18 inch
Front height : 18 inch
Back height : 15 inch
Depth : 15 inch

These cages can hold 3 to 4 birds. They are arranged either in 2-tier or 3-tier. A slope of 1/6 is provided in conventional cages, where as in reverse cages the slope is 1/5.

Elevated cage layer house

The height of the shed is raised by 6-7 feet using concrete pillars. The distance between two pillars is 10 feet. Two feet wide concrete platforms are made over the pillars. When 3 'M' type cages are arranged 4 platforms are needed. In case of 2 'M' and 2 'L' type cages are arranged 3 platforms are needed. When constructing platforms projecting angles or iron rods to be provided to fix the cages. The inter-platform distance is 6-7 feet depending

upon the type of the cages used. The total height of the house is 20-25 feet and the width is 30-33 feet. This type of houses provides sufficient ventilation in tropical countries.

Floor space requirements

Type	Age (in weeks)	Deep-litter (ft^2)	Cages (ft^2)
Egg-type chicken	0-8	0.60	0.20
	9-18	1.25	0.30
	>18	1.50	0.50
Meat-type chicken	0-4	0.30	-
	4-8	0.75	-

BROODING OF CHICKS

Brooding is the art and science of rearing baby chicks. A newly hatched chick does not develop the thermoregulatory mechanism fully and takes about two weeks to develop this mechanism and homeostasis. Therefore, they cannot maintain the body temperature properly for the first few weeks of life. Brooding can be classified into natural and artificial brooding.

Natural brooding

It is done with the help of broody hens after hatching, up to 3 to 4 weeks of age.

Artificial brooding

In artificial brooding large number of baby chicks are reared in the absence of broody hen. Equipments used for brooding are called brooders. Brooder comprises of three elements:

1) Heating source
2) Reflectors
3) Brooder guard

Heating source may be electrical; gases like natural gas, LPG and methane, liquid fuel like kerosene, solid fuel like coal, wood can be used as a heating material.

1) Charcoal pot:

Where electricity is not available, ordinary charcoal pot are used to provide supplementary heat to chicks. These pot are covered with plate / pans to dissipate the heat.

2) Gas brooder:

Natural gas, LPG or methane is connected to heating element which is hanged 3 to 5 feet above the chick to provide heat.

3) Electrical bulb:

One electrical brooder can be used for 300 to 400 chicks at the rate of 1 watt/bird.

4) Infra-red bulbs:

One 250 watts IR bulb can provide brooding for about 150 to 250 chicks.

5) Reflectors:

These reflectors are called Hovers. Flat type hover – These hovers are provided with heating element, heating mechanism and pilot lamp. Canopy type hover – These reflectors are in concave shape consisting of ordinary electrical bulb and thermostat mechanism.

6) Brooder guard / chick guard

They are used to prevent chicks from straying too far away from heat supply until they learn the source of heat. We have to provide brooder guard with a diameter of 5 feet, height of the brooder should not exceed 1.5 feet. For this purpose, we can use materials like cardboard sheet, GI sheet, wire mesh, and mat etc. depending upon the season of brooding. During winter season, brooding is done for 5-6 days. In summer season it is 2-3 weeks.

Receiving of chicks

1) After culling the previous adult birds, clean and disinfect the poultry house.

2) 3 to 4 weeks interval may be provided between 2 batches as down tome.

3) Form a circle of about 5 feet diameter with brooder guard. The 5 feet diameter brooder can hold about 200 to 250 chicks.

4) At the centre of brooder guard, provide any one of heat source like IR bulb, ordinary incandescent bulb or gas brooders.

5) Spread litter material about 2" height in a circle and then spread old newspaper over the litter material.

6) Arrange feeders and waterers alternatively like cart-wheel fashion.

7) Check the brooder for proper temperature 24 hours prior to arrival of chicks.

8) Switch on the brooder heating source several hours before the arrival of the chicks in order to maintain required brooding temperature.

9) Spread ground maize or rava or fine mash / crumble feed on the old newspaper for 1 or 2 days. Afterwards, they will learn to consume feed from the feeder.

10) Provide electrolyte, glucose and vitamins in the drinking water for first 2 to 3 days to overcome stress. After arrival of chicks, moist the beak and leave the chicks under heating source.

11) Maintain a brooder temperature of 90 to 95^0F for the first week and then reduce 5^0F every week until it reaches the room temperature.

12) Watch the behaviour of chicks in order to find out whether temperature provided is correct or less or more. In case of too much temperature, we can reduce the heat by reducing the power of the bulb or we can raise the heating element. In case of too low temperature, we have to supplement more heating source or we can further down the heating element. In case of chill weather or chill breeze, we can provide curtains towards the wind direction.

13) Remove the old newspaper after 3 days and destroy it by burning. If necessary, spread another set of newspaper.

14) Remove brooder guard after 7 to 10 days depending upon the season. While removing the brooder guard, see that the corners of the sheds are rounded in order to avoid mortality due to huddling.

15) Change the feeders and waterers according to age and requirement.

16) 24 hours lighting programme may be adopted during 0-8 weeks of age. One hour darkness may be provided to train the chicks in case of any power failure.

17) Medication programme: First and Second day – Electrolytes and vitamins. 3rd to 7th day – Antibiotics. (Other medications as and when required)

GROWER MANAGEMENT

1) Proper cleaning and disinfection of grower house is needed before introduction of grower birds.

2) Provide sufficient floor space, feeding space and water space.

3) Spread litter material to a height of 4" in case of deep-litter system.

4) Arrange feeder and waterers in the grower house.

5) Change the feeder and waterer according to the need.

6) Adopt restricted feeding programme during growing period to prevent fattening of pullers and early sexual maturity and thus to improved egg production.

7) Follow good litter management to avoid diseases like coccidiosis.

8) Only 12 hours lighting programme is sufficient in case of open-sided houses. No artificial light is needed.

9) Aim for the uniformity of the flock. Sample weights are taken once in a week to find out the average body weight as per the breeder suggestions.

10) Follow strictly the recommended vaccination, medication and other management programs like deworming, debeaking etc for the growers.

Restricted feeding

It is adopted during growing period of layers or breeders. There are two types of restricted feeding.

1) Quantitative feed restriction

In which the amount of feed is reduced below the normal requirement of birds. This can be done on day-to-day basis or skip-a-day programme or skip-two days in a week programme. But this restriction depends on the matching of the flock average body weight with standard body weight provided by the breeder.

2) Qualitative feed restriction

In which the quality of the feed is reduced below the standard requirement of the bird. This can be done by including unconventional feeds or lesser nutrient feed ingredients in place of high protein or high energy diet. Here the quantity of allotment to the bird is not restricted.

During restricted feeding programme, provide more number of feeders and see that all the birds are taking feed simultaneously or otherwise dominant birds will take more amount of feed and the weaker will be subjected feed deprivation and hence the uniformity will be affected.

Advantages of feed restriction during growing period

1) A considerable saving on feed cost because, only 80% of the calculated feed requirement will be offered.

2) They are likely to consume less feed per dozen eggs even during laying period when they are offered *ad libitum* feed.

3) The pullets accumulate less fat and therefore produce more eggs.

4) It is easier to identify weaker birds at an early age during feed restriction. Culling of such birds helps not only saving feed but also promoting layer house survivability because, healthier birds will be moving to laying house.

5) Layers feed-restricted during growing period have been found to produce heavier eggs in longer clutches than those fed *ad libitum.*

Uniformity

At a given age, growing pullets should have average body weight very closer breeder recommendations and at least 70% of the birds' weight within 10% of flock average. Points to be considered for getting uniformity among growing pullets are,

1) Receive chicks of uniform weight.
2) Provide proper feeding, watering and floor space.
3) Change the feeder and waterer according to the age.

4) The height of the feeder and waterer should be at the back height of the bird.
5) Provide proper energy in the diet.
6) Sample weights of the pullets are taken at regular intervals and change the feed accordingly.
7) Provide proper feeding space, so as to all birds consume feed simultaneously.

LAYER MANAGEMENT

Points to be considered during layer management are,

1) Proper cleaning and disinfection of layer house.
2) Provide proper floor space, feeding space and watering space both in deep-litter and cage system
3) In deep-litter system, floor space of 2 sq.ft. per bird and feeding space of 5" per bird are provided
4) In cage system 4 birds/box of 18" x 15" cage floor space is provided (0.46 sq. ft per bird)
5) 6 feet linear feeder can be used for every 30 layers or 18" diameter circular feeder of 4-5 no for every 100 birds.
6) Provide 18" diameter plastic waterer of 2 numbers for every 100 birds.
7) Spread litter material, in case of deep-litter system up to 6" thickness.
8) Arrange feeder and waterer in the poultry house to the height of birds' back.
9) Grill size may be changed according to the size of the birds head.
10) Provide nest box for every 5 layers about a week before the first egg is laid.
11) There are three types of nest: 1) Individual nest – One nest box is sufficient for 4-5 birds. 2) Community nest – This will accommodate 50-60 birds. 3) Trap nest – This will accommodate 1 bird at a time ad is used for academic and breeding studies.
12) The nest should be provided with litter material. The litter material has to be replaced at least once in a week to prevent contamination of the eggs. During night hours the nest should be closed to prevent sitting of birds in the nest.
13) In deep-litter system, the litter material should be racked in the evening daily after egg collection is over. The litter should be treated chemically at least once in a month or whenever necessary in case of wet litter problem to prevent ammonia emission in the house.
14) Provide 16 hours light during laying period.

15) Provide well-balanced layer mash. Phase feeding may be followed for layers according to age, level of production and climatic factors. The average feed consumption during laying period ranges from 100-110 gram.
16) Feed consumption during winter increases and during summer, feed consumption decreases. Summer and winter management should be followed for better flock percentages.
17) Deworming should be done regularly at an interval of 6-8 weeks depending on the worm load, especially when reared under deep-litter system.
18) Collect the eggs at least 5 times a day in deep-litter system and twice a day in cage system.
19) Cull the unproductive layers regularly.
20) Broody hen may be separated and this broodiness may be eliminated by,
    a) Providing diet containing more protein, vitamin and minerals.
    b) Light may be provided through out night.
    c) Birds may be placed in cages
    d) Birds may be subjected to stress
    e) Liver stimulant may be provided.

Vaccination schedule for layers

S.No.	Age	Name of the vaccine	Route of administration
1.	1st day	Marek's Disease vaccine	Subcutaneous injection at Hatchery
2.	7th day	Ranikhet Disease F Strain/Lasota. RD killed.	Eye drop or Nasal drop.0.2 ml S/C.on the same day
3.	14 to 16 days (II week)	Infectious Bursal disease(live) IBD(killed)	Eye drop 0.2 ml. S / C on the same day
4.	21 to 24 th day (III week)	Infectious Bronchitis	Eye drop
5.	30 to 35 days	Ranikhet disease-Lasota strain	Eye drop
6.	42 to 45 days	Infectious Bursal disease (live)	Eye drop
7.	56 to 70 days (8-10 th week)	Ranikhet disease "K" (Mesogenic)	Subcutaneous
8.	84 to 91 days (12 - 13th week)	Fowl Pox vaccine	Wing web puncture or Intramuscular
9.	91 to 98 days (13 to 14th week)	Infectious Bronchitis Vaccine	Through Drinking Water
10.	126 to 133 days	Ranikhet disease K"	Subcutaneous Injection

		(Mesogenic)	
11.	After peak production , every 8 Weeks	Ranikhet Disease Vaccine "Lasota"	Through Drinking Water

Takes:

After week of fowl pox vaccination, an inflamed area is seen at the site of vaccination. It is called as takes.

BROILER MANAGEMENT

Definition

It is a bird of about 8 weeks of age of either sex (straight-run chicks) with an average body weight of 1.5 to 2.0 kg with a flexible breast bone cartilage, pliable and tender meat.

Housing systems

Broilers can be housed on deep-litter, slatted or wire floor or cages. However, cage, slat and wire floor rearing of broilers are not as popular as litter floor rearing, due to problems like breast blisters, leg weakness and higher initial investment.

Rearing systems

The systems of rearing refer to either single batch at a time (all-in all-out system) or multiple batches of brooding and rearing of broilers.

All-in all-out system

Under all-in all-out system, the farm will have only one batch of broilers, belonging to the same hatch at any time. Sufficient chicks will be purchased to accommodate the entire farm capacity, reared and marketed in a single lot.

This system is more hygienic, lesser sub-clinical infections and horizontal spreading of diseases and thereby lesser mortality rate, better growth rate and improved feed efficiency. However, this system is not suitable for large scale farming and needs higher fixed and working capital per bird.

Multiple batch system

The multiple batch system consists of rearing of more than one batch of chicks at any time, with a batch interval of 1 to 4 weeks. Here, the farmer is buying day-old chicks and selling grown up broilers at weekly, fortnightly, once in three weeks or at monthly intervals. The chicks are reared for five to six weeks of age, or until they attain the desired body weight and sold for table.

The ideal system for India at present is having 5 to 6 batches of broilers at any time, with weekly interval between batches and "direct retail marketing". Here, the birds will be marketed daily, from 40 to 54 days of age, based on their body weight, i.e. heavier birds will be sold earlier; giving a chance for weaker birds to have a compensatory growth.

Floor space, feeder space and waterer space

The floor space requirement of broilers varies depending on their body weight at the time of marketing, housing systems, marketing age and ambient temperature. The feeder and waterer space also varies depending on the environmental temperature and health condition of the birds. The following is the approximate floor, feeder and waterer space requirement for broilers.

Age	Floor space/ bird	Feeder space/ bird	Waterer space / bird
Up to 18 days	450 cm^2 (0.5 sq.ft.)	3 cm	1.5 cm
From 19 days to 42 days	1000 cm^2 (1.1 sq.ft.)	6-7 cm	3 cm

Brooding and rearing of broilers

It is similar to that for egg-type chicks.

Cage rearing of broilers

Broilers can also be reared on cages. Broiler cages are similar to that of grower cages. To prevent the breast blisters, the bottom of the cage may be coated with some plastic materials. The floor space requirement in cages is 50% of the floor space needed in deep-litter. The relative advantages and disadvantages of cage rearing of broilers are,

Advantages

1) Higher density of rearing possible
2) Easy to catch the birds at market time and hence reduces bruising
3) No expenditure on litter
4) No incidences of coccidiosis
5) Reduced cannibalism
6) Cleaning and disinfection easier
7) Better growth and feed efficiency

Disadvantages

1) Higher incidences of breast-blisters which increases carcass condemnations
2) Higher incidences of crooked keel
3) Wing bones will be more brittle which will be a disadvantage for the processor also.
4) Birds are not having access to the unidentified growth factors in deep-litter system.
5) Cleaning faecal-trays is not labour friendly.
6) High initial investment on cages.
7) Birds will be uncomfortable especially during summer

Feeding

Generally, three types of feed are offered to broilers from day-old to marketing.

0-2 Weeks – Broiler Pre-starter mash / crumble

3-4 Weeks – Broiler Starter mash

5-6 Weeks – Broiler Finisher mash

Lighting

In open sided broiler houses, the most commonly recommended lighting programme is 24 hours light during brooding period, followed by 23 hours light and one hour darkness per day, until marketing. This one hour darkness is to train the birds to acclimatize for darkness, in case of power failure, which may cause panic and trampling.

Vaccination schedule

S. No.	Age	Vaccine	Route of administration
1	First day	Marek's (at hatchery)	S/C at neck
2	5-7th day	RDV F1	I/O or I/N
3	14th day	IBD Vaccine	I/O or I/N
4	21st day	RDV Lasota	Drinking water
5	28th day	IBD Vaccine (Booster)	Drinking water

NUTRIENT REQUIREMENT OF POULTRY

Poultry being simple stomached species, cannot synthesize most of the nutrients required for them and so the nutrients become dietary essentials chicken has to be

fed adequate quantities of balanced diet for its growth, livability and to exhibit its genetic potential to the full extent. Poultry differ from other species of livestock in body temperature and digestion

Poultry feed is composed of

60-65% Energy giving materials

30-35% of Protein source

2-8% Minerals source.

And above all water. Which is considered as the Principal nutrient should be pure, whole some, free from physical impurities, toxic substances and Bacterial contamination. Water : feed ratio 2.2 : 1. It is variable with age, climate, feed and physiological activity. Excess energy is stored as body fat.

Energy source

Yellow maize, cumbu, cholam, Rice polish.

This energy materials constitute 50% of the ration.

Protein :

Protein is required by the bird for 1. Growth 2. Maintenance of body tissues 3. Production.

Both vegetable and animal proteins are used in the feed.

Vegetable Protein :

Ground nut oil cake, Soyabean oil cake ,Gingelly oil cake, Sunflower oil cake, Mustard oil cake

This is added at 15-25% in the ration. It is always advisable to add two or more for better balancing.

Animal Protein:

Fish meal, meat meal, Blood meal,silk worm pupa meal, out of this fish meal is ideal, This forms -5-10% of the ration.

Fibre

Grain bye products like bran in included from 10-30% for fibre, bowl movement and minerals. if molasses available it can also be added for energy at 5-7% levels, which is a cheap source of energy, reduces dustiness, improves palatability.

Mineral mixture for poultry

Included at 2.3%, it is advisable to use salt free mineral mixture because fish meal available in our country is salted. Calcium supplements such as shell grit, calcite, limestone, etc. are used at 4-5% levels.

Standard requirement of nutrients:

	Chick	**Grower**	**layer mash**	**Broiler starter**	**Broiler Finisher**
Crude Protein % min.	22	16	18	23	20
Crude fibre % max.	7	8	10	6	6
Calcium % min.	1	0.8	2.75	1	1
Total phosphorus % min	0.7	0.6	0.75	0.7	0.7
Metabolizable Energy K/ca/kg.	2800	2600	2700-2750	3000	3100
Lysine (%min.)	1.0	0.7	0.5	1.0	1.0
Methionine (% min)	0.35	0.25	0.25	0.35	0.35

Approximate feed intake by commercial chicken in tropics

	Egg type (grm.)	Broiler (G.)
1st week	10	15
2nd week	15	25
3rd week	20	35
4th week	25	50
5th week	30	65
6th week	35	85
7th week	45	105
8th week	50	120

9-12 weeks – 40

13-16 weeks – 50 Restricted feeding

17-20 weeks – 60

During laying

0% Egg Production	80 gm.	70 %	115
25% Egg Production	95 gm.	80 %	120
50% Egg Production	105gm.	Over 80%	12
60% Egg Production	110 gm.		

Guide lines for feed management

- Purchase quality ingredients / feed. With least moisture and devoid of adulteration.
- If own feed is mixed formula may be modified depending upon the cost and availability of ingredients

- If agricultural farm is attached farm grown grain can be used
- Purchase one month or two months requirements.
- Screen the feed store room against rodents, sparrows other vermins.
- Observe the feed intake by the birds during summer, winter.
- If moisture level exceeds 15% (except molasses) during hot season it may cause growth of fungus and precipitate problems like aflatoxicosis.
- The feeder should not be filled to full to minimize the feed wastage.

FACTORS INFLUENCING THE NUTRIENT REQUIREMENTS

There are many factors which influence the nutrient requirement of poultry, they are

i. Species variation
ii. Breed and strain (genetic factor)
iii. Age of the bird
iv. Purpose of the bird
v. Environmental temperature (season)
vi. Water consumption
vii. Quality of nutrients
viii. Disease conditions
ix. Freshness of feed
x. Intensity of production
xi. Value added products
xii. Nutrient inter relationships

i. Species variation

The vit-B complex requirement is high for Japanese quails and turkey when compared to chicken. If its requirement is high, the protein requirement is also high.

Geese and emu can utilize high fibre and low energy diets as they can synthesize many B complex vitamins.

Ducks can utilize fish scales.

ii. Breed and strain (Genetic factor)

Heavy breeds require less percentage of protein than light breeds.

White leghorn requires more methionine than Australorp.

Lysine and arginine requirement also differ from breed to breed and strain to strain.

In general, there is a specific difference among different breeds and strains for most of the nutrients.

iii. Age of the bird

Poultry during first 21 days of life have higher requirements for some nutrients than during the growing period. The requirement of vitamin-A increases with age. The requirement of riboflavin is similar during growing and breeding period and less during growth and production of table egg. Calcium requirement during egg production is 3-4 times more than during the starting and growing period. However, trace mineral requirement is similar throughout the life.

iv. Purpose of the bird

Breeders must receive a high dietary level of vitamins than table egg producers. The egg must be fortified with vitamins to ensure better hatchability and livability of newly hatched chicks. The three most critical vitamins needed in large amounts in breeder ration are riboflavin (B_2), vit-A and vit-B_{12}. Breeders 2-3 times more of riboflavin, 20% more of vit-A and2 times that of vit-B_{12} than for commercial layers.

v. Environmental temperature (season)

When the environmental temperature increases, the requirement for protein increases and for energy decreases. Since there is reduction in feed intake in warm weather, all nutrients should be increased in proportion to the expected reduced feed intake.

vi. Water consumption

The water consumption of broilers and layers has been found to be a function of feed consumption. Broilers consume 1.5 times more water than feed where as layers consume 2 times more water than feed consumption.

vii. Quality of nutrients

Nutrient requirements depend on qualities like biological value of ingredients and presence of toxins.

viii. Disease condition

Disease condition like FLKS influences the nutrient requirement. To control this, energy content of the diet has to be reduced and protein content has to be increased. Lipotropic factors like choline chloride have to be included in the diet. In coccidiosis, high protein adversely affects the birds, so the protein level can be reduced. In general, most of the diseases cause lower feed consumption and hence

care has to be taken to include the required nutrients depending upon the feed consumption.

ix. Freshness of the feed

Fresh feed is consumed better than stale/old feed. In fresh feed nutrient loss is less.

x. Intensity of production

Birds producing more than 90% require 20% protein

Birds producing 80% requires 18% protein

Birds producing 70% requires 16% protein

xi. Value added products

For production of designer eggs birds need vit-E, selenium, carotenoid pigments and omega 3 fatty acids.

xii. Nutrient inter relationship

Energy – protein inter relationship

Vit-D_3 – Ca – P inter relationship

Choline – methionine – vit-B_{12} interrelationship.

Production Indices in Poultry Farm Business

Layer Farm Production Indices

1. Feed efficiency (FE) / Kg egg mass

It is the ratio between the feed consumed and the egg mass in Kg. This takes into consideration the feed intake, egg weight and egg production. A value of 2.2 or less is advantageous to the farm.

$$\text{FE/kg egg mass} = \frac{\text{Kg. of feed consumed}}{\text{Kg. of egg produced}}$$

2. Feed Efficiency (FE) / dozen eggs

It is the feed consumed per dozen eggs. It is the most commonly used index in layers. The value should be 1.5 or less in a well maintained farm.

$$\text{FE/dozen eggs} = \frac{\text{Kg. of feed consumed for every}}{\text{12 eggs produced}}$$

Broiler Farm Production Indices

Feed efficiency, feed conversion efficiency or Feed conversion ratio: (F.E) or FCR

This is the most important and commonly used efficiency measure in broiler farming. It is calculated by using the formula. A value of less than 2.00 at 7 weeks of age is preferable. Lower the value better will be the efficiency.

$$\text{F.E.} = \frac{\text{Total feed consumed in kg}}{\text{Total final live body weight in kg}}$$

FEED FORMULATION

Composition of broiler ration

Ingredient	Percentage inclusion	
	Starter (0-5 weeks)	Finisher (6-7 weeks)
Yellow Maize	47.00	54.50
Rice polish	8.00	10.00
Soyabean meal	17.50	14.00
Groundnut cake (expeller)	15.00	11.00
Unsalted dried fish	10.00	8.00
Mineral mixture	2.00	2.00
Salt	0.50	0.50
	100.00	100.00

Composition of grower ration

Ingredients	*Percentage*
Yellow Maize	*43*
Groundnut cake (expeller)	*8*
Gingelly oil cake	*5*
Fish meal/dried unsalted fish	*6*
Rice polish	*16*
Wheat bran	*20*
Salt	*0.25*
Mineral mixture	*1.75*
Total	*100.00*

Ration of layer mash for chickens

Ingredients	Percentage
Yellow Maize	47
Soyabean meal	12
Gingelly oil cake	4
Groundnut oil cake (expeller)	6
Rice polish	13
Wheat bran	4
Fish meal/dried unsalted	6

fish	
Dicalcium phosphate	1
Salt	0.25
Mineral mixture	1.75
Shell meal	5
Total	100.00

INCUBATION AND HATCHING

Incubation is the act of bringing an egg to hatching. It may be either natural or artificial.

Natural incubation

In this method, broody hens are made to sit over hatching eggs to hatch out chicks. A hen can sit over hatching eggs to a longer period without feed and water due to some hormonal changes in its body. *Prolactin* is responsible for broodiness in chicken.

Artificial incubation

In this method, mechanical equipments (incubators) are used for hatching purpose. Incubators are placed in a building called hatchery.

DIFFERENT TYPES OF INCUBATORS

I. Based on air circulation:

1) Sill air incubators
2) Forced draft incubators

II. Based on heating source:

1) Hot air incubator
2) Hot water incubator

III. Based on fuel used

1) Gas operated incubator
2) Oil operated incubator
3) Electrically operated incubators.

STEPS INVOLVED IN COMMERCIAL HATCHERY OPERATIONS

Receiving cleaned hatching eggs

⇓

Fumigation of eggs for sanitation

(3x concentration for 20 minutes)

(3x means 60g KMnO4 and 120 ml formalin for 100 cu.ft.)

⇓

Storage in egg holding room

(65^0F temperature and 75% R.H.)

⇓

Pre-incubation warming at Room temperature

(4 to 6 hours)

⇓

Loading eggs in the setter

(For first 18 days)

⇓

Candling of eggs for removing infertile eggs

⇓

Transfer to the hatcher

(Last 3 days)

⇓

Pulling out the chicks

(at 90% dry condition)

⇓

Sexing

(Only for layer chicks) (Vent sexing / feather sexing)

⇓

Grading

⇓

Vaccination

(Marek's vaccine – s/c on neck – 0.25 ml)

⇓

Delivery

(Plastic / cardboard chick box with proper ventilation and comfort)

HATCHERY DESIGN

Location

The chick hatcheries are modern buildings that provide separate rooms for each hatchery operations, but each room has its individual requirements. The hatchery area should be a separate unit with its own entrance and exit, unassociated with those of the poultry farm. The hatchery should be situated at least 1000 ft from poultry houses.

Size of the hatchery

The size of the hatchery is based on the egg capacity of the setters and hatchers, number of eggs that can be set each week and number of chicks hatched each week. Also, necessary space to be allotted for future expansion.

Hatchery design

Hatchery should be constructed in such a manner that the hatching eggs may be taken in one end and the chicks removed at the other. There should not be no backtracking

Hatchery rooms / Structures

Hatchery rooms must be adequate in size. Usually, hatcheries of medium size will hatch chicks twice a week, but large hatcheries will hatch more than two hatches per week. Consequently, hatching schedules will affect the size of some rooms in the hatchery. The Floor space of the various hatchery rooms when there are two hatches per week are,

1) Shower room

To maintain bio-security it is essential that all persons entering the premises shower and change into clean clothing in an adjoining room. It is the only entrance and exit, and the hatchery becomes an isolated unit as far as human beings are concerned.

2) Hatching eggs receiving counter

Employees delivering hatching eggs to the hatchery must not enter the hatchery in the course of their duties. Eggs should be delivered to the hatchery through a specialized door.

3) Fumigation room

The fumigation room should be as small as possible in order to reduce the amount of fumigant used. A fan should be used to circulate the air and exhaust the fumigant.

4) Egg holding (Egg-cooler) room

Egg holding room should be about 8 ft high, insulated, slowly ventilated, with complete air movement, cooled, and humidified. The room must be refrigerated to maintain a temperature of 65 ^{o}F. A forced-air type of refrigeration unit is required in order to keep a uniform temperature throughout the room.

5) Pre-incubation warming room

Here eggs are kept for the purpose of drying the 'sweat' over eggs. It can be achieved by providing sufficient number of ceiling fans in this room.

5) Setter room

Setters (incubators) are kept in this room. The size of the setter room will depend on the make of the equipment used. The exact room size involves the aisle and working area necessary

to move the eggs and chicks in and out of the machines. A minimum space of 3 ft should be allotted between the sides of adjacent setters and from wall to sides or back of the setters. Similarly, minimum of 10 ft should be allotted in front of two setters when kept face-to-face arrangements.

6) Egg candling (Dark) room

This room is usually constructed in between setter and hatcher room for candling eggs. Candling is usually practiced when eggs are transferred from setter to hatcher. Provisions should be made to dark the room to facilitate easy candling.

7) Hatcher room

Hatchers are kept in this room. Here sufficient spaces are to be allowed around hatcher similar to that of setter room. Since it is prone for contamination with fluffs and debris at the time of hatching, the door towards setter room is to be tightly closed unless the necessity arises.

8) Chick-holding room

Next to hatcher room, chick-holding room is present. A relative humidity of 65% is maintained to prevent excessive chick dehydration. Here, the chicks are sex-separated, graded, vaccinated and placed in chick boxes.

9) Wash room

After chicks are boxed, the trays are washed in a tray washer in the washroom. Necessary pipelines with high-pressure pumps are kept in this room.

10) Clean room

After the trays are washed, they are placed in their trolleys and moved to the adjacent clean room.

PRINCIPLES OF INCUBATION

Five major functions are involved in the incubation and hatching of poultry eggs. They are:

- Temperature
- Humidity
- Ventilation (Oxygen and Carbon dioxide level and air velocity)
- Position of eggs
- Turning of eggs

1. Temperature

Temperature is the most critical environmental concern during incubation. Embryo starts developing when the temperature exceeds the Physiological Zero. *Physiological zero* is the temperature below which embryonic growth is arrested and above which it is reinitiated.

The physiological zero for chicken eggs is about 75^{o}F (24^{o}C). The optimum temperature for chicken egg in the setter (for first 18 days) ranges from 99.50 to 99.75 ^{o} F and in the hatcher (last 3 days) is 98.5 ^{o} F.

2. Humidity

Incubation humidity determines the rate of moisture loss from eggs during incubation. In general, the humidity is recorded as relative humidity by comparing the temperatures recorded by wet-bulb and dry-bulb thermometers. Recommended incubation relative humidity for the first 18 days ranging between 55 and 60% (in setter) and for the last 3 days ranging between 65 and 75%.

3. Ventilation

Ventilation is important in incubators and hatchers because fresh oxygenated air is needed for the respiration (oxygen intake and carbon dioxide given off) of developing embryos from egg setting until chick removal from the incubator. Generally the oxygen content of the air in the setter remains at about 21%. For every 1% drop in oxygen there is 5% reduction in hatchability.

Carbon dioxide is a natural by-product of metabolic processes during embryonic development and is released through the shell. The tolerance level of CO_2 for the first 4 days in the setter is 0.3%. CO_2 levels above 0.5% in the setter reduce hatchability and completely lethal at 5.0%.

4. Position of eggs

Artificially incubating eggs should be held with their large ends up. It is natural for the head of the chick to develop in the large end of the egg near the air cell, and for the developing embryo to orient itself so that the head is uppermost. Eggs positioned horizontally will incubate and hatch normally as long as they are turned frequently. Under normal circumstances eggs are set with large end up for the first 18 days (in setter) and in horizontal position for the last 3 days (in hatcher).

5. Turning of eggs

Birds, including chickens and quail, turn their eggs during nest incubation. Nature provides nesting birds with the instinct of turning eggs during incubation. Similarly eggs to be turned at least 8 times a day. Turning of eggs during incubation prevents the developing embryo adhering to the extra-embryonic membranes and reduces the possibility of embryo mortality. In large commercial incubators the eggs are turned automatically each hour i.e. 24 times a day. Most eggs are turned to a position of 45^{o} from vertical, and then reversed in the opposite direction to 45^{o} from vertical.

HANDLING OF HATCHING EGGS AND STORAGE

The quality of hatching egg cannot be improved after lay but one can reduce the loss in hatching egg quality by adopting some standard procedures.

Maintaining egg quality in the breeder house

Use of enough clean, dry and mold-free nesting material can avoid cracked and dirty eggs. Similarly hens to be trained to use nests to lay eggs instead of laying on floors by providing sufficient number of nest boxes well in advance before the laying starts. The frequency of hatching egg collection is very important to maintain quality. Hatching eggs should be collected at least 4 times a day. Hatching eggs are susceptible to contamination and every effort must be made to reduce the microbial load.

Selection of hatching eggs

Eggs that are cracked, dirty or misshapen are usually not used for hatching. Very small or very large eggs do not hatch as well as eggs in the middle size range. Eggs with thin or very porous shells are not likely to hatch well because of excessive losses of water during incubation.

Reducing contamination of hatching eggs

Fumigation with formaldehyde gas is an effective method of sanitizing hatching eggs. Solutions containing quaternary ammonium compounds, formalin, hydrogen peroxide or phenols may be moderately effective in reducing the microbial load over hatching eggs. DO NOT wash eggs unless necessary. If it is necessary to wash eggs always use a damp cloth with water warmer than the egg.

Storage of hatching eggs

In normal hatchery operations, eggs cannot be set immediately after they are laid. Many hatcheries set eggs once or twice in a week. If hatching eggs are stored up to 1 week, hatching eggs should be kept in an egg holding room with the temperature of 65^{o}F and the relative humidity of 75%.

HATCHERY OPERATIONS

The operation of a chick hatchery involves the production of the largest number of quality chicks possible from the hatching eggs received at the hatchery.

The sequences of hatchery operations followed in commercial hatcheries are,

1) Securing hatching eggs
2) Traying hatching eggs
3) Fumigation
9) Pulling the hatch
10) Hardening
11) Grading

4) Cold Storage
5) Warm eggs prior to setting
6) Loading of eggs
7) Candling
8) Transfer of eggs
12) Sexing
13) Vaccination
14) Chick delivery
15) Washing and cleaning
16) Disposal of waste

1) Securing hatching eggs

Hatcheries can get the hatching eggs from any one of the following ways:

1) From own breeder flock
2) From other breeder flocks
3) From other hatcheries

2) Traying hatch eggs

The eggs from the breeder flocks should be transferred to the egg setter trays in the hatchery immediately after receiving.

3) Fumigation of hatching eggs

After traying, eggs are to be kept in the fumigation chamber for fumigation. Fumigating with 3x concentration of formaldehyde for 20 minutes will kill about 97.5 to 99.5% of the organisms on the shells. One 'x' concentration means 20 g of KMnO4 with 40 ml of formalin for 100 cubic feet (3x means 60 g of KmnO4 + 120 ml of formalin for 100 cubic feet).

4) Cold Storage

When the eggs are not set immediately after receiving, they should be kept in cold rook at the temperature of 65 ^{o}F and 75% relative humidity.

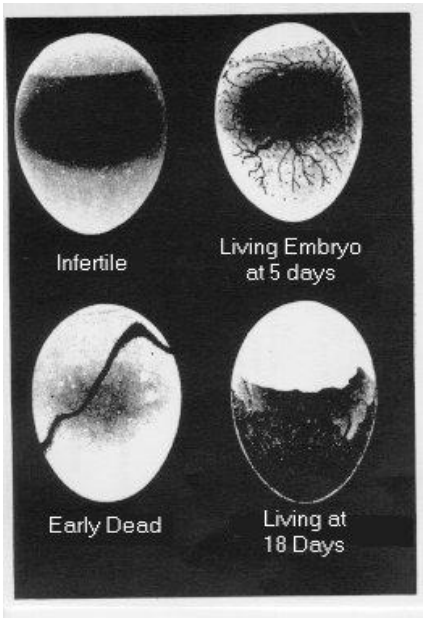
5) Warm eggs prior to setting

Approximately 6 hours prior to placing eggs in the setter they should be moved from the egg-cooler room to normal room temperature. Here, atmospheric air condenses over eggshell and form water droplets over eggshell, which is called as '*Sweating*'.

6) Loading of eggs

Placing of eggs in the setter is called '*Loading of eggs'*. Eggs can be set in the setter either all-in all-out basis or batch basis. Most of the commercial hatcheries are practicing batch system of loading eggs in the setter that will minimize the initial time taken to reach normal incubation temperature in the setter.

7) Candling



Candling is a process in which eggs are kept in front of a light source to find out the defects in eggshell, embryonic development etc. Under commercial operations, candling is done when the eggs are transferred from setter to hatcher (at 19^{th} day for chicken eggs). There are two methods of candling that can be used. The fastest method involves the use of *a table or mass candler*. An entire tray of hatching eggs may be placed on the mass candler and examined with one observation. Candling with a *spot candler or individual candler* is a little slower, but it is more accurate.

8) Transfer of eggs

In modern incubators, eggs are transferred from setter to hatcher at 19th day of incubation (for chicken egg) or when approximately 1% of the eggs are slightly pipped. In general, one-seventh of total incubation period is needed to keep eggs in the hatcher.

9) Pulling the hatch

The process of removing the chicks from the hatcher is often called *pulling the hatch.* Chicks should be removed from the hatcher as soon as all are hatched and about 95% are dry. Excessive drying in the hatcher should be avoided.

10) Hardening the chicks

When the chicks are first placed in the chick boxes they are soft in the abdomen, are not completely fluffed out, and do not stand well. They must be "hardened" by leaving them in the boxes for 4 or 5 hours. Such hardening makes it easier to grade the chicks for quality, and the chicks are more easily vent-sexed.

11) Grading the chicks

No chick below the minimum standard must be allowed to go to a customer. Some standards for quality are, 1) No chick deformities 2) No unhealed navels 3) Above a minimum weight 4) Not dehydrated and 5) Stand up well.

12) Sexing the chicks

Layer type day-old chicks are needed to be sex separated either by vent sexing or auto-sexing (feather sexing). In case of meat-type day-old chicks sexing is not practiced.

13) Vaccination

Most chicks are vaccinated against Marek's disease in hatchery before delivery. Most common method of vaccination of day-old chicks is by subcutaneous method in the nape of the neck.

14) Chick delivery

Baby chicks should reach the customer's farm early in the morning. Not only the weather is cooler during this part of the day but the early arrival allows a full day for close observation of the chicks by the caretaker.

15) Washing and cleaning

Cleaning the hatchery between hatches is of primary importance. The process must be complete. Except for the setters and setter room, every piece of equipment must be thoroughly vacuumed, scrubbed, disinfected and fumigated.

16) Disposal of waste

Hatchery wastes include infertile and non-hatched eggs and dead and cull chicks that should be disposed in such a manner not to create problem to the neighbors and also not to contaminate the hatchery premises.

IMPORTANT INFECTIOUS DISEASES OF POULTRY

Disease is a condition caused by living factors like viruses, bacteria or parasites or non-living factors such as deficiencies, toxins and other physical or chemical agents. Diseases can be classified depending on the causative factors. Diseases cause severe loss in poultry production, not only from death of birds but also due to loss in production. Some of the common poultry diseases and the symptoms of each are described below

I. BACTERIAL DISEASES

1) Coli bacillosis

This is a common bacterial disease caused by *E.coli* organism. It can manifest in different forms such as infection of the yolk sac, colisepticaemia, etc. lethargy and diarrhea will be noticed. Control of infection of the yolk sac depends on sanitary conditions at the hatchery and provision of appropriate warmth during brooding. The practice of efficient water sanitation methods and the use of clean drinkers are advised. Provide adequate ventilation and manage the litter properly.

2) Salmonellosis

This disease caused by Salmonella gallinoarum and it is transmitted vertically from parent flocks and affects baby chicks with a high mortality. Huddling, pasting of vent feathers

and whitish diarrhoea are noticed. Ensure Salmonella-free chicks from the hatchery by using sterilised fish-meal and meat meal. Pelleting of the feed will also be helpful. Add furazolidone to the feed to control Salmonellosis.

3) Infectious Coryza

Infectious Coryza bacterial disease caused by Haemophilus paragallinarum. Symptoms of this disease are swollen faces and swollen eyes, filled with a cheesy substance. Respiratory distress and poor feed intake are also noticeable. Avoid overcrowding and wet litter. Reduce the ammonia level by proper ventilation..

4) Fowl Cholera/Avian Cholera/Avian pasteurellosis /Avian hemorrhagic septicemia

Fowl cholera is a contagious bacterila diseases caused by Pasteurella multocida. Combs and wattles of poultry with this condition become swollen and bluish. High mortality and morbidity are experienced along with a watery nasal discharge and saliva dripping. Pin-point blood spots on the heart and duodenum and white spots on the liver are present. Whitish diarrhoea is noticed. Control rodents and ensure proper management. Provide good ventilation and stress-free conditions. Adult, old and parental flocks (cock) are more suspceptible.

5) Chronic Respiratory Disease

It is caused by micoplasma. Respiratory distress, the sound of rales, sneezing, poor weight gain and nasal discharge are symptoms of the disease. Infected chicks transmit the through feed and water. Avoid overcrowding, improve ventilation, and ensure hatchery sanitation and screening of parent stock. Mixing tiamutin or tylosine in the feed will be helpful.

II. VIRAL DISEASES

These are prevented by carrying out protective vaccinations at recommended age; treatment will not be effective.

1. Newcastle Disease

The highly contagious and lethal form of Newcastle disease is known as viscerotropic(attacks the internal organs) velogenic Newcastle disease, VVND, exotic Newcastle disease, or Asiatic Newcastle disease.

Transmission:

- The Newcastle virus can be transmitted short distances by the airborne route

- Newcastle virus can be passed in the egg, but Newcastle-infected embryos die before hatching. In live birds, the virus is shed in body fluids, secretions, excreta, and breath.

Clinical signs:

- There are three forms of Newcastle disease—mildly pathogenic (lentogenic), moderately pathogenic (mesogenic) and highly pathogenic (velogenic).
- Watery discharge from nostrils, labored breathing (gasping), facial swelling,
- Paralysis, Trembling,
- Twisting of the neck (sign of central nervous system involvement).
- Mortality ranges from 10 to 80 percent depending on the pathogenicity. In adult laying birds, symptoms can include decreased feed and water consumption and a dramatic drop in egg production

Treatment:

- There is no specific treatment for Newcastle disease. Antibiotics can be given for 3–5 days to prevent secondary bacterial infections (particularly *E. coli*). For chicks, increasing the brooding temperature 5°F may help reduce losses.

Infectious Bursal Disease (IBD or Gumboro disease)

Cause

- The disease is caused by a Birnavirus of serotype 1. The virus is very stable and is difficult to eradicate from an infected farm.

Transmission

- IBD virus is very infectious and spreads easily from bird to bird by way of droppings.

Clinical signs

- Clinical IBD occurs usually between 3 and 8 weeks of age depending on maternal antibody levels. Affected birds are listless and depressed, pale, huddling producing watery white diarrhea.
- Usually new cases of IBD have a mortality rate of about 5 to10% to 60%
- Highly pathogenic strains are called “very virulent” IBD (vvIBD) resulting in high mortality.

Diagnosis

- Post mortem lesions; in acute cases the bursa of Fabriciusisenlarged and gelatinous, sometimes even bloody.
- Muscle haemorrhages and pale kidneys can be seen.
- The lack of white blood cells(lymphocytes) results in a reduction in the development of immunity and decreased resistance of the birds to other infections.

3. Marek's disease

Marek's disease

Cause / Transmission:

- A herpes-virus. Highly contagious.
- Spreads by bird-to-bird contact, by contact with infected dust and dander, and by darkling beetles and mealworms that live in the chicken house.
- Morbidity is 10-50% and mortality up to 100%. Mortality in an affected flock typically continues at a moderate or high rate for quite a few weeks.
- Different forms of Marek's Disease:

Cutaneous form (skin form):

- Enlarged reddened feather follicles and white bumps on the skin that form brown crusty scabs.

Neural (nerve form):

- Progressive leg or wing paralysis .
- Twisted neck, weight loss, labored breathing, eye lesions, vision impairment, diarrhea, starvation and death due to an inability to reach feed and water and to trampling by other chickens.

Visceral (internal-organ form), i.e. tumors on visceral organs,- such as heart, ovary, tests, muscles, lungs

Clinical Findings:

- Typically, affected birds show only depression before death, but a transient paralysis syndrome hasbeen associated with Marek's disease;
- Death is usually the result of paralysis.
- Enlarged nerves are one of the most consistent gross lesions in affected birds.

Avian Influenza

Avian influenza (AI) viruses infect domestic poultry as well as pet, zoo, and wild birds. In domestic poultry, AI viruses are typically of low pathogenicity (LP), causing subclinical infections, respiratory disease, or drops in egg production. However, a few AI viruses cause severe systemic infections with high mortality. This highly pathogenic (HP) form of the disease has historically been called fowl plague. In most wild birds, AI viral infections are subclinical except for the recent H5N1 HP AI viruses of Eurasian lineage.

Etiology:

AI viruses are type A orthomyxoviruses characterized by antigenically homologous nucleoprotein and matrix internal proteins, which are identified by serology in agar gel immunodiffusion (AGID) tests. AI viruses are further divided into 16 hemagglutinin (H1-16) and 9 neuraminidase (N1-9) subtypes based on hemagglutinin inhibition and neuraminidase inhibition tests, respectively. Most AI viruses (H1-16 subtypes) are of low pathogenicity, but some of the H5 and H7 AI viruses are highly pathogenic for chickens, turkeys, and related gallinaceous domestic poultry.

Epidemiology and Transmission:

LP AI viruses are distributed worldwide and are recovered frequently from clinically normal shorebirds and migrating waterfowl. Occasionally, LP viruses are recovered from imported pet birds and ratites. The viruses may be present in village or backyard flocks and other birds sold through live-poultry markets, but most commercially raised poultry in developed countries are free of AI viruses. The HP viruses arise from mutation of some H5 and H7 LP viruses and cause devastating epidemics. Stamping-out programs are used to quickly eliminate the HP viruses in developed countries, but some developing countries may use vaccines to control HP viruses.

The incubation period is highly variable and ranges from a few days in individual birds to 2 wk in the flock. Transmission between individual birds is by ingestion or inhalation. Naturally and experimentally, cats and dogs have been infected with one strain of H5N1 Eurasian HP AI virus. Experimental infections occurred after respiratory exposure, ingestion of infected chickens, or contact exposure, but cats were more susceptible than dogs. Potentially, domestic pets could serve as a transmission vector between farms, but the ability of other AI viruses, including other H5N1 strains, to infect pets is unknown. Other mammals that have been experimentally infected include pigs, ferrets, rats, rabbits, guinea pigs, mice, mink, and nonhuman primates. Transmission between farms is the result of breaches in biosecurity practices, principally by movement of infected poultry or contaminated feces and respiratory secretions on fomites such as equipment or clothing. Airborne dissemination between farms may be important over limited distances. Limited spread by wild birds of the Eurasian H5N1 HP AI virus has been suggested but is not typical of other HP AI viruses. Other HP AI and all LP AI have minimal potential to infect dogs and cats.

Clinical Findings and Lesions:

Clinical signs, severity of disease, and mortality rates vary depending on AI virus strain and host species.

Low Pathogenicity Avian Influenza Viruses:

LP AI viruses typically produce respiratory signs such as sneezing, coughing, ocular and nasal discharge, and swollen infraorbital sinuses in poultry. Sinusitis is common in domestic ducks, quail, and turkeys. Lesions in the respiratory tract typically include congestion and inflammation of the trachea and lungs. In layers and breeders, there may be decreased egg production or fertility, ova rupture (evident as yolk in the abdominal cavity) or involution, or mucosal edema and inflammatory exudates in the lumen of the oviduct. A few layer and breeder chickens may have acute renal failure and visceral urate deposition (visceral gout). The morbidity and mortality is usually low unless accompanied by secondary bacterial or viral infections or aggravated by environmental stressors. Sporadic infections by any subtype of LP AI viruses can occur, but H9N2 LP AI is common in poultry in Asia, the Middle East, and North Africa.

High Pathogenicity Avian Influenza Viruses:

Even in the absence of secondary pathogens, HP AI viruses cause severe, systemic disease with high mortality in chickens, turkeys, and other gallinaceous poultry; mortality can be as high as 100% in a few days. In peracute cases, clinical signs or gross lesions may be lacking before death. However, in acute cases, lesions may include cyanosis and edema of the head, comb, wattle, and snood (turkey); edema and red discoloration of the shanks and feet due to subcutaneous ecchymotic hemorrhages; petechial hemorrhages on visceral organs and in muscles; and blood-tinged oral and nasal discharges. In severely affected birds, greenish diarrhea is common. Birds that survive the peracute infection may develop CNS involvement evident as torticollis, opisthotonos, incoordination, paralysis, and drooping wings. The location and severity of microscopic lesions are highly variable and may consist of edema, hemorrhage, and necrosis in parenchymal cells of multiple visceral organs, skin, and CNS.

Diagnosis:

LP and HP AI viruses can be readily isolated from oropharyngeal and cloacal swabs, and HP AI viruses from many internal organs. AI viruses grow well in the allantoic sac of 9- to 11-day-old embryonating chicken eggs, and they agglutinate RBCs. The hemagglutination is not inhibited by Newcastle disease or other paramyxoviral antiserum. AI viruses are identified by demonstrating the presence of 1) influenza A matrix or nucleoprotein antigens using AGID or other suitable immunoassays, or 2) viral RNA using an influenza A–specific reverse transcriptase-PCR test.

LP AI must be differentiated from other respiratory diseases or causes of decreased egg production, including 1) acute to subacute viral diseases such as infectious bronchitis,

infectious laryngotracheitis, low virulent Newcastle disease, and infections by other paramyxoviruses; 2) bacterial diseases such as mycoplasmosis, infectious coryza, ornithobacteriosis, turkey coryza, and the respiratory form of fowl cholera; and 3) fungal diseases such as aspergillosis. HP AI must be differentiated from other causes of high mortality such as virulent Newcastle disease, peracute septicemic fowl cholera, heat exhaustion, and severe water deprivation.

Prevention and Treatment:

Vaccines can prevent clinical signs and death. Furthermore, viral replication and shedding from the respiratory and GI tracts may be reduced in vaccinated birds. Specific protection is achieved through autogenous virus vaccines or from vaccines prepared from AI virus of the same hemagglutinin subtype. Antibodies to the homologous viral neuraminidase antigens may provide partial protection. Currently, only inactivated whole AI virus, recombinant fowlpox-AI-H5, and recombinant herpesvirus-turkey-AI-H5 (rHVT-AI-H5) vaccines are licensed in the USA. The use of any licensed AI vaccine requires approval of the State Veterinarian. In addition, use of H5 and H7 AI vaccines in the USA requires USDA approval. Treating LP-affected flocks with broad-spectrum antibiotics to control secondary pathogens and increasing house temperatures may reduce morbidity and mortality. Treatment with antiviral compounds is not approved or recommended. Suspected outbreaks should be reported to appropriate regulatory authorities.

Zoonotic Risk:

AI viruses exhibit host adaptation to birds. Human infections have occurred, usually as isolated, rare, individual cases. Most human cases have originated from infection with Eurasian H5N1 HP AI virus and, most recently, Chinese H7N9 LP AI virus. The total accumulated human cases of H5N1 HP AI virus in Asia and Africa from 2003–2013 is 648, of which 384 were fatal. The primary risk factor for human infection has been direct contact with live or dead infected poultry, but a few cases have resulted from consumption of uncooked poultry products, defeathering of infected wild swans, or close contact with human cases. Respiratory infection has been the most frequent presentation of human H5N1 cases. For H7N9 LP AI, total accumulated human cases in China for 2013 is 137, of which 45 were fatal. Most cases had exposure risk to live-poultry markets. Conjunctivitis was the most frequent symptom in human cases of H7N7 HP AI virus infection in the Netherlands during 2003, with 89 confirmed cases and 1 fatality. Other HP AI viruses and all LP AI viruses have produced very rare or no human infections.

III. FUNGAL DISEASES

1. Brooder pneumonia

Young chicks of 1-2 weeks of age are affected. A high mortality rate of 10-50 percent is noted with symptoms of gasping, respiratory distress and strong thirst. Yellowish white pin-point filaments on lungs are present. Avoid using mouldy, fungus infested litter material. Use thoroughly cleaned drinkers and feeders.

2. Mycotoxicosis

Caused by mycotoxins produced by fungi in feed ingredients. The symptoms are reduced feed intake, poor growth rate or egg production, break down of immunity and vaccination failures are the consequences. Avoid using mouldy feed ingredients, use toxin binders like zoelites, aluminium silicate or charcoal in the feed. Add liver tonics and withdraw fungal infested feed.

GENERAL DISEASE CONTROL MEASURES:

1. Buy chicks from reputed disease from companies.
2. Adhere strictly to vaccination programme.
3. Keep the houses dry cool and well ventilated.
4. Rodent and fly proof.
5. Sanitation of litter, feeder and waterer.
6. Follow medication schedules.
7. P.M.disposal through burial or inceration of the waste and dead.
8. Earmark areas for specific age group.
9. Screening visitors.10. Foot baths with sanitizens.
11. All in all out system.12. Personnel sanitation.

VACCINATION

It is correctly pointed out that “Prevention is better than Cure ".Many viral diseases cannot be treated but can be controlled only by preventive vaccination.

1) Routes of administration

Administration through 1) Drinking Water: It is time and labour saving method. Vaccine is reconstituted in cold drinking water along with skim milk powder at the rate of 4 gram per litre of water and used immediately. For example RDV Lasota Vaccine.

2) Intra ocular -Intra nasal instillation.

The vaccine is reconstituted in normal Saline solution. One drop of diluted vaccine is applied to the nostrils or eye. Ex: RDVF. The virus particle gets absorbed in the mucous membrane and immunization is obtained.

3) Spray Vaccine

Spray or mist spraying is done in chick boxes in the hatcheries. Small drops of equal size is sprayed and the boxes are allowed for 10 to 15 minutes for drying. Drying should not be done near light or by hot air.

4) Wing Web puncture method

Fowl pox vaccine is reconstituted in 50% glycerol saline and taken in forked needle and vaccination is done by puncturing through wing web. Care should be taken that muscle, nerve and blood vessels are damaged by the vaccination.

5) Feather Follicle Method

Pigeon pox vaccine is reconstituted with 50% glycerol saline. After plucking of the feather follicles in the internal thigh region, with the help of a glass rod, the vaccine is smeared and rubbed. After 5 days the birds have to be examined for "Takes" . Takes are cellular reaction taking place in the nervous system.

6) Subcutaneous injection

Ranikhet K vaccine is reconstituted with normal saline and 0.5ml is given between two layers of skin in the wing web region without damaging nerves, blood vessels and muscle. The vaccine should be protected in ice box during vaccination and should be used within one hour

Debeaking

It is recommended to debeak the layer birds to control feather pecking and cannibalism, bullying. It is carried out by means of electrocautery. It is important to remove only one third of the upper beak taking care to avoiding tongue. It is usually practiced at the age of 10-14 days and repeated at the age of 14-16 weeks. Debeaking should never be done with penknife.

Overcrowding, inadequate space for standing/ feeding/ watering and resting, starvation, external wounds, less fiber diet and deficiency of vitamins and minerals may pre dispose the birds to cannibalism.

Procedure

The bird has to be restrained by holding wings and legs by left hand and the tongue is pushed backwards by opening mouth and introducing index finger so that the tongue is not cut The upper beak is cut to $1/3^{rd}$ of it's length and the lower beak is slightly trimmed.. After debeaking vitamins and antibiotics are to be administered for 3-5days to avoid stress and secondary infections.

Deworming

Is the process of removing worms from digestive tract of the birds. The tapeworm passes segments and is consumed by intermediate host (earthworm, cockroach) where intermediate stage get developed and passed out, which inturn is consumed by host. The eggs or ova of round worms are passed in the droppings which is picked by other birds directly or indirectly with the help of chance carriers (personnel, insects, flies, ants, etc). Sometimes wild birds such as crows may serve as source of infestation.

Birds show the following symptoms when they are infested with worms

- Dullness- weakness, emaciation
- Paralysis-due to toxins produced from worms
- Enteritis-diarrhea with blood
- Anemia-due to sucking of blood by worms.
- Drop in egg production.

If infestation is on a larger scale there may be mechanical block of intestinal lumen and some times rupture occurs. This may also result due to intestinal stasis of food particles.

Deworming is practiced at intervals of 45days in layer birds and also before RDVK vaccination. Deworming is done against tape worms only on absolute necessity.

Delicing

Is the process of removing of external parasites like ticks, mites and fleas which suck the blood from the bird .The following symptoms are observed during external parasitic infestation: itching, restlesness, external wounds, loss of body weight, weakness, anemia and drop in production.

Procedure

The dipping of the birds in sunny days has to be done with the following chemicals to remove the external parasites.

Sumathion or malathion -5ml in 100ml of water. The bird has to be immersed in the chemical solution avoiding eye and mouth. The dipped one has to be dried in a separate enclosure. The feeders, waterers and building should be sprayed with this chemical solution to remove the external parasites. After dipping, to relieve stress to the bird vitamin A, B complex has to be given to improve the health of the birds.