

Class Note

Fundamentals of Animal Science (ASC121)

**(Faculty of Agriculture, Far-Western
University)**

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Course Code: ASC121

Course Title: Fundamentals of Animal Science

Credit Hours: 3 (2+1)

Full Marks: 75

Theory: 50

Practical: 25

Objective

Upon the completion of the course, the students will be able to understand the domestication of farm animals and avian species; they will also be able to know general husbandry practices of farm animals and avian species.

Syllabus

Introduction, Importance, scope and problems and statistics of livestock and their products in Nepal. Vocabulary of livestock production and common terms of managerial practices in livestock and poultry farming. Zoological classification of ruminants, non-ruminants and poultry. Breed characteristic of indigenous and exotic breeds of cattle, buffalo, sheep, goat, pig and poultry recognized in Nepal. Housings requirements- types, floor space, feeder and waterer and construction materials for farm animals. Care and management of different categories of ruminants and non-ruminants. Identification, ageing, body weight estimation of farm animals. Handling and restraining of farm animals. Marketing and transportation of farm animals and poultry birds. Feed classification and common feedstuffs and their nutrient content in Nepal. Use of NPN compounds, feed supplements and feed additives. Signs of health and disease and factors affecting health of farm animals. Care and Management of sick farm animals and birds. Climate change and its impact on livestock farming methods of mitigation. Summer and winter stress in farm animals and its amelioration practices. Waste disposal/utilization, sanitation and biosecurity. Different types of farm records and its importance.

Course Breakdown

SN	Topic	Lectures
1	Introduction, Importance, scope and problems and statistics of livestock and their products in Nepal	1
2	Vocabulary of livestock production and common terms of managerial practices in livestock and poultry farming	1
3	Zoological classification of ruminants, non-ruminants and poultry	1
4	Different between ruminant and non-ruminant animals	1
5	Breed characteristic of indigenous and exotic breeds of cattle common in Nepal - Khaila, Achami, Lulu, yak, Chauri, Red Sindhi, Sahiwal, Hariyana, Holstein Friesian, Jersey, Brown Swiss	1
6	Breed characteristic of indigenous and Indian breeds of buffaloes common in Nepal- Lime, Parkote, Gaddi, Murrah, Nili-Ravi, Jaffrabadi, Surti, Meshana	1
7	Breed characteristic of indigenous and exotic breeds of goat common in Nepal- Tarai, Khari, Sinhal, Chyangra, Jamunapari, Barbari, Black Bengal, Beetal, Boer, Sannen	1
8	Breed characteristic of indigenous and exotic breeds of sheep common in Nepal- Lampuchhre, Kage, Barawal, Bhyanglung, Merino, Rambouillet, Polworth	1
9	Breed characteristic of indigenous and exotic breeds of poultry recognized in Nepal- Sakini, Ghatikhuile, Pwakhulte, Brahma, New Hampshire, Rod Island Red, Plymouth Rock, Leghorn, Austrolop	1
10	Breed characteristic of indigenous and exotic breeds of poultry common	1

	in Nepal- Giriraj; Broilers breeds: Cobb 500, Rose, Hubbard, Indian River; Layer Breeds: Hyline, Lohman, H&N Nick Brown	
11	Breed characteristic of indigenous and exotic breeds pigs common in Nepal- Chwache, Bampudke, Hurrah, Pakhribas Black, Hampshire, Landrace, Yorkshire, Duroc, Tamworth	1
12	Housings requirements- types, floor space, feeder and waterer and construction materials for cattle, Buffalo, Sheep and goat	1
13	Housings requirements- types, floor space, feeder and waterer and construction materials for pig and poultry	1
14	Care and management of ruminant animals- calf/kid, heifer/grower, dry/suckling animals	1
15	Care and management of ruminant animals- pregnant, milking, breeding male and draft animals	1
16	Care and management of non-ruminants- Piglets, gilt, sows and breeding boar	1
17	Care and management of non-ruminants- chick, pullet, layers, broiler	1
18	Identification and ageing of farm animals	1
19	Body weight estimation, castration, dehorning/disbudding of farm animals	1
20	Handling and restraining of farm animals	1
21	Marketing and transportation of farm animals and poultry birds	1
22	Feed classification and common feedstuffs and their nutrient content in Nepal	1
23	Use of NPN compounds, feed supplements and feed additives	1
24	Signs of health and disease and factors affecting health of farm animals	2
25	Care and Management of sick farm animals and birds	1
26	Climate change and its impact on livestock farming methods of mitigation	1
27	Summer and winter stress in farm animals and its amelioration practices	1
28	Waste disposal/utilization, sanitation and biosecurity	1
29	Different types of farm records and its importance	1
30	Total	30

Practical

SN	Topics	Lectures
1	Visit to a cattle/buffalo, sheep/goat farm and observe the housing systems, breeds and records in commercial farm	1
2	Visit to a poultry shed and piggery and observe the housing systems, breeds and records in commercial farm	1
3	Identification of external body parts of ruminant animals	1
4	Identification of external body parts of non-ruminant and poultry birds	1
5	Identification of different equipment used in animal science laboratory	1
6	Study of body temperature, respiration rate and pulse rate	1
7	Casting and restraining of farm animals	1
8	Estimation of body weight by body measurement of cattle and buffalo	1
9	Estimation of body weight by body measurement of sheep, goat and pig	1
10	Age determination by dental formula in ruminant animals	1
11	Different methods of animal identification/numbering	1
12	Cleaning and disinfection of the barn/shed	1
13	Identification of feed ingredients and fodder	1

14	Grooming of dairy cow and practice on hand milking	1
15	Study different types of farm records and their uses	1
	Total	15

References

1. A Text Book of Animal Husbandry, GC Banerjee, Oxford and IBH
2. Livestock and Poultry Production, Singh and Moore
3. Livestock Production Management, Sastry *et al*, Kalyani Publisher
4. Principles and Practices of Dairy Farm Management, Jagdish Prasad, Kalyani Publisher
5. Poultry Husbandry, Jull, M. A, Tata McGrawhill Publisher
6. Outlines of Dairy Technology, Sukumar De, Oxford and IBH Publisher
7. Poultry Production and Management, Prasad and Niraj, Kalyani Publisher
8. Principle and Practice of Livestock Production and Management, Dhital, B. and Adhikari, M.

Lecture 1: INTRODUCTION, IMPORTANCE, SCOPE AND STATISTICS

Introduction:

Animal science/ husbandry is the branch of agriculture concerned with animals that are raised for milk, meat, fiber, eggs or others products. It includes day to day care, selective breeding and the raising of livestock. Further, it can be define as the science as well as an art of management including scientific housing, breeding, feeding, health care of common domestic animals aiming for maximum returns.

Livestock plays a very important role of agriculture production system of Nepal. The share of agricultural sector is about 27.6 percent in the national Gross Domestic Products (GDP). Livestock sector contributes about 13 and 27 percent to GDP and AGDP respectively, *Statistical Information on Nepalese Agriculture (2076/77)*.

Agricultural production alone is not sufficient to meet the food requirement of the people. This is especially true in the mountain and hill of the country. Livestock and crop farming are dependent on each other in Nepal because of the small land holding by majority of farmers. Mixed crop animal farming system has been traditionally practiced. In most cases, these integrated farming systems have been proved to be sustainable and efficient. Livestock act as insurance against crop failure. Livestock are dependent primarily on crop by-products and take care by surplus family labor, which may not have immediate opportunity cost in the village. Sustainability of agricultural production has received greater emphasis during recent years because of continuing increase in human population accompanied by degradation of the global environment and the need to increase food production from limited cultivable land.

Livestock constitutes an integral part of agriculture in the developing countries, because of their motive power which is essential for agricultural operations in a small land holding situation. Livestock supplies milk, meat, wool, skin, manure and other important commodities for the betterment of humankind. Nearly 20 percent household cash is earned through livestock. Often neglected in calculations of livestock's contribution is the value of draught power. Livestock are the only source of plowing, crop harvesting and transportation in the hill and mountain thus by contributing millions of rupees input.

STATISTICS:

Table 1: Livestock Population (In Number)

CATEGORY	2074/75(2017/18)	2075/76 (2018/19)	2076/77 (2019/20)
CATTLE	7,376,306	7,385,035	7,458,885
BUFFALOES	5,277,819	5,308,664	5,257,591
SHEEP	800,749	798,889	806,079
GOAT	11,647,319	12,283,752	12,811,953
PIGS	1,435,369	1,488,338	1,519,593
FOWL	72,245,732	75,709,330	82,598,879
DUCK	404,670	416,400	427,226
MILKING COW	1,039,538	1,078,775	1,166,156
MILKING BUFFALOES	1,535,948	1,560,584	1,635,492
LAYING HEN	12,517,558	12,526,979	12,927,842
LAYING DUCK	186,912	190,747	191,701

Source: Statistical Information on Nepalese Agriculture 2076/77 (2019/20)

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Table 2: Livestock Production

PRODUCTS	2074/75(2017/18)	2075/76(2018/19)	2076/77(2019/20)
MILK PRODUCTION (Mt.)	2,092,403	2,168,434	2,301,000
- COW MILK	754,126	795,530	920,400
- BUFF. MILK	1,338,277	1,372,905	1,380,600
MEAT (NET) PRODUCTION (Mt.)	346,179	357,082	552,156
- BUFF	185,180	188,574	189,517
- MUTTON (Sheep)	2,754	2,763	2,735
- CHEVON	70,802	73,914	75,023
- PORK	28,214	28,579	29,493
- CHICKEN	60,122	62,899	255,001
- DUCK	280	353	387
EGG PRODUCTION ('000 Number)	1,512,265	1,549,689	1,620,000
- HEN EGG	1,498,024	1,534,680	1,604,526
- DUCK EGG	14,241	15,009	15,474
WOOL PRODUCTION(Kg.)	594,639	589,738	592,687

Source: Statistical Information on Nepalese Agriculture 2076/77 (2019/20)

TABLE 3: LIVESTOCK POPULATION BY PROVINCE DISTRICTS , 2076/77 (2019/20)

PROVINCE	CATTLE	BUFFALOES	SHEEP	GOAT	PIGS	FOWL	DUCK
Province 1	1,981,755	850,013	62,783	2,501,263	630,818	9,523,433	104,058
Province 2	1,247,124	826,851	6,452	1,677,368	111,322	6,343,895	95,098
Bagmati	1,064,349	894,926	93,639	2,351,217	172,277	44,841,957	85,110
Gandaki	481,865	677,490	100,782	1,533,629	162,153	6,785,607	42,712
Lumbini	1,162,262	1,185,676	145,027	2,329,047	355,246	10,232,588	75,900
Karnali	504,184	302,893	306,790	1,435,690	43,469	1,917,888	9,964
Sudurpashchim	1,017,346	519,742	90,606	983,739	44,308	2,953,511	14,384
Nepal Total	7,458,885	5,257,591	806,079	12,811,953	1,519,593	82,598,879	427,226

Source: Statistical Information on Nepalese Agriculture 2076/77 (2019/20)

IMPORTANCE AND SCOPE OF LIVESTOCK FARMING

Livestock can be utilized for agricultural development through following ways to make this enterprise sustainable:

1. Food Source

Milk

Milk is regarded as the best food materials among all class people. Milk contains protein fat, solid not fat (SNF), vitamins, minerals and other elements required for the good health of people. The annual milk production from cattle and buffalo in the year 2019/2020 was 2,301,000 MT, where buffalo contributed 1,380,600 MT. and cow contributed 920,400 MT.

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Meat

Meat and meat products are important sources of nourishment for mankind. Meat contains high quality absorbable protein as compare to vegetable source, and it contains all the essential amino acids. Meat is good source of fat which provides heat and energy. Meat is rich in phosphorous, iron and copper consider as important minerals. It is also good source of vit. "B" and fat soluble vitamin "A". The annual meat production for the year 2009/10 was recorded as:

BUFF	189,517 Mt
MUTTON (Sheep)	2,735Mt
CHEVON	75,023 Mt
PORK	29,493 Mt
CHICKEN	255,001 Mt
DUCK	387 Mt

Total : 552,156 Mt

Source: Statistical Information on Nepalese Agriculture 2076/77 (2019/20)

Eggs:

The number egg production is expected to grow by 2.98 percent. So, the total number of eggs produced in the country is estimated at 648 million of which 635 million eggs (98%) is from fowl and the rest 13 million eggs (2%) is from ducks. The more eggs are produced from hill than terai and the least produced from the mountain. In egg production, percentage share of different ecological belts are as below.

Belts	Hen	Duck	Total
Mountain %	6	1	6
Hills %	51	15	50
Terai %	43	84	44

2. Source of Draft Power

Animals are the largest contributors of farm power in Nepal. Plowing the field, transportation of goods, threshing different kinds of crops, crushing sugarcane, pulling the cart are the major activities performed by animals. It is estimated that 2 millions bullocks are used for draft purpose in Nepal. In the mid-western hills, sheep and goats are used to carry load. One individual animal can carry up to 6-8 kg load.

3. Source of Fertilizer and Energy

Dung, urine and other by-products of animals are converted into valuable manure by composting. Farm yard manure (FYM) is a good source of nitrogen and mineral for crop production. An adult cattle/buffalo produces about 11 tons (30 Kg per day) of Fresh manure per year. In Nepal cattle/buffalo manure is an important source of fertilizer. In the hill and mountain region, it is the only source of fertilizer that has been used in the crop field. Considerable quantity of cattle/buffalo dung is also converted into cakes which are used for fuel purpose for cooking and other domestic works. Fresh dung is also use to produce Gas for cooking and light.

4. Source of Livestock Feed

A large amount of slaughter house by-product and significant quantity of carcass and carcass wastes are - being processed for manufacturing of meat meal, blood meal, bone meal etc. for farmanimals and poultry.

5. Source of Woolen Products

Sheep is mostly reared for wool and meat. Hand knot carpets made out of wool are exported in Germany and other European countries. Winter wear like Radi, Pakhi is widely used by mountainpeople which are made out of sheep and Chyangra wool. The sheep population in Nepal is 806,079 (2019-2020) in number and the wool production is about 600 tons annually.(0.75Kg/animal).

Scope

- Requirement of meat, milk and their products is higher than the production. Requirement and need of milk/head/day recommended by Indian council of medical research is 283 ml/day. Daily meat requirement is 45 g. /person/day.
- Climate and geographical factor is favorable to keep different livestock species in different parts of the country. Such as Yak, Nak can be raised successfully in the Himalayan range.
- Reduce the cost of inorganic fertilizer by using manure.
- Barren, unfertile land can be utilized for housing and construction in which agricultural farming is not possible.
- Utilization of animal by products such as meat meal, bone meal, blood meal etc.
- Utilization of agricultural by products such as straw, bran, oil cakes etc.
- Utilization of Industrial waste like molasses, grain godown sweeping etc.
- Scope to export animals and animal product to foreign countries there by earning of foreign currency. (eg. Import of live animals from India alone Rs. 26,8300,000/- where as export is Rs. 41 million only).
- Employment opportunity. All the family members may be employed partially or full time.

Problems/Constraints

1. Economic condition: Majority of Nepalese farmers have small size land holding. Because of the limited space for grazing and the production of pasture, livestock farming becomes difficult. Farmers cannot afford the expensive feed for their animals. High yielding improved breeds of livestock are also expensive to purchase and also they need special care to grow better.

2. Technical knows how: Poor knowledge about breeding, feeding, management and lack of facilities hinders the farmer to get profit out of this business. Well trained technician are also not available in remote areas.

3. Market facility: Market is always becoming a problem to the livestock producers. Marketing of livestock and their products are not systematized. Middleman always gets opportunity to take benefit by paying fewer efforts. Livestock product is being sold at lower price from the farm gate which is later sold in higher price to the consumer by middle man. Animal product processing facilities are also very poor in this country.

4. Credit facility: Development of a credit system started in the 1950's. Although the system has undergone an impressive development it only supplies about 25% of the total credit to rural sector. About 90% of the credit to the agricultural sector is supplied by the Agriculture Development Bank of Nepal.

5. Religious constraints: Muslims and majority of Hindu community do not eat pork and they do not keep swine to their farm. Improved breed of different species needs extra care and balanced diet to grow better, while indigenous breed can be taken care by providing with a comparatively simple agricultural by products and locally available grasses.

6. Shortage of grass land: Forests are being overgrazed. Cutting of the forest is becoming a continuous phenomenon to fulfill the need of fire wood. Looping of fodder leaves, seasonal burning of the forest caused fast destruction of the grazing area. The lack of fodder hinders the overall growth and production of livestock output and cause poor health condition of the animals. It is estimated that the food deficit is up to 40 per cent.

7. Control of disease and Parasites: Preventive measures for disease and parasites are rarely taken into consideration. Farmer runs after the technician only when animals are severely affected by disease. Because of the no availability of the appropriate medicine in the rural areas, animal cannot be treated properly. Only those farmers who live near the city area may take advantage of trained technician and receives correct medicine for their animals.

8. Insurance Scheme: Livestock insurance scheme have recently introduced and therefore it is not widely known and applied. The national Insurance Company established in 1988/89, was basically for the large commercial farms. Only a few farmer have make use of this scheme which has limited geographical coverage.

9. Support System: The activities of various organization like Government, NGO's and INGO's are responsible for agricultural development but their role are not seen effective. These organizations are more interested to support farming system rather they are interested in other activities.

10. Costly feed: Almost two third of total running cost is feed cost. It is one major area of investment. Almost of our Nepalese farmers are not able to afford costly feed which they required for their animals.

11. Poor transportation facility: In our country most of transportation is road transportation and there is no any railways treks. Proper designed animals' transportation is not available in our country.

12. Others: Low genetic potential for production (low productive breed), adverse effect of climate (temperature, solar radiation, humidity, precipitation, etc)

Lecture 2: Vocabulary of Livestock Production and Common Terms of Managerial Practices in Livestock and Poultry Farming

Terminology Used in Livestock Production

Breed: It is groups of animal that are result of breeding & selection have certain distinguishable characteristics. / A group of animals related by decent & which are similar in most of the characters like general appearance, size, colors, horns it is called breed. / A breed may be defined as a cluster domestic animal of a species where individuals are homogenous in certain distinguishable characteristics which differ from one to other group of animals.

Species: A group of individuals which have certain common characteristics that distinguish them from other group of individuals with in species the individuals are fertile when in different Species they are not.

Sire: The male parent of the calf.

Dam: Female parent of the calf.

Calf: Young one of cattle or buffalo below the age of six months is called calf.

Heifer: The younger female of cattle above age of six months to first calving.

Cow: The adult female of cattle from the date of first calving is called cow.

Bull: It is unsaturated of, cattle used for breeding or covering the cows.

Bullock: It is the castrated male of cattle used for work.

Service: The process in which mature male covers the female i.e. in heat with the object to deposit spermatozoa in the female genital tract is called service.

Conception: The successful union of male and female gametes & implantation of zygote is known as conception.

Gestation: It is the condition of female when developing foetus in present in the uterus.

Gestation period: The period from the date of service (actual conception) to the date of parturition is termed as parturition period or pregnancy period. This period varies according to species of animals e.g. in cows 279-283 days, in buffalo 310 days, sheep 148-152 days, goat 150-152 days

Parturition: The act of giving birth to young one is called parturition.

Lactation period: The period after parturition in which the animal produces milk.

Dry period: The period after lactation in which the animal does not produce milk.

Calving interval: The period between two successive calving is calving interval.

Average: It is the sum of production divided by No. of animals.

West Average: It is the average daily milk yield of a cow in lactation.

$$\text{W.A} = \frac{\text{Total milk yield. of a lactation (kg or Lt).}}{\text{Lactation period (days)}}$$

Herd Average: It is average daily milk yield of milking animal in a herd.

$$\text{H. A.} = \frac{\text{Total milk yield of a day}}{\text{No. of milking animals}}$$

Overall Average: It is average daily milk yield of the animal in the period of calving interval.

$$\text{O.A.} = \frac{\text{Total milk yield of lactation}}{\text{Calving interval (days)}}$$

Environment: The sum of all external influences to which an individual is exposed.

Genotype: The complete genetic makeup of an individual- or its combination of genes it possesses which influences its characters. Several different genotypes may.

Phenotype: The external appearance or some other overall or measurable characteristics of an individual or it is the actual expression of the character as determined by his genes & the environment in which he has lived.

Half sib: Half-brothers or half sisters

Full sib: Full brothers or full sister.

Heredity: The occurrence of genetic factors derived from each of its parent in an Individual. **Heritability:** The percentage of variation in individual characteristics between related individuals which is due to true genetic difference.

Repeatability: It is the expression of the same trait at different times in the life of the same individual or the tendency of an individual to repeat its performance e.g. dairy cow in successive lactation.

Allele: One or two or more alternative forms of a gene. Alleles are those genes which may appear at same locus in homologous chromosome.

Gene: It is the unit of inheritance, which is transmitted in gametes or reproductive cells. It is the physical basis of heredity.

Dominance: A gene is said to be dominant when its characteristic effect is expressed in the heterozygote as well as homozygote, i.e. $Aa < AA$. Ability of gene to cover in block out expression of its allele or genes that have observable effect when present in any one member of a chromosome pair.

Recessive: Which genes have number observable effect unless present in both members of a chromosome pair.

Lethal: (Deadly) A gene or genes that cause death of an individual which are possessed by them during pregnancy or at the time of birth.

Prepotency: The ability of certain individuals to stamp or impress their characters upon their offspring or prepotency is the ability to transmit characteristics to offspring to a marked degree.

Fertility: Ability of an animal to produce large number of living young.

Fecundity: It is the potential capacity of the female to produce functional ova regardless of what happens to them after they are produced.

Sterility: Inability to produce any offspring.

Free martin: A sterile heifer born twin with the male.

Cryptorchids: The failure of testes to descend fully into the scrotum. If one testis is in scrotal position the male is usually fertile but if both are retained in the abdominal cavity sterility usually reported.

Atavism: The reappearance of a character after it has not appeared for one or more generation.

Buller: Cow always in estrus condition.

Teaser: A vasectomized (castrated) bull used to detect the heat or estrus of female (cow).

Herd: It is a group of cattle or buffalo.

Flock: It is the group of sheep, goat or poultry birds.

Steer: The male cattle that is castrated when he is still a calf or before the development of sexualmaturity is called steer.

Veal: The meat of calf below the age of 3 months.

Beef: The meat of- cattle past calf stage.

Pork: The meat of swine.

Mutton: The meat of sheep & goat.

Chevon: The meat of goat

Wedder: A castrated sheep is called wedder.

Prolificacy: Ability to produce large number of offspring. The animal is said to be prolific.

Variation: The degree to which individuals differ with respect to the extent of development of expression of characteristics.

Puberty: It is the period when reproductive tract & secondary sex organs/characteristics start to acquire their mature form. Before onset of puberty the reproductive tract of heifer grows proportionately to body growth but beginning at about 6 months age growth rate of these organs is much greater than body growth. At about 10 months of age the rapid growth phase of the reproductive tract ceases & this signifies the end of puberty. Heifer reaches puberty earlier than bull.

Inheritance: Transmission of genetic factors from parent to offspring's.

Germplasm: The material on the basis of heredity taken collectively. The sum of gene constitution of an individual.

Foetus: A term for developing young one during last quarter of pregnancy.

S. No.	Species	Female	Male	Young one	Act of parturition	Average Life Yr
1	Cattle	Cow	Bull	Calf	Calving	16-20
2	Local Buffalo	Buffalo	Buffalo Bull	Calf	Calving	16-20
3	Goat	Doc	Buck	Kid	Kidding	12-15
4	Sheep	Ewe	Ram	Lamb	Lambing	12-15
5	Swine	Sow	Bore	Litter	Furrowing	8-10
6	Horse	Mare	Stallion	Foal	Whelping	18-22
7	Ass	Jennet	Jack	Foal	Whelping	14-18
8	Fowl	Hen	Cock	Chick	Hatching	3-4
9	Duck	Duck	Drake	Chick (Duckling)	Hatching	4-5

Terms Used in Poultry Production

Hen: A matured female chicken generally above 20 weeks of age.

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Cock: A matured male chicken above 20 weeks of age.

Pullet: A young female chicken from 9 to 20 weeks of age.

Cockerel: A young male chicken from 5-8 months of age.

Chick: A young male or female fowl below 5 weeks of age.

Day-old chick: Hatched out chick is called as day-old-chick up to 24 hours.

Grower: A young chick of 9th week to 20th week of age of either sex.

Brood: A group of chicks of same age raised in one batch is called as a brood.

Brooding: The process of rearing the young chick from day old stage to 4 to 6 weeks of age during which, heat is to be provided to keep them warm.

Brooder: A device for providing artificial heat to the chicks.

Broiler: They are the hybrid chicks having rapid growth and attaining about 1.5 kg weight during the period of 6 weeks of age. Sold for table purpose within 8 to 10 weeks period. They possess a very tender and delicious meat.

Capon: It is a young male birds of which testicle are removed.

Layer: An egg laying female chicken up to one year after starting the laying of eggs.

Broody: A hen which has stopped laying eggs temporarily.

Clutch: The number of eggs laid by a bird on consecutive days. A clutch of 3-4 eggs is preferred.

Moulting: The process of shedding old feathers and growth of new feather in their place moulting normally occurs once in a year.

Culling: Removal of unwanted bird from the flock is known as culling e.g. old non-laying birds, sick birds and masculine hens are removed.

Pause: It is the period between two clutches in which eggs are not laid by hen.

Hen-day-production: This is arrived by dividing total eggs laid in the season by the average number of birds in the house.

Hen-housed-average: This is arrived at by dividing the total number of eggs laid in the season by the number of birds originally placed in the house. No deductions are made for any losses from the flocks.

Terminology Related to Different Species

Cattle:

Bull: Adult male	Cow: Adult female
Calf: New born one	Heifer: Young female
Calving: Act of giving birth	Bullock or steer: Castrated male

Buffalo:

Buffalo Bull: Adult male	Buffalo Cow: Adult female
Buffalo bull calf: Young male	Heifer: Young female
Calf: New born one	Herd: Group of animals

Sheep:

Ram: Mature male	Ewe: Mature female
Lamb: Young Sheep	Flock: Group of animals
Lambing: Act of parturition	Gimmer: A yearling ewes

Goat:

Buck: Male goat	Doe: Female goat
Kid: Offspring	Kidding: Process of giving birth

Pig:

Boar: Adult male	Sow: Adult female
Gilt: Young female	Boarling: Young male
Piglet: New born one	Hog: Castrated male
Coupling: Act of mating	Farrowing: Act of parturition
Grunt: Sound of Pig	Pork: Meat of Pig/hog
Runt: Piglet, usually last to be farrowed	

Poultry:

Capon: Castrated male chicken	Layer: Chicken raised for egg production
Broiler: Chicken raised for meat production	Pullet: Chicken which is ready to lay eggs.
Cockerel: The young mature male which has not started breeding.	Moulting: The process of shading-off feather.
Cock: Matured male chicken	Hen: Matured female.

Duck:

Duck: A mature female
Duckling: Newly hatched or immature baby duck
Drake: A mature male duck

Pigeon:

Squab: Immature baby pigeon, used for meat.
Coop: A pan or small room perch made for pigeons.

Turkey:

Fryer/Roaster: A young immature turkey of either sex.
Yearling Hen Turkey: Matured female turkey usually less than 15 months of age.
Yearling Tom Turkey: Matured male turkey usually less than 15 months of age.

Horse:

Stallion: A mature male.
Mare: A mature female.
Filly: A young female up to 3 years of age.
Foal: A young of either sex under 1 year of age.
Mule: Hybrid of jack (donkey stallion) and mare.
Hinny: Cross between jannet (female donkey) and stallion

Lecture 3: Zoological classification (Taxonomy) of ruminants, non-ruminants and poultry

Taxonomy is the science of classification applied to living things and it involves their identification, naming and arrangement. The system of classification was devised by Linnaeus (1707-1798), a Swedish botanist and accepted universally as a means of references. In this classification system each individual type of organism is called a species.

Species or organism having close similarities are arranged in a group known as genus. Genus with similar characteristics are put in the same family. Similar family into orders and order into classes. Two Latin names are used to describe each organism. The generic name refers to its genus and is written with a capital letter and the specific names indicate its species and are written with a small letter. For example *Ovis aries* refers to species known as *aries* belonging to the genus *Ovis* in case of sheep.

All domestic animals are mammals (class Mammalia of sub phylum vertebrata). Mammals Possess mammary glands or udders

Are viviparous (Give birth to fully developed young ones) and

Nurse their offspring with milk produced in their mammary gland.

Zoologically, some animals are more closely related than others. Animal that are closed to each other in the zoological classification (Taxonomy) possesses more or less similar physical and physiological characters and require similar modes of feeding of feeding and management.

In general the taxonomic system is constructed into seven major hierarchal divisions.

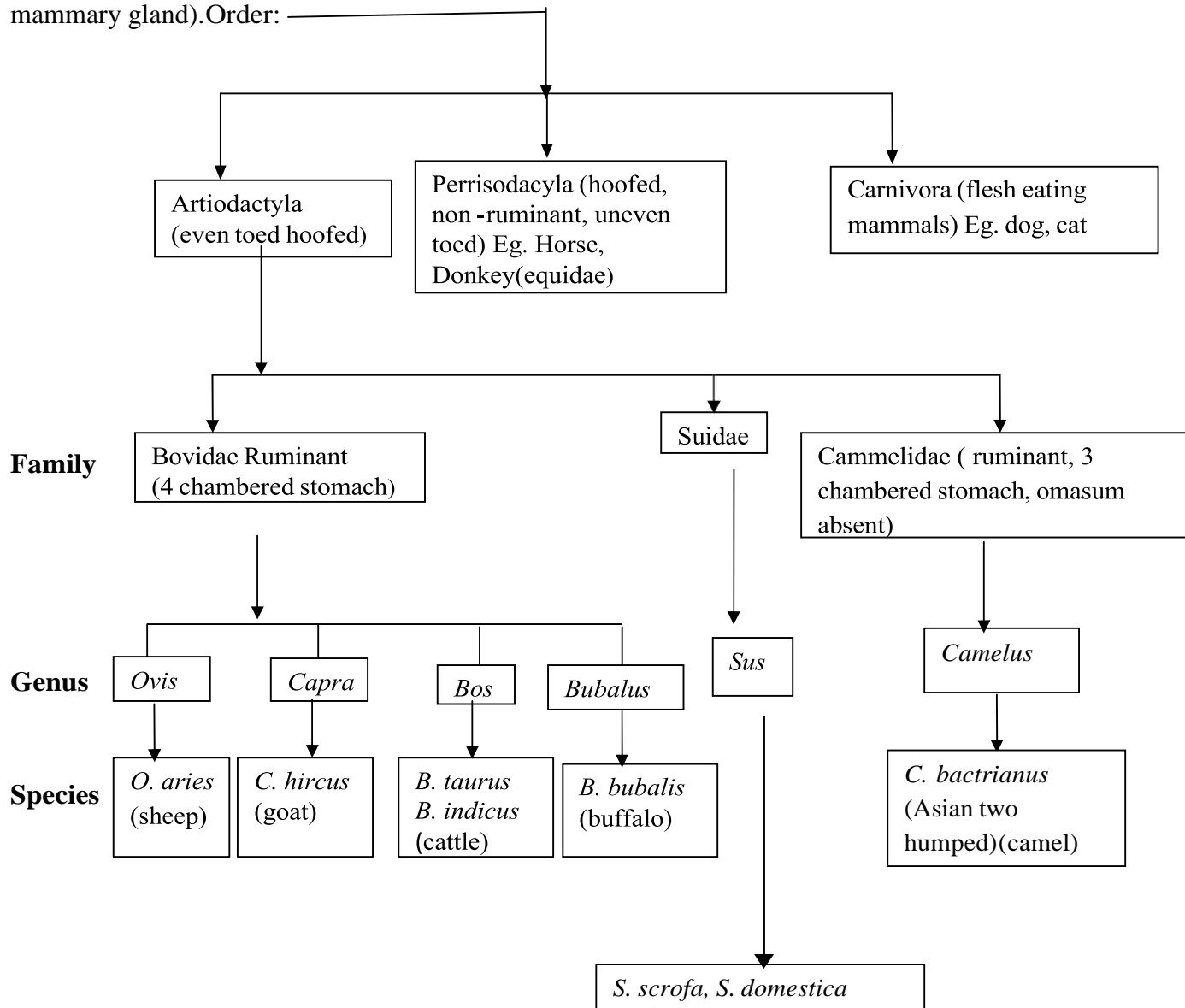
1. Kingdom 2. Phylum 3. Class 4. Order 5. Family 6. Genus 7. Species

Taxonomy (Zoological classification) of common domestic animals)

Kingdom: Animal

Phylum: Chordata (having backbone)

Class: Mammalia (animals producing young ones and suckle mammary gland). Order: —————



Taxonomy (Zoological classification) of Bird)

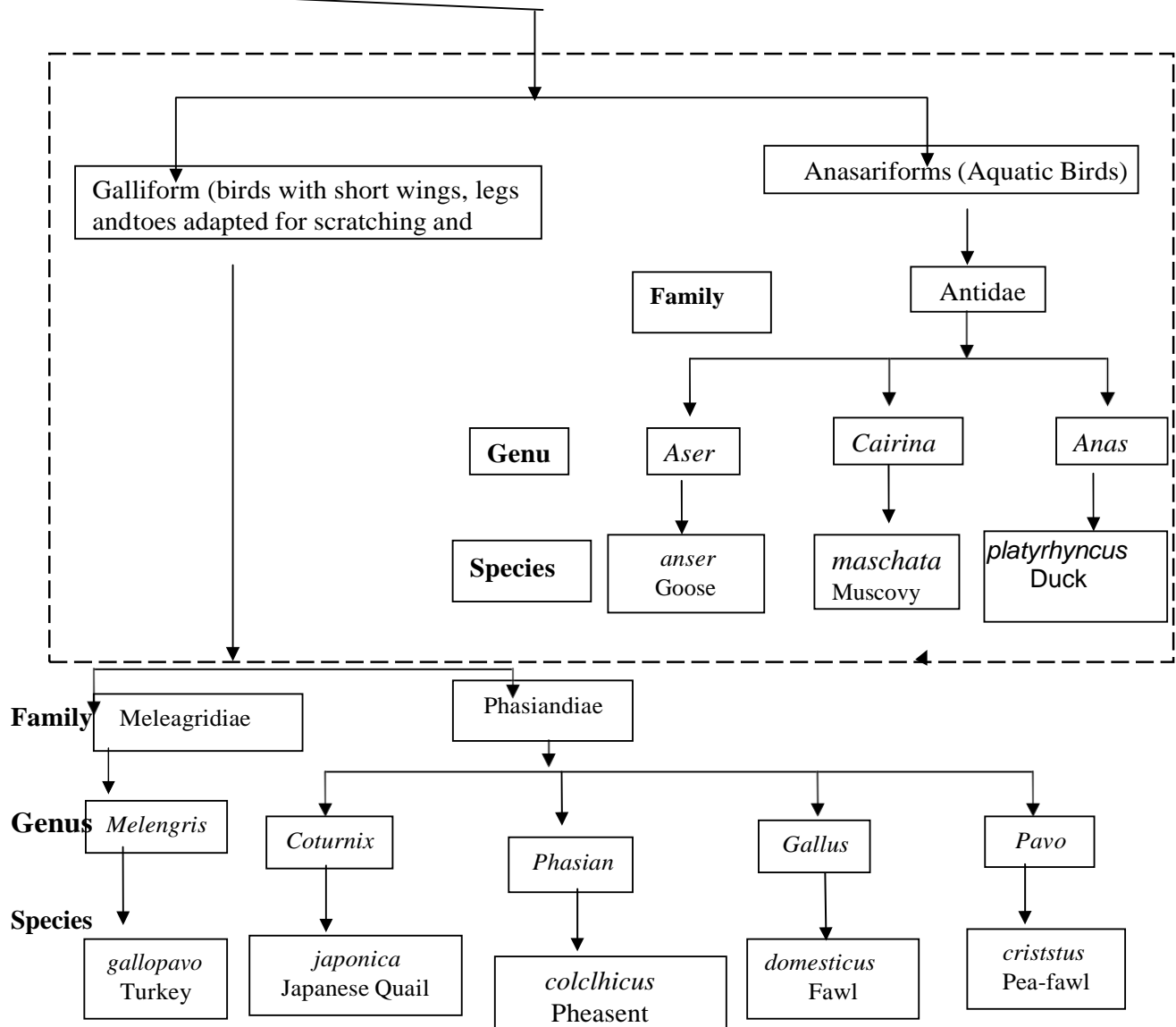
Kingdom: Animal

Phylum: Chordita

Class: Aves

Sub-Class: Neornithes (Without teeth)

Order:

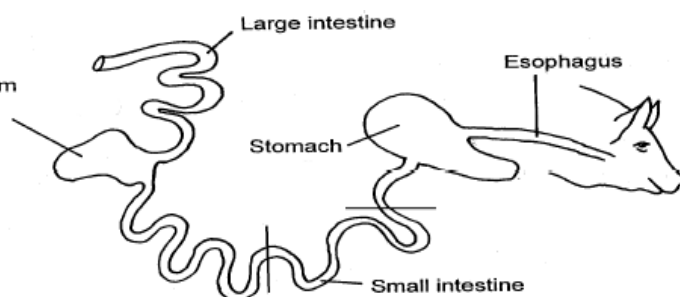


Lecture 4: Difference between Ruminants and Non-Ruminants

The Digestive Organs of Non-Ruminants

Non ruminants are animals having simple stomach. Animals belong to this group are pig, horse, dog and cat. The digestive organs of non-ruminants are much simpler they differ from ruminants, mainly in the structure of stomach and large intestine.

The general descriptions of other parts are more or less similar to the ruminants. The digestive system can be divided as:



A. Alimentary Canal

The alimentary canal of all the animals is made up of mouth, pharynx, esophagus, stomach, small intestine, large intestine, rectum and anus. It is just like a long muscular tube whose main functions are prehension, mastication, digestion, absorption of food and elimination of the undigested materials.

Mouth

It is an organ of prehension, mastication and insalivation. It includes teeth, tongue, hard and soft palate and salivary glands are situated in the mouth. The cavity inside the mouth is known as mouth cavity or buccal cavity.

Pharynx

This is the connecting tube between the mouth and esophagus. Its main function is to provide passage of food from mouth to esophagus.

Esophagus

This is a long, thin tubular structure running from pharynx to stomach. The main function of this organ is to provide passage of food from mouth to stomach.

Stomach

The stomach is located just behind the left side of the diaphragm. The stomach is subdivided into (1) Cardia (entrance) (2) Fundus (3) Pylorus (termination). Unlike ruminants, non-ruminants have small stomach. Thus an adult pig of 200 kg and a horse of 450 kg have a total stomach capacity of only about 10 litres. Ruminant stomach occupies about 80 % of the digestive tract. Where as, stomach capacity makes up about 30% in pigs and less than 10% in horse.

Function:

- Storage of food, mixing of this food with gastric secretion.
- Slow emptying of the food from the stomach into the small intestine at a rate of suitable for proper digestion and absorption by the small intestine.

Small Intestine:

The small intestine divided into three parts (1) Duodenum (2) Jejunum and, (3) Ileum.

Duodenum: is the first part of small intestine. The function is (1) To receive the food from stomach (2) Ducts from the pancreas and liver enter the first part of the duodenum and pour

their digestive juices. (3) Almost all nutrients of foods are digested in the duodenum. The main organ in the monogastric animal for the absorption of dietary. Nutrients is the small intestine.

Jejunum: The function is:

- To receive the food from duodenum.
- Secretion of intestinal juice
- Digestion of food constituents and to prepare food for absorption.
- Storage of food for some time.
- Absorption of nutrients from the walls of the intestine and their transportation into the blood stream.

Ileum: is the last part of the intestine joins large intestine. The function is:

- Digestion of partially digested food, absorption and transportation into the blood stream.
- Transport of food residue to large intestine.

Large Intestine:

It consists of the caecum, which is a blind sac and the colon which terminates at the rectum and anus. Microbial digestion of food is brought about by the action of bacteria and protozoa (MO), which are of special significance in ruminant digestion.

In simple stomach animal microbial activity occurs in large intestine i.e. Caeca. Even the pig with its short and simple tract, harbours sufficient MO in its large intestine to digest more than half of the cellulose in concentrated foods. The horse has a simple stomach but greatly enlarged caecum and colon, and these organs are inhabited by MO with activities very similar to those of rumen MO. Part of the ingested food (such as soluble CHO and proteins) should be digested by the host animals through own enzymes and absorbed from the small intestine, where as more resistant components (such as cellulose and hemicellulose) are digested by caecal fermentation.

The caecal fermentation yields volatile fatty acids which are subsequently absorbed and metabolized. Digestion of protein in the hind gut is not fully understood. but it has been claimed that microbial protein synthesized in the caecum are subsequently hydrolyzed and absorbed from that organ as amino acid. Among all the farm animals, horses and rabbits have the largest and most complex large intestine. In these species caecum (15%) and colon (47%) together make up about 62% of the capacity of alimentary canal. In pig and man which have simpler large intestine, it constitute only about 37% and 17% respectively of the total capacity.

Function:

- To receive and store the food and feed residue coming from small intestine.
- Absorption of those nutrients (water and minerals) which escaped absorption from the wall of small intestine takes place in the rectum.
- Temporary storage of feed residue in the rectum.
- Rejection of the residue through anus.

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B. Accessory Digestive Organs:

It includes (1) Teeth (2) Tongue (3) Salivary gland (4) Liver glands (5) Pancreas.

Function

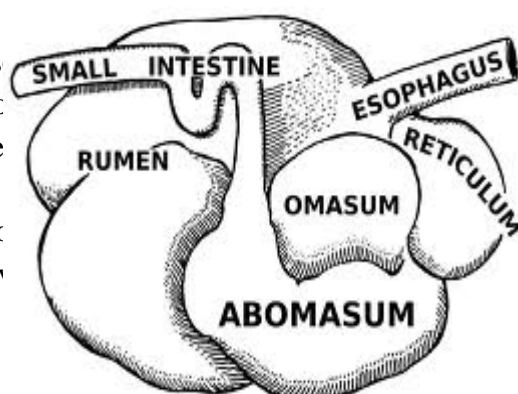
- Lip, tongue and teeth helps in prehension, or carrying the food to mouth.
- Entered food is masticated or chewed by teeth.
- Tongue contains taste buds which help to feel the taste of food when it comes to the mouth.
- Mouth contains salivary glands (Parotid, sub lingual, and Mandibular) situated behind the walls of the buccal cavity.
- Salivary glands add saliva to the mouth which clean the mouth, lubricates the food, help in dilution and digestion of food materials.
- Liver gland is the largest gland in the body and an important organ of metabolism. The bile which is conveyed to the duodenum by the ducts of the liver and within the liver, to the duodenum and the gall bladder. All domestic animals except the horse have this gall bladder. Bile plays an important role in digestion and absorption of lipids (fat).
- Pancreas is a dual organ secretes pancreatic juice into the duodenum. The exocrine part of the pancreas secretes the digestive enzymes and sodium bicarbonate, while the endocrine part secretes hormones insulin and glucagons, which enter directly into the blood stream.

Digestion in Ruminants

Animals consume feed for the maintenance of the body, growth and reproduction. The feed has to be digested and absorbed to be utilized to perform these body functions. In the process of digestion, complex proteins, carbohydrates and fats present in the feed combination with water breaks down into simpler compounds that can be absorbed easily. The digestion takes place through the action of enzymes in the alimentary canal.

The Digestive Organs of Ruminants

Animals such as the cow, sheep and goat which possess a distinct stomach from mono-gastric animals, such as man, pig, etc. The stomach of ruminants differs in structure and function from the stomach of mono-gastric animals. The ruminating buffaloes feed by renewing the cud every 40 seconds, taking 50 seconds to do so on the average 50 times per minute and renew the cud every 50 seconds.



The digestive tract is composed of the mouth, esophagus, stomach, and small intestine. The stomach of ruminants is divided into the (1) Rumen (2) Reticulum (3) Omasum and (4) Abomasum.

Mouth and Esophagus:

This is the location where food enters the system and is chewed. Salivary glands which are found in the mouth secrete a copious amount of saliva to help dilute the ingested food. Saliva

(pH 8.2) helps to reduce acidity in the rumen and also aids in the transfer of food from the mouth to the rumen via the esophagus.

Rumen and Reticulum:

The rumen microorganisms digest about 70 percent of the digestible dry matter, converting them into soluble and gaseous compounds. These are absorbed directly through the rumen wall into blood. Thus only about 30% of the ingested food passes through the rumen further in the alimentary canal. The rumeno-reticular contraction causes the passage of the fine food particles to the omasum.

Rumen and reticulum are discussed together since each compartment is separated by low partition. Eighty percent of the capacity of the stomach is related to the reticulo-rumen. The contents of the reticulum and rumen intermix freely. The wall of reticulum is honey comb in structure and is often the location where the hard object will be found. The rumen is the main fermentation vat where billions of micro organisms attack and break down the relatively indigestible feed components of the ruminant diet. The rumen MO plays three important functions; 1. They degrade complex polysaccharides to volatile fatty acids which supply the energy need of animal. 2. They synthesize all the essential amino acids which are required by the host animal. 3. The microbes also synthesize the vitamin B-complex required by the host animal.

Omasum:

After fermentation in the reticulum and rumen the feed passes through the omasum. While the function of the omasum is not entirely clear it acts as a filter pump to sort liquid and fine food particles. Coarse fiber particles are not allowed to enter the omasum. Also the omasum may be the site for absorption of water, minerals and nitrogen.

Abomasum:

The abomasum is the true stomach and the only site on the digestive tract that produces gastric juices (hydrochloric acids and enzymes, pepsin and rennin). In the new born calves, abomasum makes up about 80% of the total stomach volume, while in the mature cow it amounts to only 10 percent. Ingesta only remain here for 1-2 hrs.

Small Intestine:

The small intestine is the location where a further breakdown of the food materials occurs. Secretions of enzymes, pancreatic juice and bile aid in further digestion of the ingesta. This generally occurs in the upper portion of the intestine. The end products of the digestion process are absorbed in the lower section of small intestine.

Large Intestine:

The large intestine is the place where residues of the ingested feeds are deposited. Feed residues do undergo some fermentation. There are absorption sites for water, minerals and nitrogen.

S.N	Ruminant	Non-ruminant
1	Animals that chew and regurgitate their food more than once and digest it multiple times in different stomachs.	Animals that digest food in one stomach.
2	They have four chambered stomach. (rumen, reticulum, omasum and abomasum)	They have simple stomach with single compartment i.e monogastric (abomasum)
3	Most of the digestion and absorption takes place in stomach.	Most of the digestion and absorption on small intestine.
4	They are herbivores	They are Omnivores or Carnivores
5	Do not produce enzyme for protein digestion.	Produce enzymes for protein digestion.
6	Have no or two blunt canines.	Have four sharp canines.
7	Liver is large.	Liver is smaller.
8	Take a longer time to digest plant material.	Take comparatively less time for their digestion.
9	Digest all plant carbohydrates including cellulose	Do not digest cellulose
10	Horns are present.	Generally horns are absent.
11	Saliva contain N, P and Na	Absent of N,P and Na in saliva.
12	They can survive by roughages.	They cannot survive by green roughages and need concentrate to survive by concentrates.
13	Essential amino acid and protein is not supplied in feed	Essential amino acid and protein is required in feed, supplied in feed.
14	Manufacture essentials protein and Vitamins themselves.	Unable to manufacture, should be supply externally.
15	Microbial digestion of cellulose occurs in rumen and reticulum.	Microbial digestion of other carbohydrate in caecum and colon.
16	Eg: cattle, sheep, goat, buffalo, deer, etc	Eg: human, rabbit, dog, swine, etc

Lecture 5: Breed characteristic of indigenous and exotic breeds of cattle common in Nepal

Cattle

Indigenous cattle are maintained as a major source of draft power and manure. Religious and legal protection provided to cattle has resulted in indiscriminate increase in aged and unproductive cattle population. Milk production is about 15-180 lit per lactation extending over a period of 180-200 days. The low productivity is attributed to poor genotype, inadequate nutrition and exposition to a range of diseases and parasites. The calf mortality is high. Cows are mostly mated by natural services.

Indigenous breeds:

In midhill the black hill zebu is the predominant breed. Body weight is 200-250 kg of adult bull and 120-160 kg of adult cow. In the far west region of achhame, another distinct zebu breed named achhame has been described. This breed is smaller than black hill zebu cattle. Adult bull is 150 kg and adult cow is 100-120 kg. In the high Himalaya region a small number of humpless cattle are found named Lulu (western region) and kirko (eastern region). Adult is weighting 200-250 kg and adult cow is weighting 100-150 kg.

a. Kirko or Lulu:

These are mountain cattle found in Himalayan region of Nepal especially in Mustang, Manang, Dolpa, Mugu, Humla district. They are small and humpless cattle. They are mostly black in color and sometimes with brown or white. Body coat is hairy and horns are small and projected upward and outward. Bulls and cows are mostly used for cross breeding with Naks and Yaks respectively for producing chauri. They are very hardy and can go up in the alpine pasture for grazing along with Yaks and Naks. Cows yield 1.5 lit of milk per day and contain 5-6 % fat. Lactation period ranges from 6-10 mths. The live weight of lulu bull ranges from 200-250 kg.



b. Siri:

It is a famous draft breed of eastern hills of Nepal. The animals have thick hair coat. The cows are fairly good milker averaging 1360 liters per lactation if they are selected and stall fed. The bullocks are suitable for mountains region.



c. Terai:

It is hump type cattle. Multipurpose use: milk, manure and draft. Females are poor milk yielders and males are good animals for transport and ploughing the land. Coat color is white or red but mixed color is also available. It



is located in Terai region of Nepal and suitable for tropical and subtropical region. The age at first calving is 53 months with calving interval of 1.12 years. Milkyield is 1-1.5 liters a day.

d. Pahadi:

This is a zebu cattle raised in mid hills of country ranging from 1000-2000 meter above the sea level. Although, the breed is low milk yielder the cattle are resistant to most disease and external parasites. Body color varied from black to white i.e. black, brown, grey, white, spotted black and white. Males are good draft animals. The age at first calving is 50 mths and calving interval is 1.45 yrs.



d. Achhami:

This breed is also one of the smallest breed of hill cattle raised from 1400-2000 masl. Locally it is called Naumuthe Gai. It is resistant to most animal disease and external parasites. Body color varies from black to white. Its temperament varies from docile to wild. This breed first calves at the age of 42 mths and yields 0.5-1.25 liters milk a day. The achhamese population is decreasing year after year. This breed is localized in Achham district of western Nepal. This breed is in a line of extinction if appropriate measures are not adopted in time.



Khaila

Found in Doti and Dhadeldhura district of Far western region of Nepal. Have straight udder with elongated teats. Black and white is dominant body coat colour. Have multipurpose use such as milk, draft and manure. Adopt in adverse condition and in poor grazing condition. Calving interval is about 18 months. **Avg. milk yield: 2.5 L/Day**



e. Yak/Nak

The hairy animals are alpine cattle raised from 3000-5000 masle and are found in Nepal, Tibet, Mongolia, Russia and India. Male is called Yak, female is Nak and crossbred with zebu cattle called chauri. These animals are popular for producing milk, milk products and meat in the mountains and castrated males are used for transportation and draft power in the remote mountains.

Its temperament varies from docile to wild. The milk production varied from 220 kg to 720 kg in the lactation period of 150-180 days. Total yak/nak population is estimated to be around 8500 in the Himalayan belt of the country. Their calving interval is about 1.5 years. Body color varies from black to



white. Ear is straight. Tail having swampy switch. The dark black-brown coat is dense, wooly although the color is variable in domestic yaks. The shoulders are high and humped, with a broad, drooping head. The short legs have broad hooves and large dewclaws as an adaptation to mountainous environments. The horns are found in both sexes, though those of the females are considerably smaller and shorter. They grow up to 51 cm / 20 inches long in females, and 95 cm / 38 inches in males. The curved horns grow out from the sides of the head and curve upwards.

Nak (female) crosses with Zebu cattle (male) gives dimjo jhophyo (male which is sterile) and dimjo jom (female). Yak (male) crosses with Zebu cattle (female) gives urang Jhophyo (male which is sterile) and Urang jom (female).

Exotic breeds:

a. Hariyana:

Hariyan is an Indian dual type of cattle characterized for both milk production and drought purpose. Bullocks are powerful animals and good for transport and rapid ploughing. Cows are fairly good milkers.

Distinguishing characters:

Small head with long narrow faces from which emerge short and somewhat horizontal horns which grow longer and curve upwards and inwards in bullocks. Small and sharp ears. Navel flap is absent. Long and compact barrel shaped body. Legs are sturdy and long with well-shaped hoofs. Pin bones are prominent. Tail is short, thin and tapering towards the end with a black switch reaching just below the hocks. In cows udder is well developed with prominent teats. These are generally white or light grey in color. Average milk production is 1400 liters per lactation.



b. Sahiwal:

It is a milch breed of cattle. Average milk yield is about 2150 lits in 300 days of lactation period. Loose skin (hence named lola), short legs, stumpy horns, broad head. General colors are various shades of red, pale red and dark brown splashed with white. Horns are short and thick, do not exceed 3 inches. Massive hump (in male), voluminous dewlap and pendulous sheath. Long tail almost reaching to the ground, tapering to a good black switch. Navel flap is prominent in female. Males weight about 340 kg.



c. Red Sindhi

This breed is otherwise called as Red Karachi and Sindhi and Mahi. Originated in Karachi and Hyderabad (Pakistan) regions of undivided India and also reared in certain organized farms in our country. Colour is red with shades varying from dark red to light, strips of white. Milk yield ranges from 1250 to 1800 kgs per lactation. Bullocks despite lethargic and slow can be used for road and field work.



d. Jersey

It is a dairy cattle originated in Island of Jersey in England. It is a good milk yielders having the highest fat percentage.

Distinguishing characters:

Straight top line. Heads have a double dish. Coat color generally fawn (light yellowish brown) with or without white markings. Switch is mostly black and sometimes it may be white. The muzzle is black and has a light encircling ring. It can withstand tropical and humid climate more than Holstein-Friesian. Animals are inclined to be nervous and sensitive. Bulls are often vicious. These animals are capable of utilizing roughages efficiently. A male weight about 675 kg and females weight about 450 kg. Average milk production is 4000 liters/lactation of 305 days with fat percentage of 5.5.

**e. Holstein-Friesian**

It is exotic dairy cattle originated in Holland and is popular for high milk production.

Distinguishing characters:

It is black and white patched, humpless, comparatively big animals having long leg with large feeding capacity and udders. Head is long, narrow and straight. A male weight about 1000 kg and females weights about 675 kg. Average milk production is about 6150 liters/lactation of 305 days with 3.5 % fat.

**f. Ayrshire:**

It is regarded as hardy breed of dairy cattle, originally found in Ayrshire, a country of Scotland. It is slightly bigger than Jersey and smaller than Holstein.

Distinguishing characters:

Straight top lines. Good udders. Long horns which are turned upwards in male. Females are especially poll. They have shorter and thicker neck in comparison to other breeds. Animals are over active and difficult to manage. Male weight about 850 kg and females weight about 550 kg. Average milk production is 4840 liters per lactation of 305 days with 4.1 % fat.

**g. Brown Swiss:**

This is also an exotic breed of cattle introduced mainly to upgrade Nak and local cows of hills and mountain districts. This breed is mostly concentrated in Dolakha district as it is farmed at Jiri livestock farm. It is a multipurpose breed and originated in Switzerland. Breed is used for transport, milk and beef in Switzerland.

Distinguishing characters:

Large heads which are usually dish-shaped and thick loose skin. The coat color is light fawn (yellowish brown) in color. Animals are not aggressive as those other breeds. Quite docile and easily manageable. More heat tolerant than Jersey. A male weight about 900 kg and female weight about 625 kg. Average milk production is 5250 liters/lactation of 305 days with 4.1% fat.



Lecture 6: Breed characteristic of indigenous and Indian breeds of buffaloes common in Nepal

Indigenous Breeds of Buffalo

a. Lime

The breed is water buffalo located in low to mid hills. It is located from 700 to 1500 masl (meters above the sea level). Black coat color in combination with white and brown is white in combination with brown, white chevron below neck region. White eye brow. White color below the knee. It has sickle shaped horns. Multipurpose uses: milk, meat, manure and draft. This breed first calves at 5 yrs of age and yields 2-3 liters of milk per day having a lactation period of 305 days. Adult weights about 300-325 kg (female). It has a calving interval of 20 months.



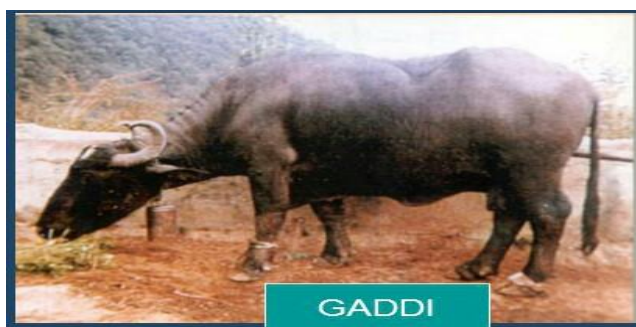
b. Parkote

This breed is raised in the mid hills from 1500-2400 masl. Body color is slightly grey, mostly horns are curved with sickle shaped. Broad head with long forehead. It is a hardy and good converter of roughages like rice straw wheat straw etc. Multipurpose uses: milk, meat, manure and draft. Its weight is 400 kg for the buffalo and 330 kg for the female buffalo. Its temperament is semi wild. Its age at first calving is 3-5 yrs and yields 2-3 liters milk per day.



c. Gaddi

This breed is located in the far western region. Body coat color is white but black is also found with white spot on forehead. Long tail. Short thick legs. Multipurpose uses: milk, meat, manure and draft. Milk yield is 3-5 liters per day that is more than other local breeds. Adult weight is 400 - 450 kg (females). Age at first calving is 5 years with calving interval of 20 months.



Exotic Breeds of Buffalo

a. Murrah

Origin: Punjab, Haryana and Union territory of Delhi. It is noted for milk production. Average lactation yield is 1400-1800 liters with a 7% fat percentage in a lactation period of 9-10 months.

Distinguishing Characters:

Small and clean head. Forehead slightly prominent. Short horns, flat and turning backwards, upwards and curling inwards in a spiral form. Body massive, long and deep. Prominent well developed udder and good sized teats. Long tail with white switch reaching to the fetlock. Adult weight is about 400-450



kg. Popular coat color is jet black with white marking on tail, face and extremities.

b. Jaffarabadi:

Origin: Located in the purest form in the Gir forest of Kathiawar especially towards Jaffarabadi in India. Heavy milkers.

Distinguishing characters:

Heavy head, bulging and prominent forehead. Broad, flat horns, droppings on each side of the neck and turning up at the points with a loose curve. Body is wedge shaped. Udder is large and well developed. Usually black in color, with white patches on face and legs and switch.



c. Nili Ravi:

Origin: Montgomery district of West Pakistan and Ferozepore district of Punjab

Distinguishing characters:

Heavy body. Males are commonly used for heavy draft and females are heavy milkers. The average milk is 1600 liters in a lactation period of 250 days. The usual color is black with white markings on forehead, face, muzzle, legs and switch. Tail is long, almost touching the ground.



d. Surti

Also known as Deccani, Gujarati, Talabda, Charator and Nadiadi. The breeding tract of this breed is Kaira and Baroda district of Gujarat. Coat colour varies from rusty brown to silver-grey. The horns are sickle shaped, moderately long and flat. The peculiarity of the breed is two white collars, one round the jaw and the other at the brisket region. The milk yield ranges from 1000 to 1300 kgs per lactation. The peculiarity of this breed is very high fat percentage in milk (8-12 percent).



e. Meshana

Mehsana is a dairy breed of buffalo found in Mehsana, Sabarkanda and Banaskanta districts in Gujarat and adjoining Maharashtra state. The breed is evolved out of crossbreeding between the Surti and the Murrah. Body is longer than Murrah but limbs are lighter. The horns are less curved than in Murrah and are irregular. Bullocks are good for heavy work. The milk yield is 1200-1500 kgs per lactation.



Lecture 7: Breed characteristic of indigenous and exotic breeds of goat common in Nepal

Indigenous Breeds of Goat

There are four common recognized and identified goat breeds in Nepal. They are Chyangra, Sinhal, Khari and Terai Goats.

a. Chyangrav

These are found in Trans Himalayan region of Nepal above 2400 masl and are raised under migratory system along with Bhyanglung Sheep. The population has been estimated to be about 6% of the total goat population in the country.

Horns are long, thick, twisted upwards and backwards. They have coarse but silky long hair reaching up to the knees, beneath which a fine under-coat of Pahmina or Cashmere is present. Most of the Chyangra goat are white or black with stripes in the face, though various colors are also present. The average body weight is 35-40 kg of male and 27-30 kg of female. Chyangra are late maturing and produce the first kid by the age of 2 yrs. It is used as pack animals.



b. Sinhal

Sinhal are generally found in high hills at an elevation of 1500-3000 masl. They are generally kept with Baruwal sheep as a mixed flock. This breed comprises about 35% of total goat population. The sinhal is heaviest among the native goat breeds of Nepal. They are generally black, light brown and white in color with coarse hairs (rough or loose in texture) covering the body. Both sexes have horns. The sinhal goats are also late maturing producing first kid by the age of 2 yrs with kidding interval of one year. Its weight is about 32-42 in male and 30-40 in female. It is used as pack animals.



c. Khari:

Khari goat are wide spread and more abundant (50%) than other indigenous breeds and are presents in mid hills. Khari goats are relatively small bodied with body weight ranging between 20-40 kg. They are more prolific among the four indigenous breeds and can adopt in different agro climatic zones. From the different locations of Nepal seven color variants were identified with dominance of black followed by brown. The average body weight for male and female goats is



28-40 kg and 17- 26 kg. Khari goats produce first kid by the age of 478 days with kidding interval of 268 days.

d. Terai Goat

Terai goats constitute about 9% of the total population of Nepal and are found in the southern most plains (terai). This breed appears to be recently developed from the population origination from Jamunapari and native breeds. They display a wide range of variations within the breed. They have short hairs. The horns are straight, ears are semi pendulous. Coat color vary from black, white, brown, brown mixed with red, black with white marking ash color and black and white on ear. The average adult body weight of male Terai goat is 30-35 kg and that of female is 18-32 kg. The average age at first kidding is 15-16 mths and the kidding interval is 7-8 mths.



Exotic Breeds of Goat

a. Jamunapari

It is a dual purpose (meat and milk) goat breed found in Itawah district of U.P, India. This is a tall and large goat breed. The adult body size of Jamunapari, goat is 65-75 kg. A lower body weight (38-45 kg) of adult Jamunapari goat has been reported. They have long legs. Coat color varies but mostly black or brown coat is common. The distinctive feature of this breed is highly convex Roman nose and very long, flat and drooping ears. Both sexes have horn and are similar in shape. Goats are more suited to grazing/browsing than stall feeding management. The age of first kidding is 25 months with kidding interval of 14 months. This breed has been introduced in Nepal for improving weight traits of indigenous breeds and has been extensively used in Terai and hill region of Nepal for cross breeding/upgrading.



b. Barbari:

This breed is supposed to be originated from Barbara of Somali Land in Africa and commonly found in U.P and Hariyana in India and in West Pakistan. The Barbari goat is small with compact body. The average adult body weight is 35.8 kg for male and 22.6 kg for females. Coat color varies but white with distinctive red spots are common. Ears are short and pointed upwards and outwards. Both sexes have twisted horns and male have large thick beard. The breed thrives are suitable under stall feeding system of management. The age at first kidding is 19 months with kidding interval of 9 months.



c. Beetal

This breed is also dual purpose and resembles to Jamunapari in most aspect. The breed is found in Punjab and Haryana of India and has been introduced in the Terai district of Nepal. The beetal goats are large in size with mature body weight of 59 and 35 kg for male and female respectively. The animals are mostly black and brown in color with typical Roman nose but not as Jamunapari, long flat curled and drooping ears and with medium sized horn in both sexes. The age of first kidding is 762 +/- 42 days with kidding interval of 368 +/- 24 days.



d. Sannen:

It was developed in the sannen valley of Switzerland. It is predominantly white or creamy white in color. The mature male weight 65-80 kg whereas the mature female ranges from 50-60 kg. They may or may not have horns. Both sexes have short hair and ears stand erect pointed forward. Face is straight and dished. They are the largest of all dairy goat breeds.



e. Black Bangal

Black Bangal is found in West Bengal, Assam and in the adjoining areas. They are dark black in color or sometimes white or spotted. The skin is comparatively superior to other breeds. They are prolific breeders and commonly have twins. Two kiddings are possible in a year. The milk production capacity is poor and sometimes kids may require additional milk supply during early stages of growth. They are short-legged, compact animals with a deep body and wide chest and a straight back. The body weight of adult buck varies from 19 to 30 kg and that of doe 13 to 22 kg.



f. Boer

The Boer goat breed is one of the meat goat breeds in the world. Although they are majorly kept for meat, they could also be raised for goat milk production. Boer goats are also called South African goats, Afrikaner and Africander. The Boer goats are characterized by their white coat color and brown heads. Some could be totally brown or white in color. Their ears are long and pendulous. They are very hardy and capable of adapting to virtually all kinds of climates or weather and many different environments. They are docile and grow rapidly (can consistently produce more muscle in a short time). They generally qualify as great breeding goats. They can kid



thrice in two years if management and other conditions are favorable. If compared with other breeds of goats, Boer goats add more weight and look healthier and fuller. Boer goats are early breeders. They attain puberty at 6 months and even the male kid is ready for breeding at age 5-6 months old. They possess great muscular development on the back and legs. They also produce very good quality and lean meat. They have high fecundity rates. Boer does are known to be good milkers and can raise many kids with great body weight gains. The neck is relatively short and very muscular. The meat is nutritious and tasty. They do well on poor or low-quality pasture and feed. They have a low temperament (gentle and tame). An adult Boer buck weighs about 110 -135 kg while the adult Boer sow weighs about 90 – 100 kg. The average birth weight is 3.6 kg for females and 3.9 kg for males. The Boer goats dressing weight percentage is over 50%. Compared to South African sheep, the Boer goat had the higher dressing percentage with carcasses having more total tissue in the forearm, neck and ventral trunk, and less tissue in the hind limb.

g. Toggenberg

The Toggenburg goat is the oldest known dairy goat breed. It was originated from the Toggenburg valley in the Canton of St. Gallen, Switzerland. And the breed was named after the region in Switzerland, from where the breed originated. Today there are more than three hundred goat breeds available throughout the world. And among these goat breeds, the Toggenburg goat is considered the oldest breed. The nickname of the breed is *Togg*.

The Toggenburg goat is a medium sized animal. They are sturdy, vigorous and very alert in appearance. They have soft, fine, short or medium length hair and their hair is laying flat. Their color is solid, varying from light fawn to dark chocolate with no preference for any shade. They have erect ears which are carried forward. The Toggenburg does have well developed udder, and they are also noted for their excellent udder development. On average, a mature Toggenburg buck weights about 68-91 kg and a doe weights at least 55 kg.



Lecture 8: Breed characteristic of indigenous and exotic breeds of sheep common in Nepal

Indigenous Breeds of Sheep

Native breeds of sheep found in Nepal

a. Bhayanglung:

It is found in high hills raised specially in the northern region at the altitude ranging between 2500-4000 meters above the sea level. It represents 4% of the total indigenous sheep population of Nepal.

Distinguishing Characters

Generally white coat color with variable head from white, brown and black. Horn is of various shapes: straight, sickles, twisted and spiral. Small drooping ears. Roman nose and short tail. Legs are short and strong. It weighs about 60-90 kg and is maintained in a transhumance system according to season. It produces fine wool, soft in comparison to other Nepalese breed. The average annual wool production is 1 kg per two shearing and carpets and rugs are being prepared from this wool.



b. Baruwāl:

The principle breed of high altitude above 1500-2500 masl is Baruwāl. These are mostly distributed in Western hills and mid-Western mountains and hills. Baruwāl sheep flocks including about 15% sinhal goats graze, migrate in mountain alpine pastures and reach up to snow line in summer and during winter they come down grazing and browsing on pastures and forest even at and around village farms. It represents 63% of the total indigenous sheep population.

Distinguishing characters:

Generally white coat color but head color differs from white to black. They have close flocking instinct and have remarkable travelling ability. Rams have long curved horns and ewes are polled. Roman nose, small atrophic ears and a short tail. The animal weighs 25-30 kg. Coarse wool and is suitable for making radi.



c. Kage

It is considered to be the third purest Nepalese breed and generally found in the valley of Kathmandu, Pokhara, Banke, Makwanpur and Nuwakot. They can thrive from 600-1650 masl and represents 21% of the total indigenous sheep population.



Distinguishing Characters:

Coat color is white except on head region. Head mostly brown, short tail. Coarse wool type sheep. Ears are erect. Wool suitable for making radi/pakhi. Males have sickle shaped horn and ewes are polled. Female 20-25 kg and males are 20-35 kg. They attain sexual maturity at the age of 18-24 months and give three lambs per two years. They produce 500 gms wool per year with two shearing.

d. Lampuchre

It is found in Terai region. It represents 12% of the total population.

Distinguishing Characters:

Coat color is mostly white but sometimes black or brown. Long tail and hence name is Lampuchre. Suitable for hot climate. Meat type sheep. Males are larger than females and have horns. Adult body weight is 20-40 kg. Wool is of very inferior quality and the production is 0.4kg/shearing.

**Exotic Breeds of Sheep found in Nepal****a. Merino**

It is the most popular fine wool breed of the world. It is originated from Spain. It is also termed as golden footed sheep.

Distinguishing Characters:

White faced sheep with white feet. Ewes are polled while the rams have rather large, heavy, spirally turned horns. Most of the portion of fore and hind legs are covered with wool. It is extremely hardy and can survive under adverse weather and grazing conditions.

**b. Rambouillet**

It has been developed in France as a breed but is a descend of the old Spanish merino. It is a medium or long wool breed.

Distinguishing Characters:

Large breed with white hair around the nose and ears. They are large with mature rams weighing about 110-125 kg whereas the ewes about 70-90 kg. The ram may have horned or polled whereas the ewes are polled. They produce an excellent fine wool fleece.

**c. Polworth**

This breed is evolved from Australia by mating with one quarter of Lincoln and three quarter of Merino. It is polled predominantly. It has long, soft and fine wool. Mature ewes is 50-



60 kg and ram is 66- 80 kg. Wool weight is about 6.7 kg/year. It is dual type breed that is for meat and wool type.

d. Lincoln

The origin of sheep is England. Lincoln had a heavy wool presents that are often twisted into spiral near the end. Lincoln produces 9.1 kg/ year wool. This is referred as world's largest breed of sheep. Adult body weight of male is 113-160 kg and female is 90-133 kg. They are rectangular in form and of great width.



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e. Leicester

The Border Leicester sheep is a dual-purpose breed of domestic sheep originated from United Kingdom. It has a long and dignified history, and was developed in 1767 in Northumberland, England. Robert Bakewell created the Dishley Leicester sheep by crossing the old Lincolnshire breed with the Leicestershire type sheep and the Dishley Leicester sheep breed became very popular with the local farmers.

The Border Leicester sheep are large sized animals. Their bodies are long and are completely white in coloration. They have well sprung ribs and a wide, strong back. Their nose is black and the ears are large in size, upright and alert. Feet of these animals are also of dark color. Legs and head of these animals are generally free of wool and only covered in short white hairs (making it easier for shearing). Both rams and ewes are generally polled. Average live body weight of the mature Border Leicester ewes is between 90 and 120 kg. And the mature ram's average live body weight varies from 140 to 175 kg.



Lecture 9: Breed characteristic of indigenous and exotic breeds of poultry recognized in Nepal

Indigenous Breed of Poultry

a. Sakini:

They are especially reared in rural area of hill region. They have slim body, strong and energetic. The adult weight is about 1.5-2 kg. They have sickle shaped feather in their tail region. They can give up to 78 eggs /year. They are highly resistant to diseases.



b. Powkh ultya:

They are found in rural area of Nepal. But their numbers are declining day by day. The feathers of this breed of poultry face towards the head region so named it powkh ultya. It is about 1.5 -2kg in adult. They can give 50 -70 eggs/year.



c. Ghatee Khuilae (Naked neck):

They are also found in rural area of Nepal. There is absence of feather in their neck region thus named ghatee khuilae. It is also 1.5-2 kg in adult.



Exotic breeds of poultry

American breeds

a. New Hampshire

This breed has single comb. The body is less rectangular in shape than Rhode Island Red. This breed is dual purpose breed. It is very hardy and produces large brown eggs. In female the lower neck feather is distinctly tipped with black. The main tail feathers are black. The breed is quite popular in Nepal.



b. Rhode island reds:

It is originated from Rhode Island in New England. The bird has somewhat long rectangular body which is also broad and deep. The back is flat and breast is carried well forward characteristics which make it a good meat producing birds. The tail presents sickle feathers and tail feathers are black. In the lower neck of the female there is slight black marking at the base. The usual color is brownish red



but white and brown are not uncommon.

c. Plymouth rock:

This breed has rather a long body, fairly broad prominent breast. Birds have single comb. There are 7 common varieties in this breed based on blue, barred, white, buff, silver penciled, partridge and Columbian. They are excellent flesh and the hens are good layers.



English breed

a. Australorp:

It is developed in Australia principally for egg production rather than meat. The back is somewhat long, and body slopes gradually towards the tail. The comb is single, the body is black, beak is black, shank and toes are black and white. They produced brown shelled egg.



b. Sussex:

There are 3 varieties in this breed such as light Sussex, speckle Sussex and red Sussex. These light Sussex has been introduced by Pakhribas agricultural centre, Dhankuta, Nepal. The birds belong to this breed has long bodies which are broad at shoulder with good depth from front to ears. The birds have brown colored shanks, beaks and toes. They have single comb. Birds are primarily of meat type but good laying strains have been developed.



Mediterranean Breeds

a. Leghorn

There are 12 varieties in this breed. Among them white leg horn which is especially breed for egg production is the most popular for production of egg rather than for the production of table meat. White leg horn has excellent feed efficiency. The eggs are white in color. All the varieties of this breed have yellow beak, skin, shank and toe. There are single comb.



b. Minor:

Birds of this breed possesses long body, large sized comb and wattle. Large white ear lobes, long strong bodies, legs set squarely under the powerful looking body are the distinct characteristics of this breed. The beak, shanks and toes are black. They are excellent producer of large white eggs. The egg shell is chalk white in color.



Lecture 10: Breed characteristic of indigenous and exotic breeds of poultry common in Nepal

Different commercial breeds found in Nepal:

Broilers are chickens (*Gallus gallus domesticus*) bred and raised specifically for meat production. Chickens are one of the most common and widespread domestic animals, typical broilers have white feathers and yellowish skin. Most commercial broilers bred for meat reach slaughter weight at between 5 to 7 weeks of age. Because of this young age, much of their behavior and physiology is that of an immature bird. Broilers are usually grown as mixed-sex flocks in large sheds under intensive conditions, but some strains can be grown as free-range flocks. Both male and female broilers are reared for their meat.

Around seven commercial broiler breeds and six layer breeds of chickens are reared commercially in Nepal. Among broiler breeds, Cobb holds a 70% market share, followed by Hubbard, Marshall, Indian River Ross 308 and others. For layers, Hy-Line Brown has the biggest market share of 40% followed by Lohmann Brown (30%).

Lecture 11: Breed characteristic of indigenous and exotic breeds of pigs common in Nepal

Indigenous Breeds of Pigs

Indigenous black pigs are maintained in scavenge conditions in the village by certain ethnic group of farmers who accept pork. These are mostly maintained in poor sanitary conditions without any economic consideration. While improved pigs have been maintained both for breeding and fattening at and around urban centers with the commercial background. Pig farming is getting more popularity around the urban centers.

Pig is a multiparas animal and it can produce many piglets at a time. They grow very fast and produce excellent quality of meat resulting quick income generation. Certain tribes of people –Rai, Limbu, Magar, Sunuwar, Tamang, Majhi, Damai, Kami and Tharu Chaudhary etc prefer pig meat more than meat from other animals. Pig meat has more demand at eastern Nepal and at urban centers where hotels and restaurants of international standards are present. People from eastern hills prefer black pigs than white. Black pigs produced at Pakhribas Agriculture Center are highly inbred as a result prolificacy has been deteriorated with comparatively slow growth rate. These black pigs required improvement for regenerating more prolificacy has been deteriorated with comparatively slow growth rate. These black pigs required improvement for regenerating more prolificacy vigor.

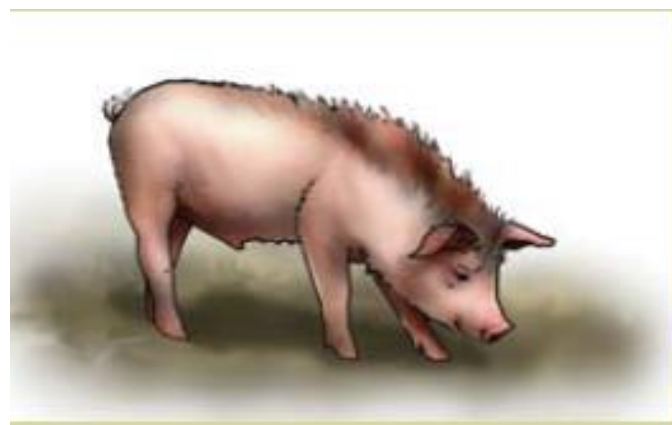
a. Chawche:

It is a local black pig maintained especially in hill region at scavenges condition. In the night it is housed in temporary sheds without any sanitary measures. It is more resistant to diseases. Its weight is about 800 gm in birth and the adult male weight is 32 kg and female weight is 24 kg. It is fed household waste, rice bran, brewery grain at least two times a day.



b. Hurra:

It is a local brown and black pig of Terai maintained mostly in group at poor sanitary condition. The hair of the neck and top line are straighter upward. They are more resistant to diseases. Its weight in birth is about 700 gm and its adult weight is about 49 kg for male and 45 kg for female. Its population is declining. It is a scavenge pig left early in the morning around settlement area for grazing. It is not fed at the house.



c. Badel (Wild pig)/ Bampudkya:

It is a wild pig. Mostly castrated males are fattened for about a year for slaughter. Its demand is quite high in the urban markets during festival season. The adult male weight is 20 kg and female is 19 kg.



d. Black Pakhribas Pig:

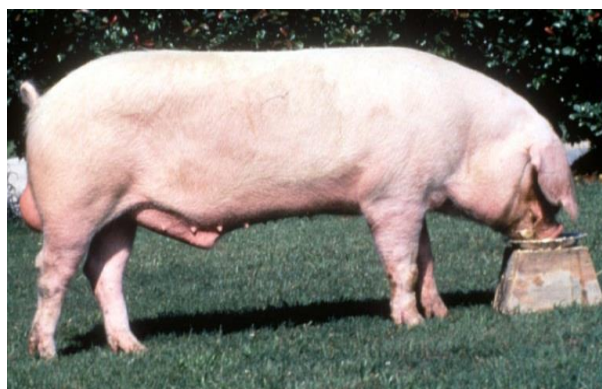
It is totally black developed in Pakhribas Agricultural Station in Eastern part of Nepal. It is developed by crossing with Saddle back, Tamworth and Hampshire. It is popular in eastern part of our country. They are more aggressive and more diseases resistant breed. Its adult male weight is about 150-190 kg and female is about 95-160 kg and at birth their weight is about 1 kg.



Exotic Breed of Pig

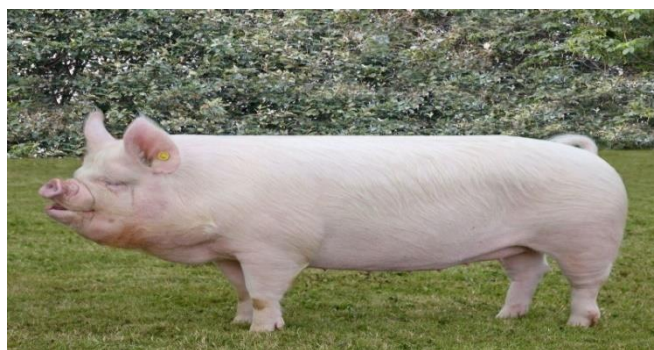
a. Landrace:

Originally it is a denish pig popularly breed to produce highest quality bacon in the world. It is a white pig characterized by long deep side, square ham, short legs with heavy lop ears (dropping ears) inclined to the front above the eyes. It has a long snout. The carcass is leaner with less backfat and lard. The breed is popular for its high prolificacy and for efficiency of feed utilization. In Nepal Landrace is used for developing crossbreed.



b. Large white Yorkshire:

Large white Yorkshire is a popular English bacon breed having noted mothering quality. It farrows and raises many liters at the time as the mother yields more milk. The pig is white in color with moderately long head, face slightly dished, snout broad and identical erect ears. Mature boar weight about 300-450 kg while sow weight 250-350 kg. It is widely used for crossbreeding.



c. Duroc:

It is an American breed, red in color with shades varying from a golden to cherry red color. It has dropping ear. It is less aggressive. It is popular for its excellent growth rate and feed efficiency. It is an early maturing; farrowing many litters and is good mother.



Mature boar weight about 400 kg and sow 350 kg. The carcass is considered as a good meat type. It is widely used for cross breeding.

d. Hampshire:

It is a medium type English breed popular for pork production. It is a black pig with white strip around the back popularly known as Saddleback. It is well known for excellent growth rate and feed efficiency. It is an early maturing, farrows 8-10 liters and is a good mother. Mature boar weight about 400 kg and sow 350 kg. The carcass is considered as a good meat type. It is widely used for cross breeding.



e. Tamworth

The Tamworth originated in central England. Long heads and impressive snouts enable these pigs to be efficient foragers. Long, strong legs and sound feet give Tamworth pigs the ability to walk for considerable distances. Ginger red coats make the pigs adaptable to a variety of climates and protect them from sunburn. Tamworths have an active intelligence, and they are agreeable in disposition. Sows are prolific, able to produce and care for large litters. The piglets are vigorous and often have 100% survivability. Both sexes of this breed reach a mature weight of 227-272 kg.



Lecture 12: Housings requirements- types, floor space, feeder and waterer and construction materials for cattle, Buffalo, Sheep and goat

Housing for Livestock

For dairy cattle, care should be taken to provide comfortable accommodation for individual cattle. Three important parameters such as (1) Proper sanitation, (2) Durability, (3) Arrangements are the key for the production of clean milk under convenient and economic conditions.

Location of dairy buildings:

The points- which should be considered before the erection of dairy buildings are as follows:

- 1. Topography and drainage:** A dairy building should be at a higher elevation than surrounding ground to offer a good slope for rainfall and drainage for the wastes of dairy to avoid stagnation within. A leveled area requires less site preparation and thus lesser cost of building. Low lands and depressions and proximity to places of bad odour should be avoided.
- 2. Soil type:** Fertile soil should be spared for cultivation. Foundation soil as far as possible should not be too dehydrated or desiccated. Such a soil is susceptible to considerable swelling during rainy season and exhibit numerous cracks and fissures.
- 3. Exposure to the sun and protection from wind:** A dairy building should be located to a maximum exposure to the sun in the north and minimum exposure to the sun in the south and protection from prevailing strong wind currents whether hot or cold. Buildings should be placed so that direct sunlight can reach the platforms, gutters and mangers in the cattle shed. As far as possible, the long axis of the dairy barns should be set in the north-south direction to have the maximum benefit of the sun.
- 4. Accessibility:** Easy accessibility to the buildings is always desirable. Situation of a cattle shed by the side of the main road preferably at a distance of about 100 meters should be aimed at.
- 5. Durability and attractiveness:** It is always attractive when the buildings open up to a scenic view and add to the grandeur of the scenery. Along with this, durability of the structure is obviously an important criteria in building a dairy.
- 6. Water supply:** Abundant supply of fresh, clean and soft water should be available at a cheap rate.
- 7. Surroundings:** Areas infested with wild animals and dacoits should be avoided. Narrow gates, high manger curbs, and loose hinges, protruding nails, smooth finished floor in the areas where the cows move and other such hazards should be eliminated.
- 8. Labour:** Honest, economic and regular supply of labour is available.
- 9. Marketing:** Dairy buildings should only be in those areas from where the owner can sell his products profitably and regularly. He should be in a position to satisfy the needs of the farm within no time and at a reasonable price.
- 10. Electricity:** Electricity is the most important sanitary method of lighting a dairy. Since a modern dairy always handles electric equipments which are also economical, it is desirable to

have an adequate supply of electricity.

11. Facilities, labour, food: Cattle yards should be so constructed and situated in relation to feed storages, hay stacks, silo and manure pits as to effect the most efficient utilization of labour. Sufficient space per cow and well arranged feeding mangers and resting areas contribute not only to greater milk yield of cows and make the work of the operator easier but also minimizes feed expenses. The relative position of the feed stores should be quite, adjacent to the cattle barn. Noteworthy features of feed stores are given below:

- Feed storages should be located at hand near the centre of the cow barn.
- Milk-house should be located almost at the centre of the barn.
- Centre cross-alley should be well designed with reference to feed storage, the stall area and the milk house of Housing:

Type of Housing

The most widely prevalent practice in this country is to tie the cows with rope except some organized dairy farms belonging to Government, co-operatives or Military where proper housing facilities exist. It is quite easy to understand that unless cattle are provided with good housing facilities, the animals will move too far in or out of the standing space, defecting all round and even causing trampling and wasting of, feed by stepping into the mangers. The animals will be exposed to extreme weather conditions all leading to bad health and lower production. Dairy cattle may be successfully housed under a wide variety of conditions, ranging from close confinement to little restrictions except at milking time. However two types of dairy barns are in general use at the present time.

1. The loose housing barn in combination with some type of milking barn or parlour.
2. The conventional dairy barn.

Loose housing system

Loose housing maybe defined as a system where animals are kept loose except milking and at the time of treatment. The system is most economical. Some features of loose housing system are as follows.

1. Cost of construction is significantly lower than conventional type.
2. It is possible to make further expansion without much change.
3. Facilitate easy detection of animals in heat
4. Animals feel free and therefore, prove more profitable with even minimum grazing.
5. Animals get optimum exercise which is extremely important for better health and production
6. Overall better management can be rendered.

The floor and manger space requirement of dairy cows are give in Table below

Other Provisions: The animal sheds should have proper facilities for milking barns, calf pens/ calving pens and arrangement for store rooms etc. In each shed, there should be arrangement for feeding, manger, drinking area and loafing area. The shed may be cemented or brick paved, but

in any case it should be easy to clean. The floor should be rough, so that animals will not slip. "The drains in the shed should be shallow and preferably covered with removable tiles. The drain should have a gradient of 1" for every 10' length. The roof may be of corrugated cement sheet, asbestos or brick and rafters. Cement concrete roofing is too expensive. Inside the open unpaved area it is always desirable to plant some good shady trees for excellent protection against direct cold winds in winter and to keep cool in summer.

Table:

Type of Animal	Floor space per animal (Sq. feet)		Manger length per animal (inches)
	Covered Area	Open Area	
Cows	20 – 30	80 – 100	20-24
Buffaloes	25-35	80-100	24 -30
Young stock	15-20	50-60	15 -20
Pregnant Cows	100-120	180 – 200	24 -30
Bulls Pen	120-140	200-250	24 -30

Cattle shed

The entire shed should be surrounded by a boundary wall of 5' height from three sides and manger etc., on one side. The feeding area should be provided with 2 to 2 % feet of manger space per cow. All along the manger/ there shall be 10" wide water trough to provide clean, even, available drinking water. The water trough thus constructed will also minimize the loss of fodders during feeding. Near the manger, under the roofed house 5' wide floor should be paved with bricks having a little slope. Beyond that, there should be open unpaved area (40' X 35') surrounded by 5' walls with one gate. A plan for such a house along with the plan for calves shed and their sections are shown in Fig, 105, it is preferable that animals face north when they are eating fodder under the shade. During cold wind in winter the animals will automatically lie down to have the protection from the walls.

Shed for calves

On one side of the main cattle shed there shall be full covered shed 10' X 15' to accommodate young calves. Such sheds with suitable partitioning, may also serve as calving pen under adverse climatic conditions. Beyond this covered area there should be a 20' X 10' open area having boundary wall so that calves may move there freely. In this way both cattle and calve sheds will need in all 50 X 50 area for 20 adult cows and followers. If one has limited resources, he can build ordinary, katcha /semi Kutcha boundary walls but feeding and water trough should be cemented ones.

Conventional Dairy Barn

The conventional dairy barn is comparatively costly and is now becoming less popular day by day. However, by this system cattle are more protected from adverse climatic conditions.

The following barns are generally needed for proper housing of different classes of dairy stock on the farm.

1. Cow houses or sheds
2. Calving box
3. Isolation box
4. Sheds for young stocks
5. Bull or bullock sheds.

Cow sheds

Cow sheds can be arranged in a single row if the numbers of cows are small say less than 10 or in a double row if the herd is a large one. Ordinarily, not more than 80 to 100 cows should be placed in one building. In double row housing, the stable should be so arranged that the cows face out (tail to tail system) or face in (head to head system) as preferred.

Advantages of Tail to tail system:

1. Under the average conditions, 125 to 150 man hours of labor are required per cow per year. Study of Time: Time motion studies in dairies showed that 15% of the expended time is spent in front of the cow, and 25% in other parts of the barn and the milk house, and 60% of the time is spent behind the cows. Time spent at the back of the cows is 4 times more than, the time spent in front of them.
2. In cleaning and milking the cows, the wide middle alley is of great advantage.
3. Lesser danger of spread of diseases from animal to animal.
4. Cows can always get more fresh air from outside.
5. The head gowala can inspect a greater number of milkmen while milking. This is possible because milkmen will be milking on both sides of the head gowala.
6. Any sort of minor disease or any change in the hind quarters of the animals can be detected quickly and even automatically.

Advantages of Head to Head system:

1. Cows make a better showing for visitors when heads are together.
2. The cows feel easier to get into their stalls.
3. Sun rays shine in the gutter where they are needed most.
4. Feeding of cows is easier; both rows can be fed without back tracking.
5. It is better for narrow barns.

Floor: The inside floor of the barn should be of some impervious material which, can be easily kept clean and dry and is not slippery. Paving with bricks can also serve ones purpose. Grooved cement concrete floor is still better. The surface of the cow shed should be laid with a gradient of 1" to 1 1/2" from manger to excreta channel. An overall floor space of 65 to 70 sq.ft. Per adult cow should be satisfactory.

Walls: The inside of the walls should have a smooth hard finish of cement, which will not allow any lodgment of dust and moisture. Corners should be round. For plains, dwarf walls about 4 to 5 feet in height and roofs supported by masonry work or iron pillars will be best or more suitable.

The open space in between supporting pillars will serve for light and air circulation.

Roof: Roof of the barn may be of asbestos sheet or tiles. Corrugated iron sheets have the disadvantage of making extreme fluctuations in the inside temperature: of the barn in different seasons. However, iron sheets with aluminum painted. Tops to reflect sunray bottoms provided with wooden insulated ceilings can also achieve the objectives. A height of 8 feet at the sides and 15 feet at the ridge will be sufficient to give the necessary air space to the cows. An adult cow requires at least about 800 cubic feet of air space under topical conditions. To make ventilation more effective continuous ridge ventilation is considered most desirable.

Stall design: The two main types of dairy barn stalls are the stanchion stall and tie stall.

1. The stanchion stall:

It is one of the standard dairy cow stalls. It is equipped with a stanchion for fastening a cow in place. Usually there is a stall partition in the form of a curved pipe between the stalls to keep the cows in place and to protect their udders and teats from being stepped on by other cows.

The stanchion should be so contracted and arranged as to allow the cows the greatest possible freedom. There should be several links of chain at the top and bottom of the stanchions and sufficient room on each side of it to permit (lie animal to move its head from side to side. It is important to provide for the comfort of the cows and to line them up so that most of the droppings and urine go to the gutter. Practically, it is not possible to fit every cow to her stall properly. To compensate this, many stanchions have adjustments so that they can be set forward if the cow is too large for the stall or backwards if the cow is too small. The cow can be fastened easily and quickly with the stanchions and is held more closely in place than other types of ties. However/ she is held more rigidly and therefore, the stanchion is less comfortable than other types of fasteners.

2. The Tie Stall:

The tie stall requires a few inches longer and wider than the stanchion stall. It is designed to provide greater comfort to the cow. In addition to larger size, the chain tie gives the cow more freedom. Instead of the stanchion, there are two arches, one on each side of the neck of the cow. The cow is fastened by means of rings fitted loosely on the arch pipe,; and connected to a chain which snaps to the neck strap on the cow. The correct space between arches is 10-12 inches. This prevents the cow from moving too far forward in the stall. It is important that in this type of stall, the arches and all other stall parts are kept lower than the height of the cows.

The cow has more freedom in the tie stall then in the stanchion, large cows and those with large udders get along better in them because of freedom they enjoy. It is not desirable to have a tie chain in a small stall.

Manger:

Cement concrete continuous manger with removable partitions is the best from the point of view of durability and cleanliness, A height of 1'-4" for a high front manger and 6" to 9" for a low front manger is considered sufficient low front mangers are more comfortable for cattle but high front mangers prevent feed wastage. The height at the back of the manger should be kept at 2'-6" to 3'. An overall width of 2' to 2 W is sufficient for a good manger.

Alley:

The central walk should have a width of 5'-6' exclusive of gutters when cows face out, and 4'-5' when they face in. The feed alleys in case of a face out system should be 4' wide, and the central walk should show a slope of 1" from the centre towards the two gutters naming parallel to each other, thus forming a crown at the centre.

Manure gutter:

The manure gutter should be wide enough to hold all dung without getting blocked, and be easy to clean. Suitable dimensions are 2' width with a cross-fall of 1" away from standing. The gutter should have a gradient of 1" for every 10' length. This will permit a free flow of liquid excreta.

Doors: The doors of a single range cowshed should be 5' wide with a height of 7', and for double row shed the width should not be less than 8'-9'. All doors of the barn should lie flat against the external wall when fully open.

Calving Boxes:

Allowing cows to calve in the milking cowshed is highly undesirable and objectionable. It leads to sanitary milk production and spread of disease like contagious abortion in the herd. Special accommodation in the form of loose-boxes enclosed from all sides with a door should be furnished to all parturient cows. It should have an area of about 100 to 150 sq. Ft With ample soft bedding. It should be provided with sufficient ventilation through windows and ridge vent.

Isolation Boxes:

Animals suffering from infectious diseases must be segregated soon from the rest of the herd. Loose boxes of about 150 sq. Ft are very suitable for this purpose. They should be situated at some distance from the other barns. Every isolation box "should be self contained and should have separate connection to the drainage disposal system.

Sheds for young stocks:

Calves should never be accommodated with adult in the cow shed. The calf house must have provision for daylight ventilation and proper drainage. Damp and ill-drained floors cause respiratory trouble in calves to which they are susceptible. For an efficient management and housing, the young stock should be divided into three groups, viz., young calves aged up to one year, bull calves, i.e., the male calves over one year and the heifers or the female calves above one year. Each group should be sheltered in a separate calf house or calf shed. As far as possible the shed for the young calves should be quite close to the cowshed. Each calf shed should have an open paddock or exercise yard. An area of 100 square feet per head for a stock of 10 calves and an increase of 50 square feet for every additional calf will make a good paddock. It is useful to classify the calves below one year into three age groups, viz., calves below the age of 3 months, 3-6 months old calves and those over 6 months for a better allocation of the resting area. An overall covered space of:

- 20-25 square feet per calf below the age of 3 months,
- 25-30 square feet per calf from the age of 3-6 months,
- 30-40 square feet per calf from the age of 6-12 months and over, and
- 40-50 square feet for every calf above one year,

Should be made available for sheltering such calves an air space of 400 to 500 cubic feet per calf is a good provision under our climatic conditions. A suitable interior lay-out of a calf shed will be to arrange the standing space along each side of a 4-feet wide central passage having a shallow gutter along its length on both sides. Provision of water through inside each calf shed and exercise yard should never be neglected.

Bull or Bullock shed:

Safety and ease in handling a comfortable shed for protection from weather and a provision for exercise are the key points while planning accommodation for bulls or bullocks. A bull should never be kept in confinement particularly on hard floors. Such a confinement without adequate exercise leads to overgrowth of the hoofs creating difficulty in mounting and loss in the breeding power of the bull.

A loose box with rough cement concrete floor about 15' by 10' in dimensions having an adequate arrangement of light and ventilation and an entrance 4' in width and 7' in height who make a comfortable housing for a bull. The shed should have a manger and a water trough. If possible, the arrangement should be such that water and feed can be served without actually entering the bull house. The bull should have a free access to an exercise yard provided with a strong fence or a boundary wall of about 2' in height, i.e., too high for the bull to jump over. From the bull yard, the bull should be able to view the other animals of the herd so that it does not feel isolated. The exercise yard should also communicate with a service crate via a swing gate which saves the use of an attendant to bring the bull to the service crate.

Housing for sheep and goat

Housing of sheep \goat is not a serious problem. It is enough if the goats are provided with a dry, comfortable safe and secure place, free from worms, and affording protection from excessive heat and inclement weather. In Nepal, the system of sheep and goats raising varies according to the ecological belts. In the high hills (above 2000 m) sheep and goats are raised in the transhumance system. They move to the high alpine pasture during the summer and come down to about 1200 m altitude during the winter. In the lower hills and terai, sheep and goats are usually allowed to graze in the communal grazing lands, forests or fallow lands according to the seasons during the day and are in housed during the night.

Sheep and goats are usually herded near by the shepherd's tent or cave during the night in open area in the high hills. If they have to stay for long period due to the availability of good pasture, they are padlocked usually in a circular or rectangular paddock constructed with wooden planks, which are raised vertically as closely packed pillars. There is usually only one door passage.

Sheep and goats are usually housed in the side rooms of the farmer's house or in lower hills and terai region of Nepal. The floors are usually raised 45-60 m from the ground level and slatted with bamboo poles, wooden planks or beaten bamboos. To protect the animals from predators and drought walls made using wooden poles. Lightning system is not made available in the pen. Many farmers protecting newborn from cold by keeping them in own house.

Sheep and goat are prone to respiratory infection if kept in enclosures without ample ventilation.

Slatted floors housing system is slightly modified system of housing (Slatted floors housing) sheep and goat prevent respiratory trouble.

Slatted floors housing: - This system of housing is preferred in the area where wood and bamboos are available in cheaper rate where as there is shortage of bedding materials. The essential requirement in the construction of slatted floors is that complete freedom from under floor draughts must be achieved. There should also be ample room beneath the slats so that the under floor can hold manure for a certain period of time without cleaning. The slats must be laid parallel to the entrance doors, so that from the eye level of sheep when they enter the building the floor appears solid. Such floors can easily be lifted by two men for cleaning and disinfections. Although the spacing and size of slats depends upon the wood type (durability), breed and the number of animals to be housed, size has been 37.5mm x 37.5 mm-tapered 35mm on under side width and a 12.5mm to 20mm gap. The depth of the dung pit to the slats is usually 0.9m. The height of the pen side is 1.0m. Animals are fed from common hayracks and concentrate troughs mounted on the pen side nearest to the central gangways.

Buildings for sheep and goat farms

General flock pens: -Adult breeding ewes or nannies are housed in this pen. Ewes or nannies pens are constructed either with concrete floor or with slatted floors. One adult unit is provided with 0.8 to 1.5 Sq. M. floor space each pen should accommodate 40-50 ewes or nannies. The pen usually includes one or two hay or fodder racks parallel located along the walls, which are raised to about 75 cm. from the floor. Just beneath the racks, concentrate feeders are used in such a way that animals cannot step into feeder.

Shed for ram or buck: - Rams or bucks are housed separately in these pens so as to control unwanted breeding. 2.2m x 1.25m floor space is provided to each animal and there should be provision of hay rack and concentrate feeder.

Lambing or kidding pens: - These are the maternity pens. Pregnant ewes or nannies are housed individually in these pens. These pens shall be made draught free. Pens should be provided with some heating device, particularly in the cold season to keep the new born warm. Proper bedding with dries straw or saw dust helps better survival of the newborns. The pen is provided with hayracks and concentrate feeder.

Lamb / kid pen: - Lambs or kids from weaning up to attaining maturity are housed in these pens. Usually lambs / kids are housed in groups of 40-60 animals per pen. The pen is provided with hayracks and concentrate feeder.

Sick animal pen: - Away from the general pen, one or more (depending on flock size) sick animal pens of about 3 x 2 x 3 M size may be constructed. Such pen should be free from any contamination, well ventilated and with smooth surface so that harmful germs cannot grow or survive.

Shearing room: - This is the place where sheep are shorn and hence, a shearing room is required only on farms where sheep are kept for wool. This room should be well lit by having large glass windows all around. The floor should be cement paved and surface made smooth and a collecting room attached to it.

Accessory buildings: - Next to the shearing room shall be located the wool store for storing wool and shearing equipments. The room should be made dust and damp-proof. There should also be weighing yards, stores for concentrate mixture medicines, farm equipment etc. and shed for hay straw storage at convenient places. Another important structure required on a sheep farm is the dipping tank.

Building for milch goat: - Milch goats are rarely seen in Nepal, although Jamunapari goats in the western Nepal sannen and local goats in some town areas are being used as supplementary milk producers. All the goat milk is used only for home consumption in Nepal. When there is large number of milch goats the shed is divided into a number of stalls, one stall for each doe. This facilitates milking and stalls feeding of goats individually. The stalls may be arranged in two rows with a passage between them. The dimension should be 1.2m x 0.8m.

Lecture 13: Housings requirements- types, floor space, feeder and waterer and construction materials for pig and poultry

Poultry Housing

Poultry is housed for comfort protection, efficient production and convenience of the poultry man.

Essentials of Good Housing:

Comfort: The best egg production is secured from birds that are comfortable and happy. To be comfortable a house must provide adequate accommodation; be reasonably cool in summer, free from draft and sufficiently warm during the winter provides adequate supply of fresh air and sunshine; and remain always dry. Given these the hen responds excellently.

Protection: Includes safeguards against theft and attack from natural enemies of the birds such as the fox, dog, cat kite, crow, snake, etc. The birds also should be protected against external parasites like ticks, lice and mites.

Convenience: The house should be located at a convenient place, and the equipment so arranged as to allow cleaning and other necessary operations as required.

Location of Poultry House:

In planning a poultry house, the location should be taken into consideration. In selecting site for poultry houses the following factors should be considered.

1. Relation to other building: The poultry house should not be close to the home as to create unsanitary conditions. On the other hand it should not be too far away either because this will require more time in going to and for in caring for the birds. In general at least three trips should be made daily to the poultry house in feeding, watering, gathering the eggs, etc.

2. Exposure: The poultry house should face south or east in moist localities. A southern exposure permits more sunlight in the house than any of the other possible exposures. An eastern exposure is almost as good as a southern one. Birds prefer morning sunlight to that of the afternoon. The birds are more active in the morning and will spend more time in the sunlight.

3. Soil and drainage: If possible the poultry house should be placed on a sloping hillside rather than a hilltop or in the bottom of a valley. A sloping hillside provides good drainage and affords some protection. The type of soil is important if the birds are to be given a range. A fertile well drained soil is desired. This will be a sandy loam rather than a heavy clay soil. A fertile soil will grow good vegetation which is one of the main reasons for providing range. If the poultry house is located on flat poorly drained soil, the yards should be tiled otherwise the birds should be kept in total confinement.

4. Shade and Protection: Shade and protection of the poultry house are just as desirable as for the home. Trees serve as a windbreak in the winter and for shade in the summer. They should be tall, with no low limbs. Low shrubbery is no good as in their presence the soil becomes contaminated under the shrubbery, remains damp/ and sunlight cannot reach it to destroy the di

ease germs. One thing we should remember that plenty of sun shines should be available at the site.

Housing requirements:

Floor space: The smaller the house the more square feet are required for each hen. Bigger pens have more actual usable floor space per bird than smaller pens. The recommend at as suggested might be useful regarding floor, feeders and watering space.

For economic production of laying hens it is always better to keep them in small unit of 15 to 25 birds. This number can go up to a maximum limit of 250 birds. In commercial poultry farms units of 125 or so are advisable. Where there is a long house, partitioning at every 20 feet should be made to eliminate drafts, etc.

Ventilation: Ventilation in the poultry house is necessary to provide the birds with fresh air and to carry off moisture. Since the fowl is a small animal with a rapid metabolism its air requirements per unit of body is high in comparison with that of other animals. A hen weighing 2 kg and on full feed, produces about 52 liters of CO₂ every 24 hours. Since CO₂ content of expired air is about 3.5 per cent, total air breathed amounts to 0.5 liter per kg live weight per minute. A house that is a tall enough for the attendant to move around comfortably will supply far more air space than will be required by the bird's that can be accommodated in the given floor space.

Temperature: Hens need a moderate temperature of 50°F to 70°F. Birds need warmer temperature at night, when they are inactive, than during the day. The use of insulation with straw pack or other materials, not only keeps the house warmer during the winter months but cooler during the summer months Cross ventilation also aids in keeping the house comfortable during hot weather.

Dryness: Absolute dry conditions inside a poultry house is always ideal condition dampness causes discomfort to the birds and also gives rise to the diseases like colds, pneumonic etc. Dampness in poultry house caused by: (1) moisture rising through the floor; (2) leaky roofs or walls; (3) rain or snow entering through the windows; (4) leaky water containers; (5) exhalation of birds.

Light: Daylight in the house is desirable for the comfort of the birds. They seem more contented on bright sunny days than in dark, cloudy weather. Sunlight in the poultry house is desirable not only because of the destruction of disease germs and for supplying vitamin-D but also because it brightens the house and makes the birds happy. Birds do fairly well when kept under artificial lights.

Sanitations: The worst enemies of the birds, i.e., lice, ticks, fleas and mites are abundant in poultry houses. They not only transmit diseases but also retard growth and laying capacity. The design of the house should be such which admits easy cleaning and spraying. There should be minimum cracks and crevices. Angle irons for the frame and cement asbestos or metal sheets for the roof and walls are ideal construction materials, as they permit effective disinfection of the house. When wood is to be used, every piece should be treated with coal tar, cresol, or similar

strong insecticides before being fitted.

Purpose of Housing

- To protect birds from inclement weather like excessive heat or cold.
- To protect birds from direct sun rays and rain.
- To minimize effect of dampness, especially in rainy season.
- To provide safety from their predators like dogs, cats, foxes wild animals etc.
- To apply scientific management practices easily for improving productive performance.
- To provide suitable atmosphere for expression of full genetic potential.

Essentials of Good Poultry House Location

- There should be good drainage facility. Sandy loam type of soil is desirable.
- The elevation should be higher than surroundings.
- The house should be such that the floor is well exposed to sunlight.
- Protection from wind.
- Market should be near.
- Availability of cheap labor.
- Availability of water and electricity.
- Good transportation facilities.
- Surrounding should be safe, clean and peaceful.
- Other infrastructures like bank, school, post office etc. should be near.

Layout Plans for Poultry House Construction

The following points must be taken into consideration while making the layout plans for the poultry house.

1. Orientation of House

The orientation should be such that the morning sunlight should enter the poultry house.

- East west direction
- Width wall facing West and East.
- Length wise sides to North and South.

2. Foundation of House

The foundation of house should be raised to about 0.6-0.9m height to avoid dampness and to keep out surface water during rainy season.

3. Floor

The floor should be moisture proof, plain, free from cracks and crevices and easy to clean.

4. Walls and Partition

Partition is done of 1m height of bricks and cements lengthwise. And above that wire-netting is better to maintain effective cross ventilation. Full wall was made in breath wise.

5. Ventilation

In case of brooder house in cage system, small ventilation of about 0.4m width and 0.6m length are installed in every 3m section of side walls on both sides of house. The center height of house is about 10ft and side height of 6ft is optimum.

6. Doors

It is placed to side walls facing North or South. 1m wide and 2m height is desirable. Small disinfectant ditch at the entrances as a footbath should be managed.

7. Width of Poultry House

For effective cross ventilation needed 6.20-9.0m. If greater than 9m, birds in centre of houses are severely deprived of adequate ventilation.

8. Length of Poultry House

As per your need

Types of Housing System of Poultry

Brooding, housing system of poultry can be categorized into the following types:

1. Free Range System

This is the oldest method and now has been replaced by intensive system due to relatively more advantages. A range should provide shelter, greens, feed, water, shade and safety. Foraging is the major source of feeding for birds. The average stocking density of adult birds in this system is 250 birds per hectare. Scientific management practices cannot be followed in this system. Hence this system is not suitable for commercial purpose.

2. Semi-Intensive System

In this system, birds are confined to house in night time but they are also given access to runs. Generally, outside run of 16-24 sq. m per hen is provided. In this system also there is only slight control over birds and scientific management practices cannot be applied.

3. Intensive System

Birds are totally confined to houses. For the commercial production of birds, intensive system is used.

Advantages of Intensive System

- Minimum land is sufficient.
- Scientific management can be employed.
- Production performance is better.
- Saving of labors.

Types of Intensive System of Housing Deep Litter System

The bedding materials like rice husk saw dust, ground-nut hulls or sugarcane bages called litter are used to rear birds on floor.

Advantages of Deep Litter System

- Safety to birds.
- Birds receive nutrients like Riboflavin, Cynocobalamin and 'Animal Protein Factor' from the litter.
- Litter is a bad conductor of heat, so provides warmth in cold weather.
- Excellent manure is produced.
- Germs like Salmonella are killed by heat produced by fermentative action.
- Control of humidity in the house.

Disadvantages of Deep Litter System

- If not cared properly, remains moist and full of foul smell.
- Damp litter produces ammonia which can be problematic.

- If not cared properly, problem of Coccidiosis may be seen.
- Requirement of balance feed at all times.

Litter Management

The success of deep litter system mostly depends on skillful management of litter during entire period of rearing. Caking of litter should be avoided. For this regular stirring of litter should be done. The waterer should be checked for leaking of water. The wet litter should be removed and may be replaced with fresh ones. The ammonia level produced by litter should not exceed 25ppm. Proper ventilation should be maintained to keep litter dry. To control dampness in litter mix 1kg lime or 0.5kg superphosphate per 15 sq.ft floor area.

Cage System

It is the more intensive type of poultry production and involves rearing of poultry on raised wire netting floor in smaller compartments called cages. This system has been proved very efficient for laying operations. Feeders and waters are attached to cages from outside. The droppings are either collected in trays underneath cages or on belts for it or on the floor or deep pit under cages, depending on types of cages.

Advantages of Cage System

- Less space per bird is required. Generally one third spaces as compared to deep litter.
- Better flock supervision.
- Pecking and cannibalism minimized.
- Saving of labor.
- Better disease prevention and control of infection.
- The major litter borne problem like Coccidiosis are eliminated.
- Less mortality rate.
- Less expensive on medication.
- The cost of litter and litter management problems are totally eliminated.
- Definite feed saving up to 10gm/bird/day.
- Breakage of egg is reduced.

Disadvantages of Cage System

- Initial investment is higher.
- Sometimes problems of “Cage Fatigue” may be observed in overweight birds.

Types of Cages:

1. Stair-Step (reverse) type Cage

It is also known as California type. The compartments are arranged step-wise in two or three tiers on stands in two or three rows. Droppings may fall on ground or in deep pit under cages. The droppings may be removed once in 6 months or after 12 months.

2. Battery Cages

It is also known as Vertical cages. The compartments of cages are arranged one above the other on stands with a tray or shift belts under the compartments for collection of droppings. Droppings are preferably removed every day or at least on alternate day in this system.

3. Flat Deck Cages

This is a single tier cage system popularly used for rearing chicks up to 8 wks, for easy handling of them in modern methods of poultry production and management. Each cage is usually 1m

square block fitted on stand. Lengthwise each cage is divided into two compartments and each compartment consists of 20 chicks. Up to 4wks of age, waterer are provided from width wise and then from both the sides (length and breadth). Feeders to cages are attached to both sides of length wise. Dropping can be easily removed along with the shifting of chicks to grower houses at 8 wks of age.

Floor space requirement in different system

System	Age	Floor Space/ birds
Deep litter	0-4 wks	0.5 sq.ft
	4-8 wks	1.0 sq.ft
	8-12 wks	1.5 sq.ft
	12-16 wks	2.0sq.ft
	16-20 wks	2.5 sq.ft
	More than 20wks	3.0 sq.ft
Cage system	0-6wks	33 sq. inch
	6-18wks	45 sq. inch
	Above 18 wks	72 sq. inch

Brooding of Chicks

Care and management of chicks is known as brooding of chicks. In case of broilers, till four weeks of age and in case of layers till six to eight weeks of age are called chicks. Brooding plays a major role in growing efficient layers and broiler finishers as it is development period for body of birds. This is a very sensitive period because chicks do not have ability to regulate body temperature for the first five days and thermoregulatory system is not fully developed until two weeks of age. Extra effort during the brooding phase will be rewarded in final flock performance. Brooding of chicks has following components:

Temperature

Chicks require appropriate temperature. Variation towards higher or lower leads to more mortality or slower growth. Temperature is usually measured at level of 6cm above floor and 6-8cm inside the edge of warm zone of brooder.

Age (week)	Brooder temperature (°F)	House temperature(°F)	Age (week)	Brooder temperature (°F)	House temperature(°F)
1	95	81	5	75	61
2	90	76	6	70	56
3	85	71	7	70	56
4	80	66	8	70	56

Too high or too low temperature results in slow feathering; retarded growth; piling; pecking and mortality. Behavior and distribution of chicks under and around the brooder is the best guide for judging correctness of temperature instead of thermometer.

Device for providing artificial heat is called brooder. Electric hover or canopy is used commonly.

Height of brooder depends on need of brooding temperature but at least 10-14cm clear space above chicks. Bulbs of different intensity like 200, 100 or 60 watts can be used to reduce or increase temperature. Infra-red lamps of 250 watts can also be used with an added advantage of germicidal effects of org

Chick Guard

Chick guards are placed as a barrier to avoid straying away of birds from heat source. Guard area should be gradually expanded and removed after 7-8 days. Cardboard or metal sheet of 45cm height placed in a circular manner at a distance of 85-90cm from the edge of brooder and can be increased to 130cm as age advances.

Floor Space

System	Age (weeks)	Floor space/bird (sq. ft.)
Deep litter system	0-4	0.5
	4-8	1.0
	8-12	1.5
	12-16	2.0
	16-20	2.5
	>20	3.0
Cage system	0-6	33 sq. inch
	6-18	45 sq. inch
	>18	72 sq. inch

Feeding and Watering Space

Age (week)	Feeding space/ chick (cm) Linear type	Watering space/ chick (cm) Linear type
0-2	2.5	0.25
3-6	4.0	1.0
7-12	7.5	1.0
>13	10.0	1.5

For efficient growth of chicks frequent feeding (4-5 times) in a day with ad-libitum fresh water.

Litter or Bedding

Rice husk saw dust, groundnut hulls, straw etc. are used as comfortable bedding material for rearing poultry. Spread the litter/ bedding material with depth 4-5cm and increase to 8-10cm as age advances. Daily stirring should be done to avoid caking and to keep dry and loose to reduce ammonia odor. On an average, litter should contain around 18-24% of moisture.

Ventilation

Brooder should be well ventilated for excellent growth performance and health of birds. High moisture level also can lead more ammonia fumes causing irritation of eyes and respiratory distress. Level of ammonia should be below 25ppm and carbon-dioxide should be below 0.5% and oxygen availability should be 21%. Excessive dust causes irritation of respiratory tract and increase disease incidence.

Light

Generally chicks are provided with continuous light; sunlight in day time while in night, with using electric bulbs or tubes up to 8 weeks of age. Light helps in faster development of feathers, increased feed intake and essential for vision.

Housing of Swine

Good housing with adequate accommodations incorporating all essential requirements of pigs must be provided so that the animals can grow quickly and efficiently. This is only possible through scientific housing which includes the provision for fresh air, exercising, sunlight, protection from inclement weather conditions. Care, management, comfort and safe of the pig have to be considered. Breeding pigs should be kept in proper house for obtaining quick growth, efficiency and economic return. Pig house could be constructed in a single or double row of pens with a walking space in between. The pen should be facilitated with feed and water trough at convenient place or keeping the room dry and warm. Door facility should be provided in each pen for easy movement of pigs from one room to another. The house should be constructed at cement mortar for making strong and roofed for protection from unfavorable weather conditions. Each separate pen should be facilitated with run yard that is used to obtain fresh air, sunlight, for doing exercise and to dung at one corner. It is recommended to maintain different stock in separate rooms for convenient management. It becomes economic to maintain growing stock of same age fattened in a room. There should be separate isolation box for sick animals.

Systems of Housing Pigs

i) Open air system

ii) Indoor system

A combination of these two is however practiced in most of the parts of various countries. The size of the enterprise, the type of pigs to be reared or produced, the availability of land and the climatic conditions, management system (pasture or indoor) are the guiding factors for choosing the housing system. In case of farms with small holdings no special purpose pig house is necessary but in a specialized farm accommodating a large number of animals, there may be the necessity of constructing special purpose house for different categories of stocks e.g. breeding stock and store pigs.

Location

The farm should be located near the city or location where there is a heavy demand of pork products (for minimizing the cost of transport) and it should be accessible by road. Proximity to public utilities like electricity, water supply and other necessary facilities like labor, good drainage system should be available or accessible. The buildings should be situated in such a way that doors and windows will receive maximum sunlight and the pigs will get shelter from prevailing direction of wind.

Constructional Details

Floor
One of the essentials of a big building is a warm, dry bed free from draught. Floor should be hard, impervious to liquid and easy to clean. A concrete floor should be laid on a hard foundation with a rough surface.

Roof

It should be water proof and should not be a bad conductor of heat. R.C roof or tiles are excellent

for this purpose. In colder regions the roof should be insulated. Thatched roof or tiled roof may also be provided in pig housing.

Wall

Walls should be 4'-5' high from the floor. Brick and concrete are the best materials for the construction of walls for a height of about 3' from the floor while the remaining 1 or 2 feet may be of wood or 1" G.I Pipes. Wood can also be used but it must provide a flush surface to pigs, otherwise will gnaw it.

Troughs

About 72-80% of cost of pig production is debited to food. So the position and construction of feed trough is considered to be an important factor. A trough space of about 12 inches should be provided to each swine to facilitate proper feeding without scrambling and fighting. All troughs should be strong, easy to clean and fitted in such a way that pigs cannot tilt them.

Water Supply

It is required for cleaning and drinking purpose. Fresh drinking water should always be available to the pigs all the year round. Automatic drinking bowls are the best way for providing water to pigs but too costly.

Floor Space Requirements

Floor space requirements are generally influenced by system of management, age and size of animals. Generally following floor spaces are recommended:

Fattening Pigs: 10-16 sq.ft per pig Fattening pigs in yards: 30-40 sq.ft per pigs

Farrowing pigs: 60-80 sq.ft per sow and litter Boar pens: 40-50 sq.ft per pig

Description of Permanent Buildings

Boar Pen

In the conventional house-breeding boar should be individually housed in separate strong pen having nearly 50 sq.ft enclosed floor space and 120 sq. ft. yard for run. The breeding boar uses the yard for runway, obtaining fresh air and sunlight and even dung at one corner. The height of the pen should be not less than 4 1/2 ft. high. Boar pen should be so arranged that the breeding gilts and sows maintained in the house be able to see and smell each other for stimulates sexual behavior.

Farrowing Pen

Provision of a separate breeding house is preferred. The pregnant sow should have separate pen for farrowing and rearing litters up to the stage of weaning. The pen should have floor space of 60-80 sq.ft attached with 120sq. ft. yard for run. The yard is usually used for obtaining fresh air, sunlight, running and to dung at one corner. The feeding trough and drinking water facility should be located inside the enclosed pen at convenient place and the pen should be dry and warm. A creep space should be made at one side of the pen to coop or brood the newly born piglets, where heating is arranged. The creep space is separated by guardrails of G. I. pipes where only piglets can enter but not the sow. the piglets should be fed creep feed at this creep space since third day of their birth to weaning.

Dry Sows and Gilts House

They do not require any special accommodation; however, dry sows and gilts could be housed in separate pens away from main breeding pen. Separate feeding, water trough and runway arrangements can be made available. They could be either kept individually in a pen or in-group in a large room. Each pig requires about 40 sq. ft. floor space for comfortable accommodation.

Weaners and Fatteners Pen

Weaners and fatteners of same age can be housed in separate pens having feeding, water trough and runway facilities. Fattening pig is required nearly 10-16 sq.ft. of floor space individually.

Segregation Shed (Isolation Box)

In the intensive system of pig keeping there is always chance of becoming some pig sick. The sick pigs should be timely identified, separated and kept in a segregation house away from the main units. Here the sick pig should be treated and kept on observation unless it is not properly cured.