Dairy Cattle and Buffaloes Production and Management

Practical Manual on Dairy Cattle and Buffaloes Production and Management

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EXERCISE-1
STUDY OF EXTERNAL ANATOMY/BODY PARTS OF CATTLE, BUFFALO, SHEEP AND GOAT

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India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it

(Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized

and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods

in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

Objectives:

A person working with animals should have proper knowledge of the different parts of theanimal body for the following reasons:

1. To judge the utility of animal. Degree of development of certain parts of the animal body has relationship with the usefulness of the animal e.g. size of the udder and milk production in lactating animals, development of legs and ability to work in working bullocks etc.
2. The knowledge of external anatomy or body parts is essential for classification/recognition/registration of breed of animal.
3. For giving exact information and communication at the time of sickness, injury, theft, sale and purchase of animal etc.
4. To know about the sex as well as the general health/sickness of the animal.
5. The student must be acquainted with different terminologies of animal body parts.
   For the convenience and ease of understanding the body parts, the cattle/animal's body is arbitrarily divided into five regions, viz.

(A) Head
(B) Neck
(C) Body or Barrel
(D) Fore limbs or Fore quarters and
(E) Hind limbs or Hind quarters.

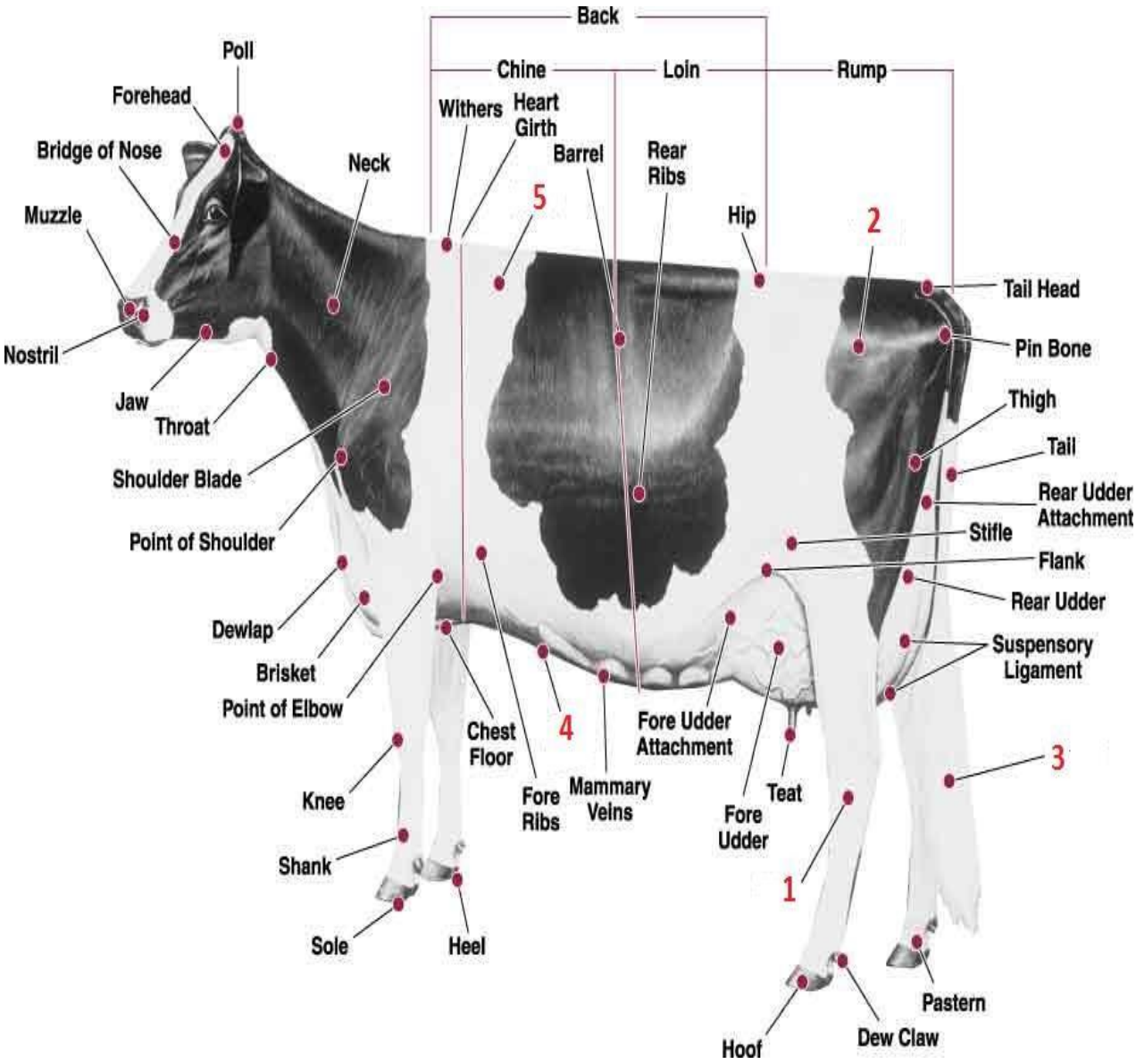
The External Body Parts of a Cow:

(A) Head :

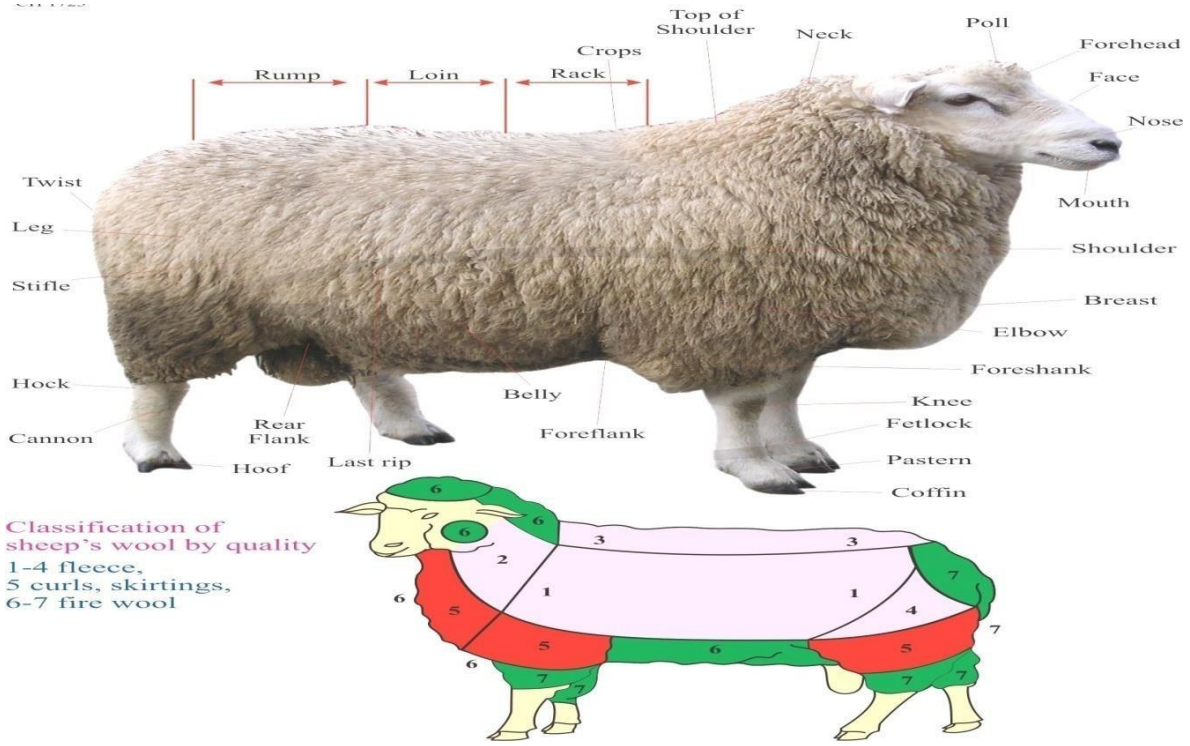
1.	Mouth	:	Lips, tongue, teeth, jaw and dental pad, organ of prehension.
2.	Horn	:	Generally black in young age and yellowish black in old age. Insome breeds they are pinkish yellow. The rings are present on horn. A) Tip of the horn B) Base of the horn.
3.	Head crest	:	The portion between the bases of horns.
4.	Fore head	:	The portion situated below the head crest and above the level of two eyes. It is flat, dishy or bulging in shape.
5.	Face	:	It is the portion below the level of two eyes up to the muzzle.

6.	Poll	:	It is the bulging portion situated at the middle top centre of the fore-head.
7.	Cheeks	:	Lateral portion of the face below the eyes on both the side.
8.	Chin	:	Portion below the lower lip. It is fleshy and pink in colour.
9.	Muzzle	:	The projecting part of the head including the mouth, nose and jaws.

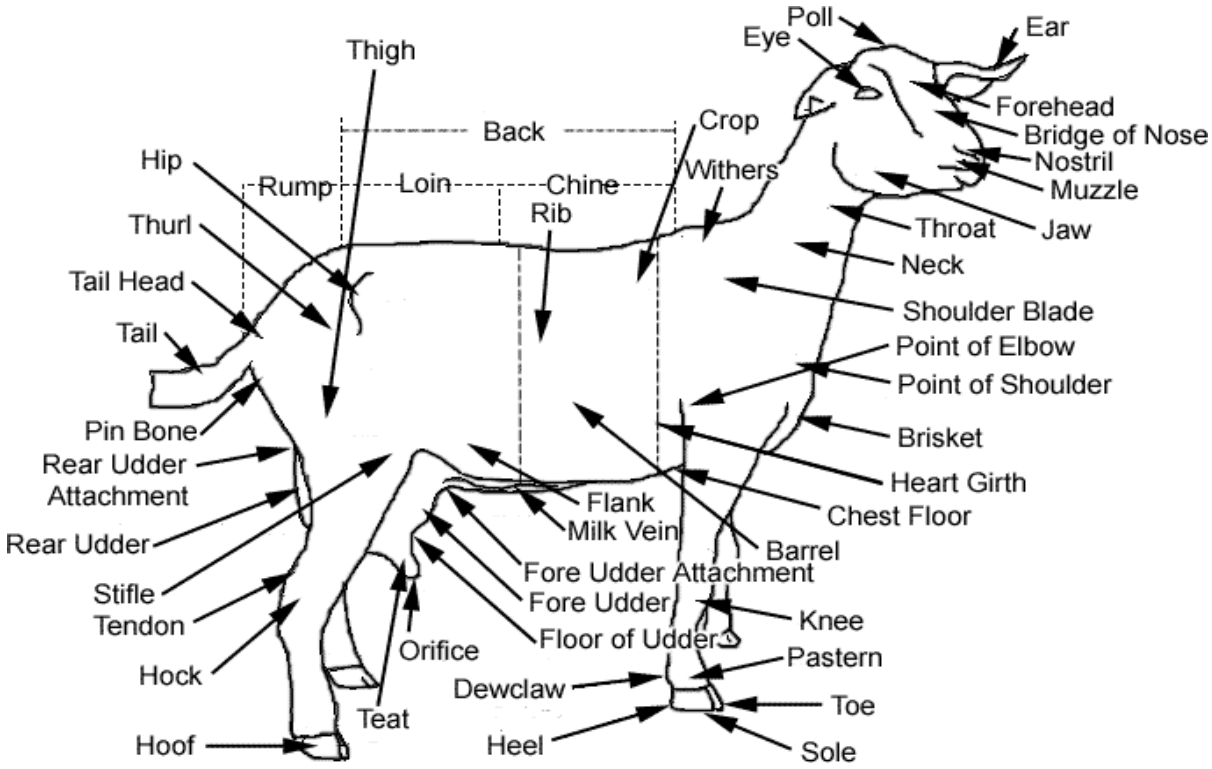
10.	Muffle	:	Fleshy bare part of the upper lip and nose. Generally it is black. In some breeds it may be pinkish or spotted. It is wet with droplets of water in healthy animals. It has specified line and marking into muzzle print.
11.	Nose	:	It has two nostrils.
12.	Eye	:	Eye brows, eye lids, eye lashes and eye ball.
13.	Ear	:	Tip of the ear, fringe of the ear and base of the ear. They are erect to pendulous in shape.



External Body Parts of Cattle



External Body Parts of Sheep



External Body Parts of Goat

(B) Neck :

1.	Neck crest	:	It is the upper portion of the neck between head crest andhump/points of withers. It is the portion where yoke is placed in bullocks.
2.	Dewlap	:	A hanging loose, wavy fold of skin between chin and brisket. It is more developed in tropical breeds of cattle and helps in heat dissipation. European cattle possess less developed dewlap.
3.	Brisket	:	A fleshy bulging mass between and in front of the fore limbs.
4.	Jugular groove	:	A groove running down the neck above the wind pipe.

(C) Body or Barrel :

1.	Hump	:	The bulging fleshy mass between neck crest and back.
2.	Point of withers	:	Point just behind the hump located between the two shoulder blades.
3.	Back	:	Portion between point of withers and the last ribs.
4.	Loins	:	The triangle formed by joining the head of last ribs to the two hook bone.
5.	Sacrum	:	Portion from middle point of two hook bone and ending near the croup or root of tail.
6.	Rump	:	Sloppy/encircling portion on either side of the croup between the hook bone and pin bone.
7.	Hook-bone	:	It is the prominent bone on either side of the root of tail (tuber ischii).
8.	Pin bone	:	It is also the prominent bone on either side of the root of tail (tuber ischii).
9.	Tail	:	A distinct flexible appendage extending from the rear end of the animal’s body.
10.	Switch	:	Bunch/tuft of hair at the end of the tail.
11.	Chest	:	Portion between two fore limbs just behind the point of elbow.
12.	Heart girth	:	The circular measurement around chest.
13.	Ribs	:	Thirteen pairs.
14.	Hollow of the flank	:	The depression of the abdominal cavity between last rib and hook-bone which is triangular in shape.
15.	Flap of the flank	:	Thick skin hanging between hind limb and abdomen.
16.	Navel	:	Point on the lower side of the belly, left by dropping off thenavel cord through which embryo receives nutrition and oxygen from the mother and gives off the waste products.

17.	Udder	:	Structure containing mammary glands of cows. It has four quarters each having one separate teat. Degree of development of udder generally shows the capacity for production of milk. The teats are well placed at equal distance, shows even development of udder.
18.	Milk vein	:	Situated on either side of abdomen between udder and milk well. It is zigzag and carried impure blood from the udder tothe heart.
19.	Milk well	:	It is point on either side of the chest where the milk vein enters into the body cavity.
20.	Milk mirror	:	The bare yellowish portion extending from below the vulva up to the udder.
21.	Anus	:	Posterior opening of the alimentary canal.
22.	Vulva	:	External female uro-genital organ reflect that female is in heat or not.
23.	Supernumerary teats	:	Extra teats which are non-functional. They may be removed.

(D) Fore Quarters :

1.	Shoulders	:	Portion between the points of withers and point of shoulder.
2.	Point of shoulder	:	It is a prominent joint of shoulder situated between point of withers and the elbow joint.
3.	Arm	:	Portion between point of shoulder and point of elbow.
4.	Fore arm	:	Portion between elbow joint and knee joint.
5.	Knee joint	:	Joint between fore arm and shank.
6.	Cannon	:	The portion between knee joint and fetlock joint.
7.	Fetlock	:	Joint between the shank and pastern.
8.	Pastern	:	Round portion between the fetlock joint and coronet.
9.	Coronet	:	Hairy streak just above the hoof.
10.	Hoof	:	It has two digits, black in colour in case of cow and buffaloes.The space between the two digits is known as interdigital space.
11.	Dewclaw	:	Rudimentary hoof, two in number on each leg.

(E) Hind Quarters/Limbs :

1.	Point of hip or hook bone	:	The external angle of ileum occurs as a bony prominent on either side of loin.
2.	Hip joint	:	The prominence formed over the hip joint by the greater trochanter of the femur.
3.	Stifle	:	The joint between femur, patella and tibia. Situated between hip joint and hock joint at the flap of flank.
4.	Thigh	:	The region between the hook bone and pin bone on upper side and hock joint on lower side.

			Upper thigh – Portion up to stifle. Lower thigh – Portion from stifle to hock joint.
5.	Hock joint	:	The complex joint formed between lower thigh and cannon. Itis made due to union of tibia and fibula, bones of hock and metatarsal.
6.	Hock point	:	The upper most extremity of the hock joint.
7.	Tendo- Achilles	:	The large tendon attached to point of hock. The milk man's or achilles tendon rope is tied on the tendon of the cows to prevent kicking or hamstring while milking. Parts below the hock joint are similar to those found in fore quarters.

Points of Bull/Bullock :

1.	Scrotum	:	It is pouch in which testicles are situated.
2.	Testicles	:	Two in number, found inside the scrotum and produce sperms.
3.	Penis	:	Male uro-genital organ of copulation.
4.	Sheath	:	Outer covering of the penis.

Questions:

1. Draw the figure of cow and goat and point out the different body parts.

2. Write the importance of muffle, neck crest, hollow of the flank and udder in dairylivestock.

3. Enlist the joints of fore and rear quarter of animal.

4. Differentiate the male and female animal from their body parts.

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EXERCISE-2
EXTERNAL BODY PARTS OF SWINE & POULTRY

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India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma,

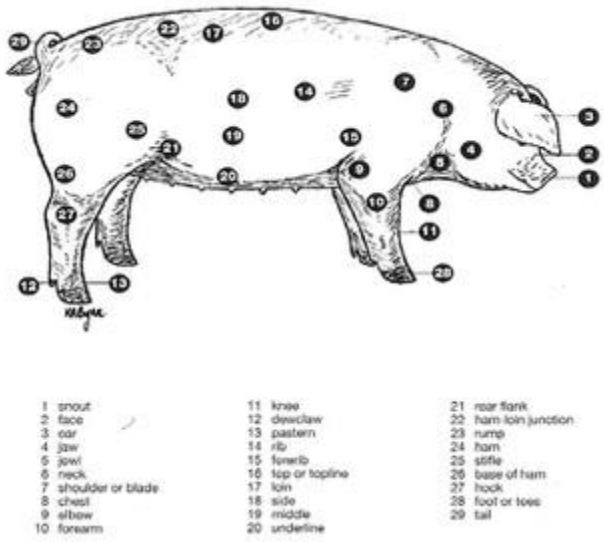
2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk

approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra

2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

External Parts of the Pig

It's important to know the words used by swine producers. When you know and use the right words, other people who own swine will be able to understand you.



Parts of the Hog. Click on image to enlarge. (Graphic by Keith Bryan)

The parts of a pig's body have special names. Some parts have the same names as the meat products produced from them. For example, the upper hind leg of a pig is called the ham. Ofcourse, this is where the ham we eat comes from.

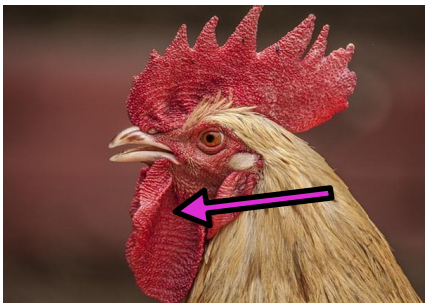
Learn the terms listed on the diagram on this page. On a sow or gilt, you also should be able to identify the underline (teats) and vulva. On a boar, you also should be able to locate the scrotum, testes, and sheath.

External Body parts ofChicken



1- Comb

- Comb is a fleshy growth.
- both male and female havecomb.
- most common shape "**single comb**“



2- Wattles

- The soft meat hanging from the two side of chicken beak is known as **wattle**.

The functions of wattle & comb is?

Cooli

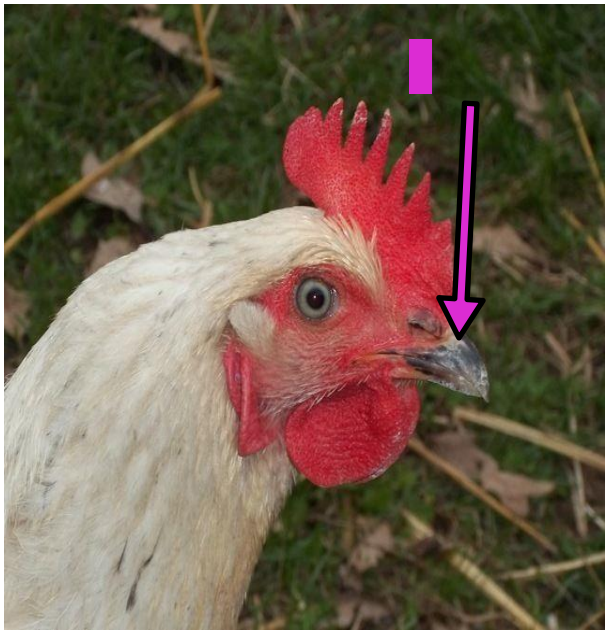
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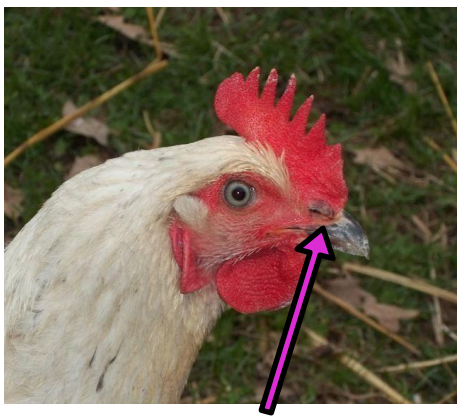
3- Nostril

- The nostril of chicken is near on the joint place of beak and comb.

4- Beak

- Beak of chicken is on the frontside of head.

Serve many purpose?



Eating

Feeding

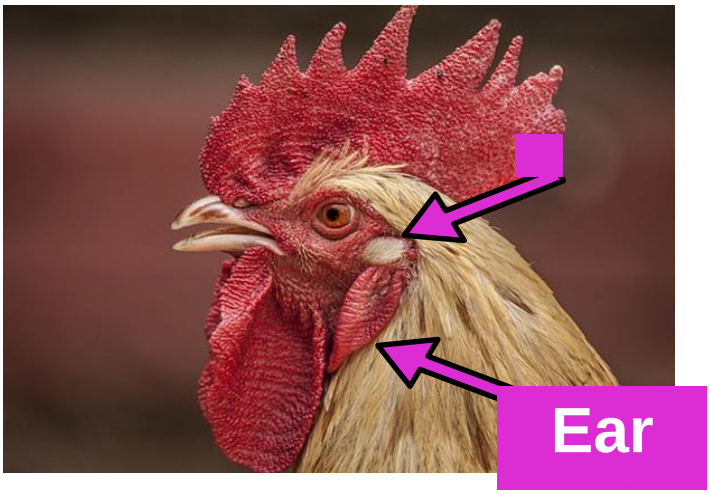
its

young

As a weapon

5- Ear Lobes

- The hanging skin from chicken ear is known as **ear lobe**.
- There is various colored ear lobe of chicken.
- Ear lobes can help determine what color eggs your hen will lay.



6- wings

- The chicken has two wings.
- Chicken's **wing** has several flight feathers, the **axial** feather separates the **primary** feathers and **secondary** feathers.



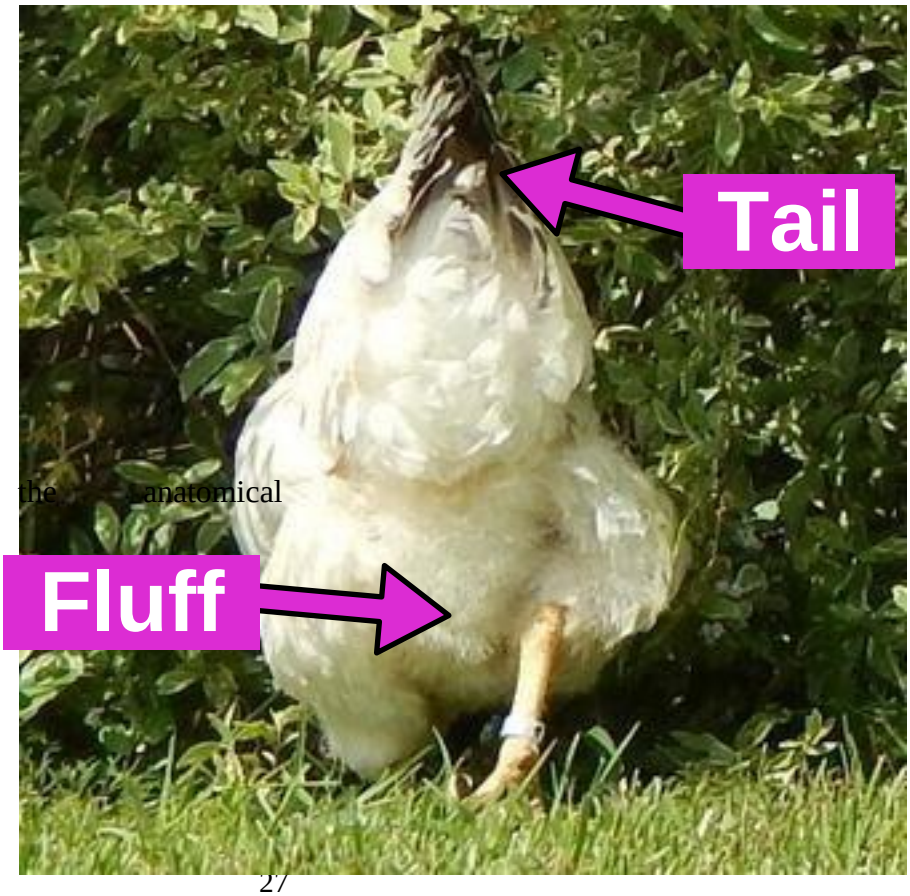
7- Tail

- Both cock and hen have a tail.
- The feather of tail of cock get curved to down when it became big sized and itlooks like a **sickle**.
- Hens don't have feather.



8- Vent

- a chicken's vent is the opening where she expels waste AND lays her eggs.
- It's all one thing!
- "**Cloaca**" is the anatomical term for vent.



9- Spurs



- is a **sharp-Horn protrusion** that can grow on the legs of chickens, and is used for **fighting and self-defense**.
- Although all chickens have the potential to grow spurs, large spurs are most common on **roosters**.
- Hens can and sometimes do have large spurs, but generallydo not.

10- Leg

- The chicken has a pair of leg and every leg consist of:

1) **Hock**: Joint between the thigh and shank.
2) **Shank**: The portion of chicken's leg below the hock.
3) **Toes**: Most chickens have three toes projecting forward and one projecting back, sometimes referred to as **Claws.**



Type of feathers on chicken body

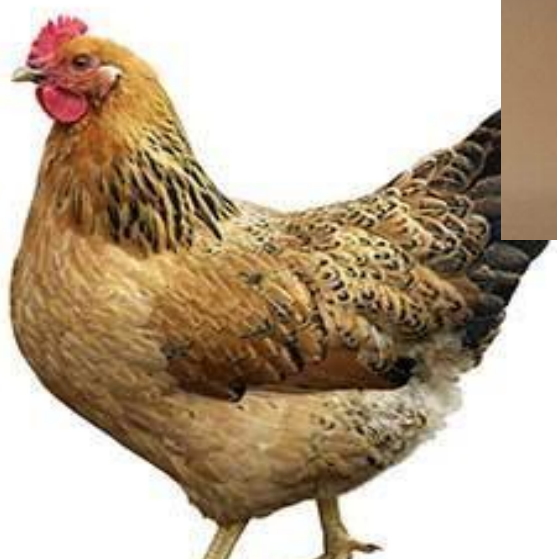
1. Hackle Feathers.
2. Saddle Feathers.



Type of feathers onchicken body

3. Sickle Feathers.
4. Fluff.



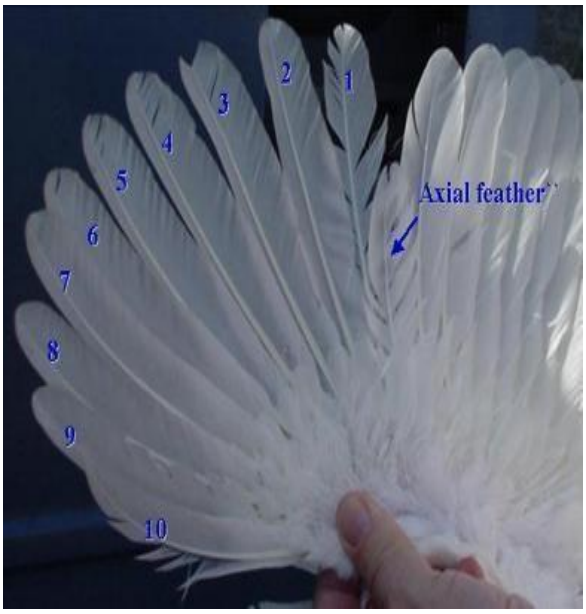


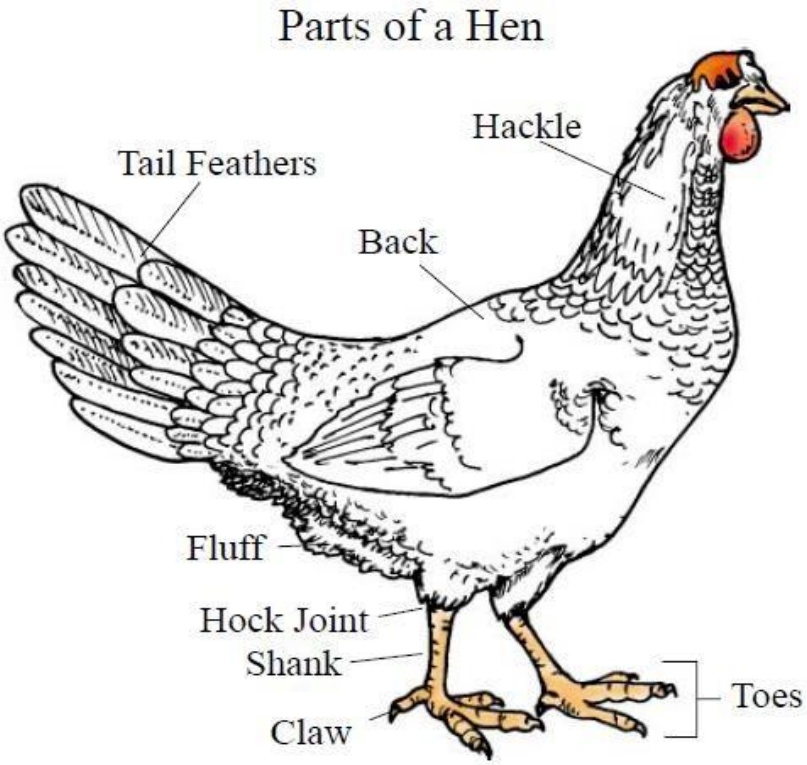
5. The feather on the wings:

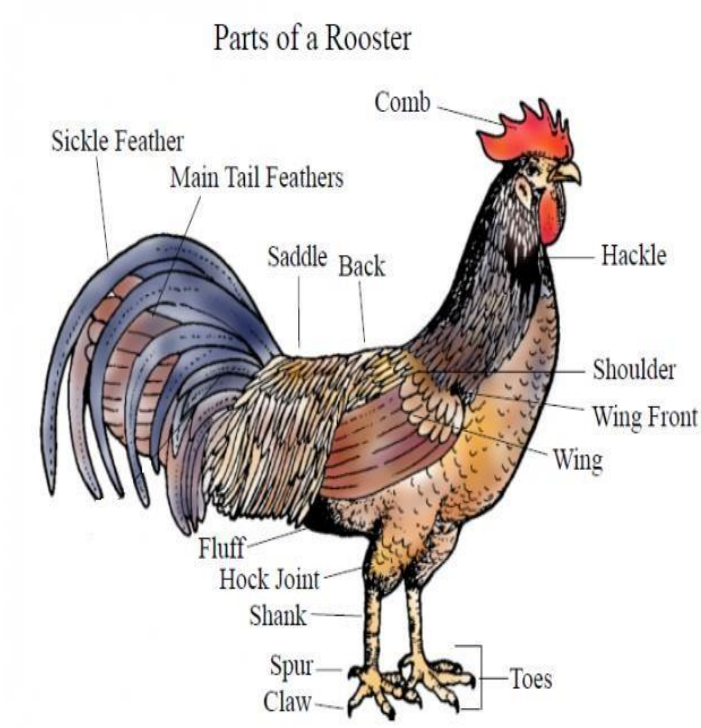
a) **Primary Feathers**: Longer wing feathers growing from the outer section

b) **Secondary Feathers**: Longer wing feathers growing from middle section

c) **Axial Feathers**: Short feather between primary and secondary feathers of the wing.




Parts of a Hen
Hackle
Tail Feathers
Back
Fluff
Hock Joint
Shank
Toes
Claw



The differences between male and femalechickens:

1) The size of the comb and wattles.
2) The size of the spurs (in olderbirds).
3) The characteristics of the feathers.



Molting

- Shorter days … in autumnseason.
- To chickens, it is time to renew their feathers.
- Molting causes stopping egg production.



Order of the molt

- During the molt, feathers are dropped from the various parts of the body in a definite order,
- that is:

1. **head**
2. **neck**
3. **breast**
4. **back**
5. **abdomen**
6. **Fluff**
7. **wings**
8. **Tail**



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EXERCISE-3
HANDLING AND RESTRAINING OF LIVESTOCK

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India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma,

2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility,

and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

Farm animals are kept by their owners for economic motive. Therefore it becomes necessary to workwith them and handle them for various purpose viz.:

1. To take work from the animals like bullocks, horses and camels etc.
2. To milk animals like cows, buffaloes etc.
3. To control and restrain the animals for treatment, castration, breeding, giving identification marksetc.
4. Transport the animals after purchase, for sale or for shows and exhibitions.

The method/s of handling the animals will be different for the different animals. The factors governing the method and mode of handling the animals are as follows:

(1) Species, (5) Physiological status,
(2) Breed, (6) Age,
(3) Sex, (7) Familiarity-previous habit,
(4) Individuality, (8) Use of proper method.

1. Species: Animals of different species have different temperament, different body size and strength etc. A horse is more active, large and powerful animal as compared to sheep. The methods of their handling will be different.

2. Breed: Animals of different breeds react differently as they have temperamental differences. A Giror Sindhi animals will be very mild and docile as compared to a Kankrej or Khillar animal which would be very nervous and vicious. The latter are to be handled with more caution.

3. Sex: Sex difference is found to govern the temperament of animals. A breeding male i.e., bull, ram, buck, etc., may be more temperamental and vicious than the respective females viz., cow, ewe, or doe or castrated males viz., bullock, wether, etc., they are, therefore, to be handled with more caution and should be restrained better.

4. Individuality: Certain individuals may be more or less temperamental then others. While handling the animals, the temperament of the individual animal may be assessed from the behaviour of the animals and also from the past experiences of the workers and owners etc.

5. Physiological status: Female animals in heat and soon after calving are more nervous and excitable. The same animals after about mid pregnancy develop mild, docile temperament.

6. Age: Animals which are adult and old viz., cows, bulls etc., can be handled easily. Young animals viz., heifers, bull calves etc., are more likely to be nervous and mischievous.

7. Familiarity: With familiar persons and in familiar surroundings animals may be handled relativelyeasily. This very much depends upon the degree of previous handling i.e. the habit of the animals. Animals made used to tying, untying, grooming, and tying of the legs etc., give much less trouble in handling then those kept under ranching or semi-ranching conditions.

8. Use of proper method: If undue fear, pain, discomfort or excitements are caused to the animals while handling, they get unruly and wild. Teasing of a horse or a bull; rough, noisy treatment to a freshly calved heifer etc., are the examples of improper handling.

While taking work from farm animals or while milking, treatment, castration, applying identification mark, it becomes necessary that some of their activities or undue movement can be prevented. This process is called restraining and the contrivances/devices used for these purposes are called restraints.Some of the common restraints are as follows.

Muzzle



: Muzzles are used to prevent cattle; horses etc. eating their beddings, calves suckling their mother or bullocks eating grasses while inter culturing. There are two kinds of muzzle

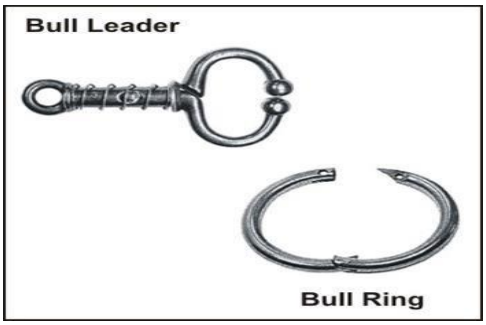
1. Wire muzzle or Coir muzzle
2. Leather box muzzle.

Bull-Nose Ring



: They are used for restraining powerful bulls. They are generally made in the semi-circular pieces joined together. They are made from non-rusting metals like steel, aluminium or brass. A hole is first punched with the help of bull nose punch in the nasal septum and then bull nose ring is fixed.

Bull Leader



: It is a long stick with sliding hook at one end and used to control the bull from close distance when applied on the bull nose ring.

Side Stick



: A specially prepared stick of desired length with ropes on either end or a simple strong-stick may be used for this purpose. It is tied at one end with the halter and the other end is held in a position by means of ropes. Side sticks are used to prevent animals licking medicines applied on the limbs and suckling their milk by her.

Mouth Gags : Gags are devices for keeping the jaws of animals apart for examination of mouth. Drinking pattern mouth gag is most suitable for cattle, other mouth gag (i.e. Vernell's mouth gag, Butler's mouth gag,wooden mouth gag etc.) are also used forintroducing the cattle probing.



Milk Man's Rope : It is applied by passing a thin rope around the joint of hind legs together and finally making a quick release knot of the free ends towards milkerfor milking.



Nose-Peg : It is made from wood having one end button shaped and other long end pointed with a round groove at central bar and used for restraining camels.



Travis or Crush : These are made of hard seasoned wood or metal tubing to restrain the animals in standing position. Now a day's Travis for large animals are available in various designs for specific use.

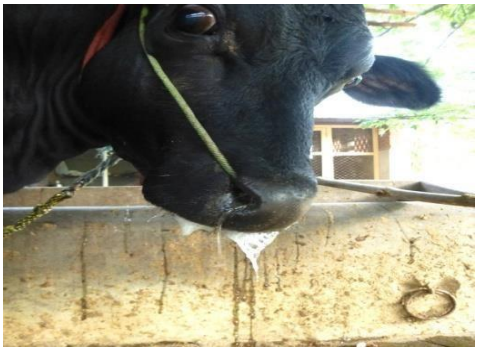


Halter



: Halters are made up of leather, but for farm animal's simple rope can be used.

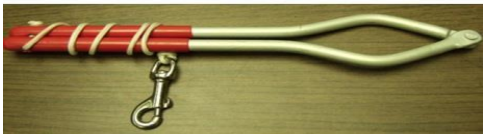
Nose String



: A thin cotton rope is passed through the hole made in nasal septum and behind the base of horn. Then both end of the rope is tied.

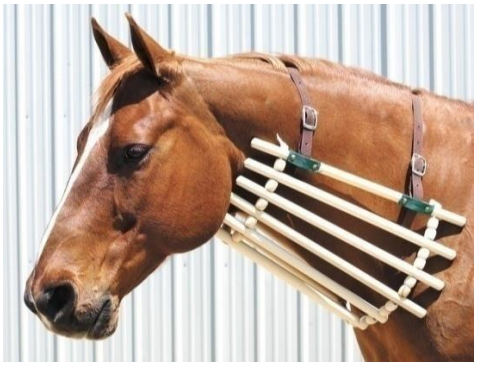
Twitch





: A twitch consists of a piece of stout wood about one meter long carrying a hole at one end. A loop of piece of rope is inserted through this hole. For applying a twitch, the horse should be halteredand held by an assistant. The rope is applied on the muzzle with left hand while holding the stick with right hand. After adequate grip on upper lip, twists up the loop by means of stick.

Cradle



: Ten or twelve pieces of wood are arranged on two pieces of cord. Two short pieces of wood board longitudinally are kept on either side of long pieces. It is useful to prevent a horse getting his head to a fore or hind limb in cases of blistering or wounds. It allows very little vertical or lateral flexion of head.

HANDLING OF SHEEP

Objective: To study various methods of handling of sheep for identification, castration, docking,crutching, shearing, weighing, drenching etc.

Catching:

For catching a sheep, take it long a fence or in a corner of yard in the group, follow it for a while and grasp it hurriedly either under the chin or neck and push it back. Generally ewes, hoggets and lambs can be held in the position simply by grasping under the chin and the rear flanks with two hands simultaneously. Some time a sheep can be held between two knees of the operator while the chin is kept grasped. As young and female sheep are mild and timid, they are not required to be secured rigidly. Under no circumstances the sheep should be caught by wool.

Controlling:

For castration place the ram lambs on its rump in sitting position. Draw each hind legs forward and upward inside the fore-legs. Hold the hock joints with four fingers and catch the fore- legs at the knee with your thumb. For docking same procedure is applied, but the back of the lamb is facing to the operator. For securing sheep in standing position "Y" shaped portable sheep stalk or small Travis can be used. For mass drenching or vaccination, sheep are driven through a catching penleading to a race.

Casting of sheep:

First stand on one side of the sheep body and catch the fore and the rear legs while passing your hands underneath the sheep. Gently pull the legs upwards. Allow the sheep to fall when it is rolling on your limbs. The legs are tied with ropes as in cattle.

Questions:

1. Enlist the common restraints used for restraining of bulls.

2. Name the animals in which nose string and nose ring are used along with the method ofapplication for restraining.

3. Enlist common restraints used for restraining of horses along with the method of application.

4. Define restraints and restraining.

5. Justify: Restraining of bull is more difficult than cow.

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EXERCISE-4
IDENTIFICATION METHODS OF FARM ANIMALS

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India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of

goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized

and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government

schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

If a herdsman has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance. But when the number is large, some systematic method of identification is necessary.

Objectives/Importance:

1. Identification of farm animals is essential for efficient routine management viz., breeding a cow inestrus, treatment of sick animal, recording milk production of animals etc.
2. It is necessary for registration as well as for insurance of livestock.
3. In case of loss or theft of animals, identification marks are useful.

Systems of Identification:

1. Name:

Name can be given to the animals after the place of purchase, owner, from physical appearance or on the names of rivers, gods etc. Generally this system of naming is used along with other systems of identification. This system is useful for small number of animals only while not applicable in large herd or flock.

2. Marking or Numbering:

Name alone is inadequate for large herd or flock for identification purposes. For this reason, system of giving identification marks or numbers should be followed.

(a) Tattooing:

This consists of piercing small letters and/or figures by steel points into the subcutaneous tissue by means of tattooing fork. The steel points carry small amount of tattooing ink into the subcutaneous tissues.

The part to be tattooed should be thoroughly scrubbed with methylated spirit to remove greaseand debris. Tattooing ink is applied over the parts. The desired number or figure fixed to the tattooingink is applied over the parts. The desired number or figure fixed to the tattooing fork is then firmly pierced. The ink is rubbed on the pierced mark of the part with the thumb.



(Tattooed Dog)

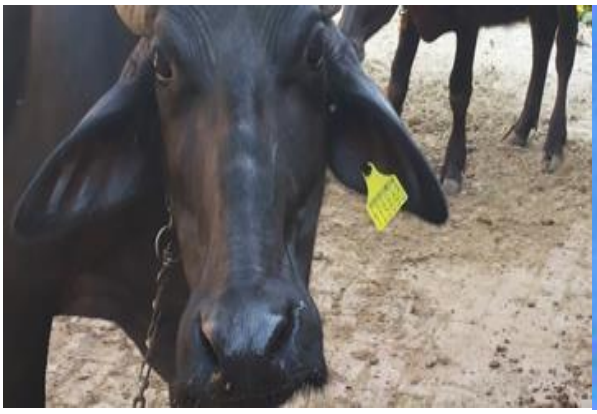


(Tattooing ink with tattooing fork)

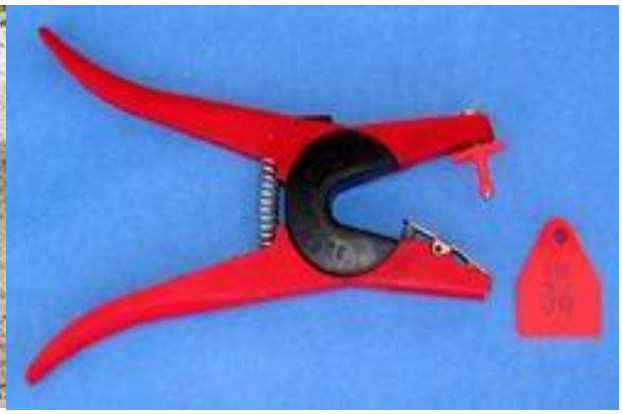
The inner surface of ear is most suitable site for tattooing. A portion of the ear free from hair and devoid of major blood vessels is chosen. Tattooing can be done underneath the root of tail, escutcheon or on inner surface of lips or on the gums; if necessary. Tattooing number is used for new born calves, foals, lambs, kids etc.

(b) Ear Tagging:

Tags are small metal or plastic plates like labels which can be readily inserted on the ears of young animals. Tags bear number of the animal and name of the farm. Tags are fixed to the ear with the help of tagging forceps. Tagging is mostly used for marking sheep and goats. Though pigs and young calves can be tagged, the marking site of the tag should be on the top of ear. Some antiseptic should be applied to the wound for healing.



(Ear Tagging in Buffaloes)



(Ear Tags with Ear Tag Applicator)

(c) Ear Notching:

This method is mostly used to mark pigs at a commercial farm. It comprises of cutting 'V' or 'U' shaped notched at specified places along the borders of ears. Notches may be made by means of special ear notching or sharp scissors. Coded series for ear notches are used for identification, for thisreason, one must decide suitable coding system for his farm.





(Ear Notching in Pigs)

(d) Branding:

It consists of searing a number on skin, hooves or horns. Branding is most suited for marking cattle, buffaloes, camels etc. Calves should be branded at the age of one year. Branding is done by means of metal numbers specially made for this purpose. It is usual practice to brand

the animal on shoulder and thigh or horns or hooves. Branding preferably is done during the winter season.

Hot Branding:

The iron numbers fixed to wooden handle are heated in fire and are branded on the thigh or shoulder so that roots of hair will die. These numbers can be read throughout the life of an animal.

Cold Branding:

In this method the metal (brass) bumpers are dipped in a liquid popularly known as branding oil or branding ink. The liquid has some corrosive substance in its composition which acts as a burning agent. These numbers gone away after a year or two.



(Hot Branding Iron Rod)



(Cold Branding Iron Rod)

Freeze Branding:

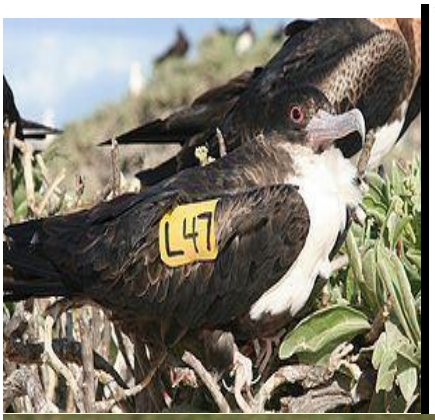
In this method the branding iron is frozen at – 196^0C or at – 700^0C by liquid nitrogen or carbon dioxide. Here the hair turns white.

(e) Number Plates:

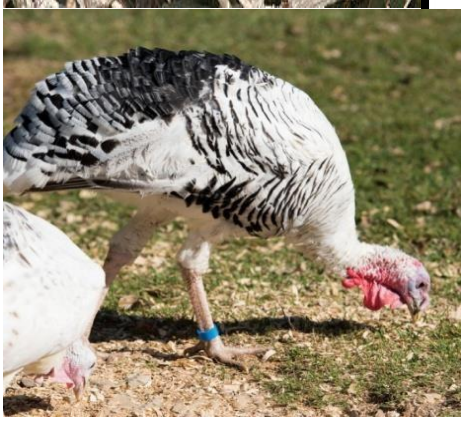
Plates of various shapes and sizes bearing the name and address of the owner and number of the animals are placed around the neck of animal by means of neck strap or neck chain. Sometimes such plates are also fixed around the base of the horn. Such plates are largely used for dairy cattle andbuffaloes.

(f) Wing and Leg Bands:

These are very light, adjustable aluminium colored numbering strips. These are mainly used for identification of birds. Wing bands are inserted through a slit made in the skin near the edge of wing. Leg bands are applied on the legs with a slight free movement, if properly adjusted. There are practically little chances of their loss.







(Birds with Wing and Leg band)

(g) Toe Punching:

Small holes are pierced in the webs of the feet of chicks after hatching. These marks are usedfor group identification in ducks.





(Toe Punch)

(h) Colour Marking:

The colours are painted/spread on different body parts of animal. This is commonly used insheep, goats, camels and donkey for group identification. This method is very simple and cheap.





(Colour Marking in Goat and Sheep)

(i) Electronic Chip:

It is the electronic silicon chip that can be fitted at the shank region or at neck region by putting incision on skin and muscles at the part and remain for throughout the life. The electronic identity gives detail and record the information about the animal regarding different farm activities (milking, breeding).

Questions:

1. Enlist the methods of identification commonly used for each of the following: Cattle, Buffalo, Poultry, Duck, Sheep, Goat, Camel and Donkey.

2. State the procedure of ear tagging in calf/foal.

3. What precautions will you take while branding an animal?

4. What precautions will you take after branding an animal?

5. Write the complete procedure of ear notching in pigs.

6. What are the advantages of colour marking method of identification over other methods?

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EXERCISE-5
VISIT TO INSTITUTIONAL DAIRY FARM (IDF) AND IPF TO STUDY BREEDS OF LIVESTOCK AND POULTRY

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India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of

goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The

poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the

economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

We visit various dairy farms where cattle, buffalo or both the species are maintained with different objectives. Information to be collected and critical observations to be made while moving in/taking round in the farm and having clear concept of target/goals for performance traits for different species or breed will help to analyse managerial practices and performance of the herd.
Information to be collected and certain observations to be made while visit to dairy farm are:

1.	Species/breeds: of bovine kept	Cattle : Buffalo:
2.	Size of the farm:	Small/Medium/large
3.	Institutional/organized or Private	a) Organized- Government/University /Trust b) Private
4.	Establishment	a) When: b) By whom:
5.	a. Objective/Motive	Academic/Research /both Business -Profit
	b. Objectives, if a research farm	a) b)
6	Land available	Livestock farm Fodder Farm
7.	Systems of Farming	Specialized /Diversified /Mixed Farming
8.	Building/Structure	a) Primary structures c) Layout of sheds b) Ancillary structures d)Type of arrangement
9.	Feed and fodder	Fodder crops Cultivated/Dry/ Purchased Feeds being utilized
10.	Observations while visit to sheds	Condition of animals, Condition of sheds, Cleanliness of sheds, floor, water trough, manger Drainage facility, Manure pit, distance from sheds,condition Fly/Mosquito/Insects problem
11	Level of mechanization/use of machines	Chaff cutter Milking machine Harvester (mechanical harvesting)
12.	Information on method of rearing calves	Weaned /suckled
13.	Information on Herd performance traits	Production performance: Wet average and Herd Average Reproductive performance: Milch : Dry Ratio (%

		milch animals)

14.	Herd performance characteristics	i) Age at First Calving (AFC) ii) Calving Interval/ Inter calving period (CI) ii) Lactation period /days v) Total Lactation Milk Yield (TLMY) v) Standard Lactation Milk Yield i.e. first 300 days (SLMY) vi) Dry period/days
15.	Mortality in Calves / the Herd	Calf mortality < 6 month of age or Overall herd mortality
16.	Efficiency of Land use	Cropping intensity

i) BREEDS OF LIVESTOCK:

Identification of Various Breeds of Cattle, Buffalo, Sheep and Goat:

Breed is a group of animals of a species having similar physical and economical characters. Each ecological region has a breeds of animals adapted to the climate of that region. According to necessity and adoption, a breed of animal developed by the people in a region.

Objectives: - To be familiar with breeds.

- To know the physical characteristics of breeds.
- To know the breeds of animals of the region, state and country.

Breeds of Cattle:

There are 42 well defined cattle breeds classified as milch, draught and dual purpose and are usually named after area, location and habitat they occupy.

Utility Classification of Cattle Breeds:

(A) Bos. indicus: Indian cattle, humped cattle.

1. Milch Breeds: (Dairy Breeds)Features:

(i) The cows are high yielder produce 1500 liters or more milk per lactation.

(ii) The cows are docile and mild in temperament while the bullocks are slow workers.Breeds: Red Sindhi, Sahiwal, Gir, Deoni and Gaolao.

2. Dual Purpose Breeds: Useful for both milk and draught purpose.

Features:

(i) The cows are fairly good milkers, produce 900-1400 liters milk per lactation.

(ii) Bullocks are medium fast and good for draught.

Breeds: Kankrej, Hariana, Ongole, Tharparkar, Rathi, Mewati and Nimari.

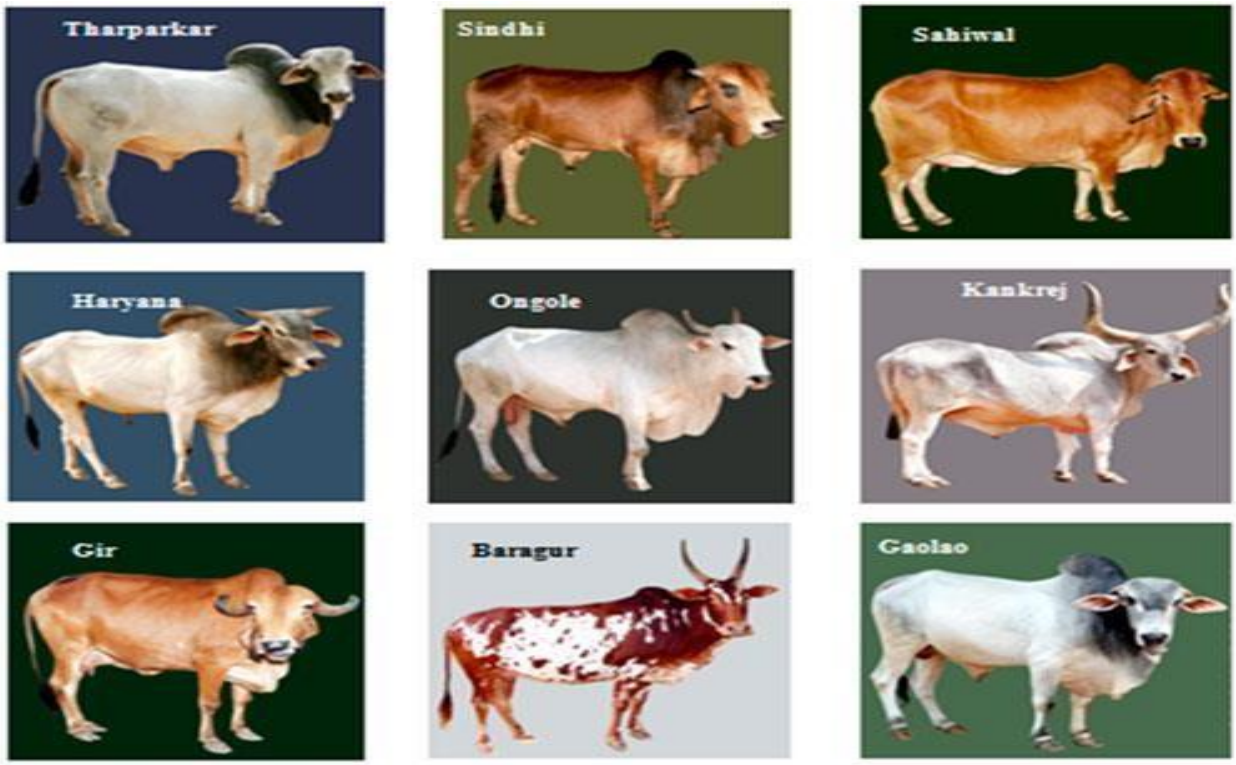
3. Draught Purpose Breeds: Useful for agriculture works

Features:

(i) Majority of Indian breeds raised for draft purpose.

(ii) Cows are poor milk producers; produce less than 900 liters milk per lactation.

(iii) Bullocks are active, powerful and good draft animals.Breeds: Khillari, Hallikar, Malvi and Amritmahal . **Photographs of Breeds of Cattle**



Cattle Breeds

	Milch purpose	Dual purpose	Draught purpose
North Gujarat	--	Kankrej	--
Gujarat	Gir	--	Dangi
India	Red Sindhi, Sahiwal, Deoni, Gaolao	Tharparkar, Haryana, Ongole, Rathi, Mewati, Nimari	Amritmahal, Khillari, Kangayam Nagori, Malvi, Ponwar, Siri

Buffalo Breeds

North Gujarat	Mehsana, Banni
Gujarat	Jaffarabadi, Surti
India	Murrah, Nagpuri, Bhadwari, Toda, Sambalpuri, Jerangi, Kalahandi

Indian buffaloes: (*Bubalus bubalis Linn.)* Local name: Arna, Bhains, Geva, Erumai.**Features:**

- Semi aquatic animal abundant in humid localities.
- Large massive and clumsy creature.
- Short thick legs and conspicuous hoofs.
- Horns thick, flat, curved or straight.
- Jet black colour or light coloured brown breeds.

Photographs of Breeds of Buffaloes

Nili Ravi



Toda



Jaffarabadi



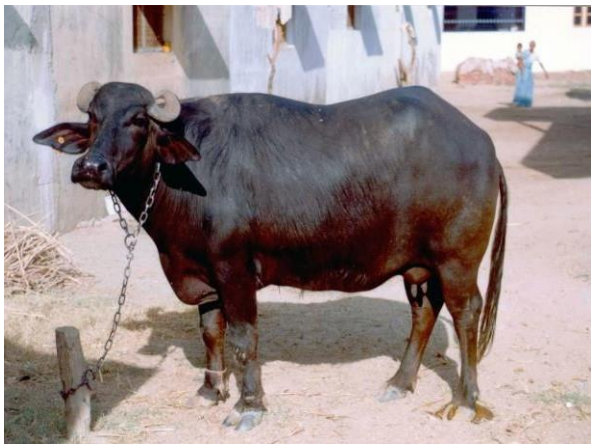
Mehsana



Murrah



Banni



CLASSIFICATION OF BREEDS OF SHEEP AND GOAT

Classification of Breeds of Sheep:

Sheep produce fleeces of different types. The fleece differs in their hair content, fiberdiameter, fiber length and fineness of wool and accordingly sheep breeds are classified as:

1. Fine Wool Breeds:

Features:

(i) Produce only wool fibres in their fleece, hair absent.

(ii) Fibre diameter ranges from 17 to 23 µ (microns), very fine wool.Example: Merino, Rambouillet, Pollworth.

2. Medium Wool Breeds:

Features:

(i) Fleece of these sheep does not contain hair.

(ii) Diameter of wool fibre varies from 23 to 32 µ (microns).Example: South Down, Suffolk, Hampshire.

3. Long Wool Breeds:

Features:

(i) Wool is coarse having fiber diameter more than 33 µ.

(ii) Fibre length varies from15 to 30 cm.Example: Lincoln and Leicester.

4. Crossbred Type Wool Breeds:

Features:

(i) Developed by crossbreeding between fine wool breeds and long wool breeds.

(ii) Wool quality similar to medium wool sheep. Example: Corriedale, Panama, Columbia, Hissardale.

5. Carpet Wool Breeds:

Features:

(i) Fleece contain hair i.e. modulated fibers

(ii) Wool is coarse wiry and tough used for carpet making.

(iii) Wool fibre diameter is more than 33 µ.
Example: Marwari, Patanwadi, Bikaneri, Chokla, Magra.

6. Fur Wool Breeds:

Features:

(i) Skin of sheep with wool known as fur used for making fancy articles, fur coat, purse, ladies wear, gloves etc.

(ii) Skin is obtained by killing of lamb called pelt.Example: Persian, Lamb pelt, Karakul, Broadtail.

Classification of Breeds of Goat: Our traditional goat farmers have extensively practiced the art of selection and inbreeding for evolving definite breeds with specific or multiple

functions. The country as a whole represents an important genetic reservoir of goat breeds for meat, milk, fibre and skin production.

(A) Milch Breeds: These breeds of goats are mainly reared for milk purpose on commercial lines. E.g. Alpine, Saanen, Toggenburg and Nubian. Saanen is also known as Jersey of the goat world due to its high milk production potential.

(B) Dual Purpose Breeds: These breeds of goats are reared for milk as well as for meat purpose. They produce 100-200 liters of milk per lactation and 1-2 kids per kidding. E.g. Jamunapari, Barbari, Beetal. Whereas, triple purpose breeds i.e. for milk, meat and hair are Marwari, Mehsana, Kutchi and Zalawadi.

(C) Meat Breeds: These breeds of goats are mainly reared for meat purpose on commercial lines. E.g. Black Bengal goat breeds (known for excellent mutton and skin quality), Deccani, Malabari etc.

ii) STUDY OF DAILY ROUTINE FARM OPERATIONS

All the routine operations on a dairy farm are scheduled to meet with the main object of producing milk from the animal and selling the same profitably. The work of production and sale of milk is to be done daily twice all throughout the year without any holidays. Daily, twice, the milk has to reach the customer's doors at the appointed time. In order to achieve this, the timings of all the different works, to be done daily on the farm, are fixed. It is very necessary to observe the fixed timings.

Dairy animals are creatures of habit. They become nervous if the regularity of different time schedules is not observed. This leads to loss in production. Dairy farm is a very busy concern. Unless the timings and sequence of all the routing operations are decided and scrupulously observed, there will be mismanagement.

Daily Farm Operations Schedule

The various operations should be carried out in an orderly manner as per well prepared schedule.

Approximate time (hours)	Sl. No.	Farm operations
03.00 - 03.30	1.	Cleaning/brushing of milch animals
03.30 - 05.00	1.	Feeding half of the daily concentrate ration just before milking.
	2.	Milking cows.
05.00 - 05.30	1.	Delivery of raw milk (in cans) to the milk pick-up van of dairy plantsand receiving previous day's empty cans.
	2.	Washing and disinfection of milking barns.
05.30 - 08.00	1.	Cleaning of milk cow sheds.
	2.	Feeding of dry/green fodder to milch stock.
	3.	Cleaning farm premises.
	4.	Isolation of sick animals.
	5.	Isolation of "in-heat" cows for artificial insemination

Note: Use milkers at the rate of one for every 12-14 cows, for all the above operations. Milkersgo off duty by 8.00 a.m. and farm labour come on duty.

Approximate time (hours)	Sl. No.	Farm operations
08.00 - 12.00	1.	Cleaning calf, maternity, dry-stock, bullock and bull sheds.
	2.	Feeding half of the daily concentrate ration to calves, pregnant cows and bulls.
	3.	Exercising and grooming of bulls.
	4.	Treating sick animals.
	5.	Breeding cows that are "in-heat".
	6.	Harvesting, chaffing and feeding of green fodder to all the stock. Mangers in all sheds should be filled with green fodder.

Note: Animals should be taken for grazing (if practiced) between 09.00 a.m. and 02.00 p.m. inwinter, and between 06.00 a.m. and 10.00 a.m. and again between 05 .00 p.m. and 07.00 p.m. in summer.

Approximate time (hours)	Sl. No.	Farm operations
12.00 - 01.00	1.	Lunch-cum-rest period for labourers.
01.00 - 03.00	2.	Miscellaneous jobs for dairy farm stock identification; periodical vaccination; preparation of concentrate mixture; repair of farm fences, fittings and repair of equipments; rope and halter making; weekly scrubbing and white-washing of drinking water tanks; manure disposal/ conservation; hay and silage making; periodical spraying of animal houses with suitable pesticides; periodical deworming of stock; clipping hair from sides and hind-quarters of cows; grooming; toe trimming; dehorning of calves; attending to sale and purchase of livestock and their transportation; fitting and training of cows for show.

Note:

. The dairy manager should plan the jobs well in advance in such a way that they are evenly distributed over the week. Some jobs may require longer time and the labour have to work extratime on such occasions.

. Milkers come on duty by 2.30 hours and remain up to 5.30pm hours whereas general farm labours go off duty by 5.00 hours.

02.30 - 03.00	**l.**	**Washing, brushing of milch cows by milkers.**

Approximate time (hours)	SL.No.	Farm operations
03.00 - 04.30	l.	Feeding the other half of daily concentrate ration to milk cows just before milking.
	2.	Milking.
	3.	Cleaning calf, maternity, dry-stock and bull sheds and feeding the

		other half of concentrate ration to calves, pregnant cows and bulls.
04.30 - 05.00	1.	Delivery of milk (in cans) to milk pick-up vans of milk plants and collection of mornings empty cans.
	2.	Washing and disinfection of milking barns.
	3.	Feeding dry and green fodder to calves, dry-stock and bulls.
05.00-06.30	1.	Cleaning of milch cow shed.
	2.	Feeding green / dry fodder to milch stock.
	3.	Cleaning farm premises.

OTHER FARM OPERATIONS:

(A) CASTRATION:

Castration means to render the gonads non-functional. Though the definition includes the operation performed on animal of either sex. Conventionally castration means rendering the testis (male gonads) functionless.

Aims of castration:

Castrated animals produce better quality of meat. If male animals are not castrated, their meat will have a peculiar odour and will be coarser. Consequently entire male animal will fetch lowerprice. Castrated animals grow faster. Castrated animals are more docile and so easier to handle. A small number of male animals will be required for breeding. Excellent male animals are selected for breeding. The others if not castrated will produce inferior progeny. Castrated male animal can be grazed, housed or managed together with female animals.

Age of castration:

Ram lambs should be castrated while they are young, the best age being 7 to 15 days.

Methods of Castration:

There several methods of castration. Each method has some advantages and disadvantages.

1. Open method of castration:

In this method an incision is made, on both the testicles through the scrotum. The testicular material is removed completely. If the animal is not young, profuse bleeding takes place in this method. A mild disinfectant may be used to wash the wound. The operation should be done on a clearday with all the aseptic precautions. Lambs to be castrated should be placed in a clean, dry place and pain should be minimum.

2. Close method of castration:

In this method the spermatic cords leading to the testicles are crushed. This method does not leave an open wound and is bloodless. As the nerves and blood vessels are cut off the testicles become functionless, the tissues die and shrink in size. It is quick and almost painless operation. "Burdizzo"castrator is used for crushing the spermatic cords. The operator must be skilled in its use otherwise result in partly castrated lambs.



Burdizzo Castrator



Castration with Burdizzo Castrator

3. Elastration or Rubber band method:

It is also a bloodless method of castration. A very tight and strong rubber ring is put around the spermatic cord at an early age of animal. Because of the constant heavy pressure the nerves and blood connections are cut off and scrotum with testicles gradually dies and drops down.





Elastrator with Rubber Ring for Castration

Vasectomization:

Sometime adult male animals are vasectomized so that they can be used as teasers. Teaser should have sex libido and can detect female animals in heat, but they can't impregnate females as their ejaculates do not contain live sperms. This is so because at the time of vasectomization, the vas- deferentia are cut and ligated, but the blood and nerve supply to the testicles are kept intact.

(B) DOCKING:

Docking means cutting of the tail from the base.

Aims of docking:

Docking is done in case of sheep that are kept for wool production. As wool acts as an insulating layer and does not allow quick evaporation of the moisture. The skin becomes wet and dirty due to urination and defecation. The dirty area with warmth provides a good breeding place for flies. They lay eggs which hatch into larvae in this area. Larvae pass down the skin and

causes inflammation and complication like maggot wound. If tail of sheep is removed, area around the tail dries up quickly and as a result avoids fly nuisance and its complications. The Indian sheep are not docked because they have shorter tails and they grow shorter and sparse woolly coat. But for exotic and crossbred sheep, it is necessary to dock them.

Age of docking: Lambs may be docked at the time when they are castrated.

Methods of Docking:

1. Docking with a knife:

The lamb is held in the same way as for castration. The tail is severed about 2.5 cm from the body as measured on the underside of the tail. Press the skin towards the body before cutting, leaving loose skin above the cut. A band or tourniquet may be tied at the base of the tail before cutting, whichshould be removed after 3 to 4 hours.

2. Docking with hot iron pincers or chisels:

This method results in loss of blood and less danger of infection. But the wound heals slowly. The cutting iron is heated up to just turning to red. The cutting edge of this iron is sharp, so in this method the cutting is obtained by burning through rather than cutting through the tail. Electrically heated irons with thermostatic control are also available.

3. Elastrator:

This bloodless method of docking is similar to that used in castration. The light rubber band is fitted around the tail. This method is not liked by many persons as the tail is removed slowly and sometimes putrification takes place creating a condition favourable for flies to breed.

In general docking and castration of animals should be done under all the sanitary precautionsand when there is minimum fly nuisance.

(C) HOOF TRIMMING:

Thorough pairing or trimming of the hooves of sheep is the most important part of the prevention and treatment of foot-rot. For this purpose specially designed knives or secateurs are used. Moistening the hooves before pairing, will soften them and will make the job easier. A mild antiseptic solution may be used to wash the hooves. Hoof trimming is also done with stud rams and ewes before mating season.

iii) STUDY OF FARM RECORDS

Dairy business cannot be carried out without maintaining the necessary set of accurate records.

Importance of Records:

1. Records are the mirrors of a farm. They are necessary for genetic improvement of dairy cattle. Records are necessary to know the milk production efficiency of the dairy animals and based on this information we can retain or cull the cows or their offsprings. Hence without a set of records properly, accurately and reliably maintained, improvement of livestock by breeding is not possible.

2. Records give us the information about the financial status of the dairy farm. Whether it is making profit or incurring loss or is just maintained. They also give the information about the extent of profit or losses.

3. Profit can be increased by reducing the wasteful and undue expenditure. To know such items, it is necessary to have detail record on each item of expenditure viz. feeds, labours, interest, depreciation of farm building and farm equipments, animals and miscellaneous items like medicine, vaccination breeding charge etc. The sales of milk, sale of culled animals, sale of manures,

sale of empty gunnybags etc are also recorded.

Classification of Records:

Records required to be maintained on the dairy farm can be classified into four major group orcategories.

1. Records/Register Pertaining to Financial and Account Matter.
2. Records/Register Pertaining to Accounting of Animals.
3. Records/Register Pertaining to Milk Production.
4. Records/Register Pertaining to Reproduction

1. Registers Pertaining of Financial and Account Matter

It includes registers such as cash book, ledger book, milk coupons, bill book, receipt book, demand and collection register, dead stock register, concentrate and forage register etc. These register are more pertaining to administration and account side rather than the technical side and hence not discussed in detail over here.

2. Register Pertaining to Accounting of Animals

These include registers such as cattle yard report/daily dairy roll call register, herd register, birth and death register. This group of register is concerned with increase or decrease in the herd strength. The increase in herd strength may be by birth, purchase of animal and farm transfer. The decrease in herd strength could be due to death, sale and farm transfer of animal.

a. Cattle Yard Report

This is a primary record, maintained daily and is also called daily diary. It is a key register on the livestock farm. Entries in all other register are made from this register. This register gives herd strength and detail of all changes in the strength. It also records details of sickness and treatment, vaccination, deworming, estrus, breeding/service to the heifers and cows, pregnancy diagnosis, feeding etc. Any other item thought to be important is also noted in this register such as extreme change in climate, rainfall, cloudy or windy weather, cyclone etc.

b. Roll Call Register

This is an annual register maintained month wise. It is changed every year on 1st April. It gives the number of animals in each class or the herd. Change in the number of animals in any classis noted and detail of change is given. The number of animals in each class on the last day of the month is recorded and carried over to the first date of next month, after actual counting the herd strength.

Roll Call Register

Month……

Date	Cows	Heifers	Bulls	Bullocks	Male Calves		Female Calves		Others
					≤1yr	≥1yr	≤1yr	≥1yr	

c. Herd Register

This is also an annual register. It is changed every year on 1st April. In this register all the individual animals in different classes of the herd are listed according to their date of birth. The animal as on 31st March is listed class wise on 1st April of the next year according to their birth date. The details of each animals, viz. name and number, date of birth, parents etc. are

given. Any new addition of animals in each class after 1st April is demarcated by a line. The details of removal of animals from the herd during the year should be given in the respective columns.

d. Birth Register

This is an annual register, which give information about the number of births on the farm, sex of calves born (male and female). Birth weight of the calves, name of sires and dams, date of last service of dam, gestation period, number of heifers becoming cows, their age at the first calving etc. Average of the above characters for the year is made at the end of the year.

e. Death Register

Like birth register, it is also an annual register. It gives information about total death during the year and their cause. The frequency of a particular disease can be seen from this register. The responsible person must sign the register, as it is concerned with final write off of the animal.

Sr. No.	Name and No. of animal	Breed Group	Sex	Class	Date of Birth/ Death	Post mortem done or not	Post mortem report and reasons of death

3. Register Pertaining to Milk Production

These include 4 register viz. Daily milk production register, Monthly Milk Production register, Lifetime milk production register (monthly progress register) and History sheet.

a. Daily Milk Production Register

This is written daily both morning and evening or sometime thrice a day. Cows are listed in this register according to their breed group and date of calving. The daily total milk production is divided by the number of milking units (both morning and evening milking unit) gives **"wet average".** If the milk production is divided by total number of cows, then it gives **"herd average".** By watching carefully the fluctuation in the wet average as well as correcting the reason efficiency of the milk animals is maintained by taking care to breed the animals within 2-4 months postpartum. This is included in the column of date of last service. The total milk production of each cow for a month is transferred into the monthly milk yield register.

b. Monthly Milk Production Register

It is an annual register. Cows in the milk on 1st April are entered in this register according to their date of calving up to 31st March is entered at the top of the register. From April the entries are made till the cow dries-off or till the total milk production of lactation completed, if not, the totalmilk production of lactation is carried over a new register next year. Lactation day are also shown at the bottom. This register gives information like name and number of cows, which have completed their lactation, their lactation milk yield, length of LP, length of previous dry period etc. If the cow has calved again, this information is then entered into the history sheet of concerned cow completing the lactation.

c. Life Time Production Register (Monthly Progress Register)

This register gives the information about the milk yield of the individual cow from first calving till death or sale. That is the performance of entire productive life of each cow is

available from this register. Annual milk production each year and also the progressive annual average (PAA) are calculated from this information. The PAA figure indicates the upward and downward trend inthe productive efficiency of the cow. This figure can be used in taking decision for culling orretaining the animal.

d. History Sheet

This register gives overall milk productive capacity of the cow. One page is allotted to each heifer on calving. At that time all details of their parentage/pedigree, breeding, description of phenotype, birth date, date of calving, age of first calving etc. are entered on the upper part of the page. Relevant information about service, date of calving, calf born, sex of calf etc. are entered in the lower part in respective columns. On completion of lactation, lactation milk yield , milk yield of first 300 days, lactation period, dry period, gestation period etc are entered and the average are calculated. The average daily milk production from first to latest calving is a good indicator of the increase or decrease in overall efficiency of the animal to produce milk and to reproduce, from the lactation to lactation.

4. Register Pertaining to Reproduction

It includes Cattle yard report, Service book, Service ledger and History sheet.

a. Cattle yard Report

Some details are already given under group 1 register. This gives information like cows and heifer coming in heat, date of heat, date of service, (natural or artificial) name and number of sire/ bull used etc. These entries should be made promptly. Otherwise calves with unknown sire will be born. These entries of the service are transferred into service book later on. Finding of rectalpalpation of repeat breeders, pregnancy diagnosis etc from this register are transferred to service ledger.

b. Service Book

This is maintained monthly. Service to heifers and cows are written in this register from cattleyard report. This is useful in making the list of cows/heifers due for pregnancy diagnosis. Similarly, list of advanced pregnant animals and the list of animals expected to calve in current month are made from this register.

Service book Month…….Year……				
Date	Name and No of Cows/ Buffalo	Name and No of bull /Buffalo bull	Natural services of AI	Remarks

c. Service Ledger

This register gives the information of near past history and current state of reproduction of each breedable female in the herd. The list of examination of repeat breeder and anoestrus animalscan be prepared from this register.

Sr. No.	**Service ledger** (Classified/individual service register)		
	Name and No. of Heifer/Cow	Date of Calving	Service Records (Dates of AI/PD)

			1st	2nd	3rd	4th	5th	Remark

d. History Sheet

It gives information about overall reproductive efficiency of each cow e.g. age at first calving, length of dry period, calving interval for all lactation etc. of individual cow.

Idiopathic Pulmonary Fibrosis) to study breeds of livestock and poultry

Progressive scarring of the lung, also termed pulmonary fibrosis, has become the focus of many basic, translational and clinical investigations throughout the world. To date, this research has revealed much needed information about the epidemiology and pathogenesis of pulmonary fibrosing disorders, with particular attention to idiopathic pulmonary fibrosis (IPF), the most common of the idiopathic interstitial pneumonias and the most devastating due to its poor prognosis.

However, despite many recent advances, only 2 so-called antifibrotic drugs are currently approved for the treatment of IPF; these drugs slow-down lung function decline, but do not improve the condition, and their role in other progressive fibrosing lung disorders remains unknown.

Thus, much research is still needed to gain further insights into the pathogenesis of these disorders, to identify reliable diagnostic and prognostic biomarkers, and to develop effective and safe interventions that improve survival. If successful, this resea:\c:rch has the potential of positively affecting the natural course of related fibrosing disorders of the skin, kidney, heart, liver and other organs.

A major hindrance to progress in pulmonary fibrosis research is the lack of animal models capable of better resembling fibrosing lung disorders in humans and adequately predicting the efficacy of new interventions. Most animal models of pulmonary fibrosis available today require induction of lung injury by exogenous agents (e.g., bleomycin) and do not adequately model human disease, thereby raising questions about their utility in the quest for novel treatments.

Even if animal models were able to duplicate most of the characteristics of human disease, such as the usual interstitial pneumonia or UIP histologic pattern found in IPF, it would be difficult to duplicate the genetic and environmental factors that contribute to disease development in humans. This, compounded by the anatomic and behavior differences between animals and humans, has prevented the development of a truly relevant model.

Interestingly, spontaneous progressive pulmonary fibrosis is not restricted to humans. In fact, this disorder has been recognized for over 2 decades in veterinary medicine in a variety of domestic animal species including cats, dogs and horses.

Unfortunately, these disorders have received little attention in the biomedical community outside of veterinary medicine. Given that the affected species are long-lived animals that share a common environment with humans, they might represent relevant models of spontaneously occurring, progressive lung fibrosis. If so, investigating pulmonary fibrosis in these species could advance progress in this area.

Because of the potential of such approaches to accelerate discovery and to promote awareness,

communication and collaboration regarding spontaneous progressive fibrosing lung disorders in mammals, the Westie Foundation of America (WFA) sponsored a 1-day meeting in October 2007 held in Lafayette, Indiana, USA. The WFA is the official breed association of the West Highland Terrier, a breed of dogs that is known to be afflicted with progressive lung fibrosis. This workshop brought together international physicians, veterinarians, pathologists, researchers and advocacy experts to discuss fibrotic lung disorders in humans and domestic animals. Afterward, a working group of the American Thoracic Society and participants of the initial workshop reported on the workshop findings and made the following recommendations

(1) Promote the conduction of detailed descriptive studies in affected domestic animals to define the clinical, imaging and pathologic presentation of pulmonary fibrosis in these species; (2) Emphasize the need for performing genetic studies and other pathogenesis-based investigations in naturally-occurring spontaneous models of pulmonary fibrosis to investigate the potential translation to IPF in humans as these models should provide more relevant tools to investigate the potential effectiveness of novel antifibrosis drugs in prehuman trials; (3) Emphasize the need for studies defining the anatomic and cellular differences in the lungs of different species for the adequate interpretation of discordant findings; (4) Stimulate the generation of suitable reagents to adequately test hypotheses in different species of animals; and (5) Promote the establishment of a consortium of interested centers and a central repository of clinical information and biologic specimens from naturally-occurring spontaneous models of lung fibrosis in domestic animals to enable further research that may benefit both physicians and veterinarians in their efforts to adequately manage lung fibrosis in their patient populations.

In May 2014, a second meeting on Comparative Biology of Pulmonary Fibrosis was held in Louisville, Kentucky. As before, clinicians, researchers, veterinary doctors, pathologists and patient advocates came together to discuss the state of research in this field. The meeting was again endorsed by members of the Working Group on Lung Fibrosis of the Assembly of Respiratory Cell and Molecular Biology of the American Thoracic Society, and was supported by industry, The Westie Foundation, The Morris Animal Foundation and The AKC Canine Health Foundation. During the meeting, extensive discussions surrounded the limited progress made in the field since the first meeting. However, energized by the potential this field of investigation could have on understanding fibrosing lung disorders, the team powered through an ambitious agenda hoping to define a new path for such efforts. The proceedings of this meeting were not published; however, considering the perceived importance of the discussions held, a group of meeting organizers and participants came together to summarize its proceedings in this document.

The group discussion first focused on the fact that key clinical manifestations of pulmonary fibrosis are common in both humans and domestic animals. These similarities are best highlighted in recent publications showing that in canine IPF, for example, the disease is a chronic, progressive, interstitial lung disease affecting mainly middle-aged and old West Highland white terriers.

It is clinically characterized by exercise intolerance, restrictive dyspnea and coughing, and course crackles are present on lung auscultation. Abnormal blood gases and shortened “6-minute walk test” distance, a test that evaluates endurance and gas exchange capability, are common, and secondary pulmonary hypertension is not infrequent.

These data emphasize the striking similarities in the clinical presentation of spontaneously occurring pulmonary fibrosis observed in humans and domestic animals as highlighted previously.

More data about the imaging presentation of pulmonary fibrosis in domestic animals have also emerged (see Figure 1). In a retrospective study including 21 West Highland white terriers (WHWT), the severity of pulmonary computer tomography (CT) findings was positively correlated

with severity of clinical signs, and negatively associated with survival time after diagnosis. The most common CT findings included ground glass pattern (16/21 dogs) and focal reticular and mosaic ground-glass opacities (10/21 dogs), with very rare and minimal honeycombing identified.

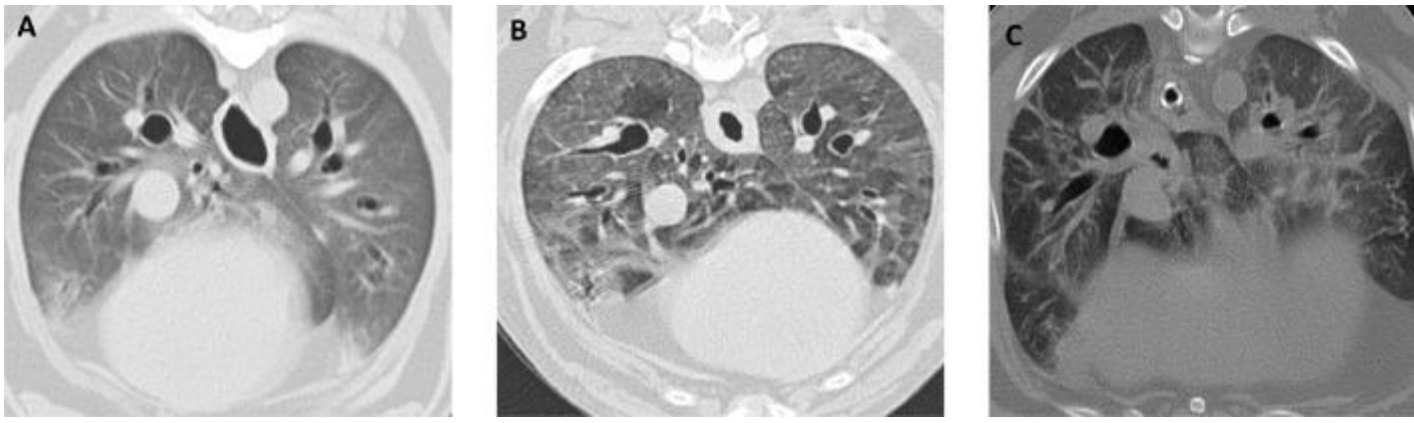


Figure 1Computed tomography scan image of dog with pulmonary fibrosis. (A) Ground glass opacity in mildly affected dog. (B) Extensive ground glass opacity with prominent mosaic attenuation in moderately affected dog. (C) Ground glass opacity, traction bronchiectasis and parenchymal bands in severely affected dog.

In addition to the above, the group also discussed that noted similarities between dogs and humans began to dissipate when evaluating the pulmonary histopathologic findings present in these conditions. In 18 WHWT with canine IPF, a pattern resembling NSIP was predominant rather than a pattern of UIP.

NSIP, for nonspecific interstitial pneumonia, is another histologic pattern observed in another type of idiopathic interstitial pneumonia. In contrast to UIP, the NSIP pattern is more homogenous throughout the lung, shows more cellularity and less fibrosis, and fibroblastic foci are not typical; this entity is considered responsive to immunosuppression in many circumstances in humans.

The majority of the dogs tested showed multifocal areas of accentuated subpleural and peribronchiolar fibrosis with what was reported as occasional honeycombing and “profound” alveolar epithelial changes, and fibroblastic foci were not seen. In some cases, intra-alveolar organizing fibrosis adjacent to interstitial mature collagen deposition was observed, especially in more severely affected areas. Interestingly, severe pulmonary lesions were more frequent in the caudal than in the cranial lung lobes. The increased availability of high-resolution computed tomography data from affected dogs, coupled with the limited pathologic data already available, support the contention that the canine form of IPF is in fact NSIP. Case cohort studies are now ongoing at the University of Edinburgh Veterinary School to assess the clinical response of affected dogs to immuno-suppressive therapy with prednisolone and mycophenolate to determine if this indeed behaves as NSIP. Furthermore, while the ground glass attenuation and mosaic pattern on HRTC can be associated with hypersensitivity pneumonitis, this condition can be excluded as it is not recognized in the dog. One confounding factor, however, is the often-late presentation of affected dogs with extensive fibrosis making measurable response to trial therapy problematic.
In evaluating 9 cats carrying a diagnosis of pulmonary fibrosis based on radiographic findings, investigators found focally increased soft tissue attenuation, masses and ventral consolidations that exhibited no improvement with dorsal vs. ventral recumbence.

On histology, pulmonary fibrosis in these cats was evident with type II pneumocyte hyperplasia and smooth muscle hypertrophy. Epithelial metaplasia was present in one case. However, they also

observed changes consistent with a broncho-interstitial pattern, alveolar pattern, pulmonary masses, pulmonary bullae, pleural effusions and cardiomegaly. Overall, the findings suggested highly variable radiographic characteristics, which might mimic pulmonary fibrosis, but also other conditions such as asthma, pneumonia, pulmonary edema and neoplasia.
In another study, 23 cats with a histology of UIP were investigated.

Most were middle-aged to older cats (median 8.7 years) with no obvious sex or breed predisposition. Symptoms included respiratory distress and cough. Duration of signs was less than 6 months in 17 cats. Exam revealed tachypnea, inspiratory or mixed inspiratory and expiratory effort, and adventitial lung sounds. Radiographic changes included dense patchy or diffuse interstitial, bronchiolar, and alveolar infiltrates. BALF revealed mild neutrophilic inflammation in 6 cases, with no consistent pathogen identified. Response to steroids is poor and most cats died within days to months.
Horses also develop pulmonary fibrosis, known as equine multinodular pulmonary fibrosis or EMPF because of its characteristic imaging and histologic patterns that are distinct from UIP in the setting of IPF in humans. Emerging data point to the equine gamma Herpes Virus 5 as the cause of EMPF as investigators have been able to experimentally reproduce EMPF in horses inoculated with EHV 5 isolated from cases of EMPF.

Overall, the group remained impressed with the similarities observed in symptoms, lung examination, abnormalities in oxygenation and imaging studies, and outcomes when comparing humans and domestic animals with pulmonary fibrosis. However, the differences observed in histopathology strongly argue against these being identical conditions. This prompted discussions regarding mechanisms of action and several presentations were devoted to this topic. To date, there is consensus that IPF and other forms of fibrosing lung disease are likely triggered by certain exposures in the setting of host genetics that render the lung epithelium susceptible to injury. In turn, epithelial cell injury leads to its dysfunction and the subsequent elicitation of intracellular pathways responsible for the overexpression of soluble profibrotic growth factors. Of these, transforming growth factor-β (TGFβ) is considered the most influential, but many other activated signals exert pro-fibrotic activity. The above results in the proliferation of fibroblasts and the excessive expression and deposition of fibronectin, collagens, and other extracellular matrices that ultimately destroy the delicate architecture of the lung and its gas-exchanging units.

New data regarding the potential role of oxidative stress, dysregulated miRNAs, epigenetics, telomere shortening, tissue stiffness, aberrant metabolism, altered immunity, and aging have further added depth to our understanding of mechanisms of disease, but it is too early to determine if this new knowledge will lead to clinical tools capable of affecting patient outcomes.

Similar mechanisms are likely present in canine IPF as TGFβ protein was detected by immunohistochemistry in areas of fibrosis, and a receptor for TGFβ, TFGβRI and a transcription factor known for promoting its intracellular effects, pSMAD2/3, were found in the epithelium.

Interestingly, latent binding TGFβ protein gene expression was decreased as was β8 integrin; these changes have been proposed to ultimately affect TGFβ activation. Another extracellular matrix implicated in pulmonary fibrosis, thrombospondin-1, also appeared upregulated. Of note, circulating TGFβ1 concentrations in the periphery were higher in animals “predisposed” to pulmonary fibrosis compared to “nonpredisposed” breeds.

Alveolar interstitial fibrillin-2 immunoreactivity was upregulated in WHWTS as well. This is similar to what has been found the idiopathic interstitial pneumonias in humans.

Chemokines have also been implicated in the pathogenesis of IPF. Similarly, higher levels of CCL2 and CXCL8 have been detected in bronchoalveolar lavage fluid obtained from affected WHWTs compared to healthy dogs.

Circulating levels of CCL2, but not CXCL8, were reported in the same animals. In contrast, no differences in relative gene expression for CCL2, CXCL8, CCR2 or CXCR2 were observed when comparing the lung biopsies of control vs. affected animals. In those affected, CCL2 and CXCL8 immunoreactivity was detected in bronchial airway epithelial cells. In other work, Activin B, a cytokine member of the TGFβ superfamily, was found to be upregulated in the bronchoalveolar lavage fluid of WHWTs with canine IPF, but not Activin A.

These studies suggest that similar mechanisms of action are acting in both human and animal forms of spontaneous pulmonary fibrosis, but they fail to explain how such pathways lead to distinct histologic patterns observed between species.

CONCLUSIONS, CHALLENGES AND RECOMMENDATIONS

Overall, the discussions of the 2014 meeting emphasized a concept unveiled during the earlier meeting. Namely, that domestic animals develop spontaneously occurring interstitial lung diseases that can result in pulmonary fibrosis and share features with the human condition. While prior discussions centered on the possibility that some of these animals may develop disease identical to the human condition, the more recent histopathologic studies available suggest that domestic animals develop diseases with clinical manifestations similar to those of human IPF, but are likely distinct from that condition. Nevertheless, the group felt that, while identifying a model identical to the human condition would be preferable, a more realistic goal would be to simply identify better models of spontaneously occurring disease than those currently used today; domestic animals such as the WHWT might provide such a model.

Two important challenges hindering progress in this area remain present today. The first relates to difficulties inherent in communicating about these disorders considering that domestic animals with pulmonary fibrosis are simply referred to has having IPF (e.g., canine IPF), which is confusing as these animals do not appear to adequately mimic human IPF. The group recommends that the term *"idiopathic interstitial pneumonia or IIP"* be used as this reflects classifications used in human disease. For example, instead of canine IPF, the term canine IIP should be used, at least until these IIPs are better defined.

The above challenge is directly linked to gaps in disease definition due to an inadequate understanding of the clinical, histologic and radiographic manifestations of pulmonary fibrosis in distinct animal species. Greater understanding of IPF and related idiopathic interstitial pneumonias in humans came after defining their distinct clinical, radiographic, and histologic presentations. In fact, today, an accurate diagnosis of these human conditions remains dependent on the interpretation of the aggregate clinical, radiographic and histologic data. This knowledge laid the foundation for the emergence of standardized, placebo-controlled, and randomized clinical trials that culminated in the identification of anti-fibrotic drugs. Unfortunately, this information is not available for domestic animals. To date, studies correlating the clinical, radiographic and histologic presentations of domestic animals with fibrosing lung disease are very limited, and a clear classification of these disorders and diagnostic algorithms remain to be developed. Success in collecting such data would be greatly accelerated by the establishment of domestic animal clinical registries well linked to tissue and other biological sample repositories. Such repositories may be located at specialized veterinary centers with interest and expertise in this field. Undoubtedly, the

resources needed to support such endeavor are significant and may originate in industry, private foundations and government agencies.

In short, domestic animals develop spontaneously occurring fibrosing lung disease that resembles the human condition. Although not identical, these models might be superior to those used today when testing mechanisms of action and the effectiveness of novel interventions. However, this will first require a better classification of fibrosing lung disorders in domestic animals based on clinical, radiographic and histologic presentations. Obtaining the information needed to develop such classification would benefit from a registry of clinical data and biological samples. The molecular tools needed to test genetic variants and mechanisms of action and to unveil potential targets for intervention are available, but this will require access to well-defined biological specimens from nonhuman disease. The above effort will likely require support from industry, private foundations and government agencies. Considering the burden of fibrosing lung disorders to both humans and domestic animals, such investment is considered worthy.

Questions:

1. What is the importance of maintaining dairy farm records?

2. Write the importance of castration and docking along with the methods to perform them.

3. Define: Wet Average and Herd Average.

4. Define: Service Book and Service Ledger.

5. How breed classification is important in management of livestock?

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EXERCISE-6
DAILY ROUTINE FARM OPERATIONS AND FARM RECORDS

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G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic -circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et al. 2023). India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et al 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et al 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number

of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words

ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural

development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

Record keeping is a necessary element of good livestock business management. With no written records, farmers have to depend on their memory while making decisions regarding their farm practices. But, memories can become unreliable after a few days, months or years. Thus, recording of the performances of the animals can be done easily if animals have some identifications / numberings. Thus, both animal recording and identification are always required. There are several useful records such as production and financial transactions in the dairy enterprise. If we know what is happening on the dairy farm we need to maintain some useful farm records. Farm records are like the progress report cards students get at school. If farmers have farm records, they can tell how well they are managing their farm in comparison to other farmers. They can also see the strengths and weaknesses in their farm operations. It is also important to have accurate facts and figures when borrowing money, seeking government loans and tax returns.

Advantages of record keeping at farm

- Records provides basis for evaluation of animals from past records hence helps in selection and culling animals
- Helps in preparing pedigree and history record of animals.
- Helps in assessing the past records and designing better breeding plans to check inbreeding, selecting superior parents and helps in better replacement and culling practices.
- Helps in progeny testing of bulls.
- Helps in analysing feeding cost and benefits from animal product outputs. Hence helps to formulate economic feeding strategies for optimal productions.
- Helps in detection of abnormal conditions or disease status of the herd that leads to loss in body weight, loss in milk production etc.
- Helps in finding the commonly occurring diseases in the herd and thus to formulate in time precautionary measures like vaccination, deworming etc.
- Helps in fixing proper prices of animal meant for purchase and sale.
- Helps in overall better supervision and management of herd.
- Helps in ascertaining the income and expenditure (economics) of dairy farm.
- Helps in estimating the cost of milk production.
- Helpful in comparing the efficiency of labour and herd with other farms.
- To compare the herd performances in different years to determine the amount of profit/loss each year and setting future goals/directions for the farm.

Types of records to be maintained at a dairy farm

1. **Livestock register** : This register records the number of the animals at the farm along with their identification number, date of birth, sire number, dam number, calf and its sex, date of calving, date of purchase, date of sale/auction/death.

2. **Calving register :** This register maintains the records of calving that take place in the farm. It maintains dam and sire number of the calf, calf number, sex and its date of birth and any other remarks like type of calving (normal/abnormal).
3. **Daily milk yield register :** This register records the daily milk yield performance of the cows.
4. **Calf register :** maintains the records of calf at the farm, calf number, sex of the calf, sire number, dam number, birth weight etc.
5. **Growth record of young stock :** this record maintains the weight of the young stocks at different intervals.
6. **Daily feeding register :** This register records the amount concentrate, dry fodder, green fodder and other feeds given to the animals daily.
7. **Herd health register** : This register maintains the record of the diseased animals along with history, symptoms, diagnosed disease, treatment given and name of the veterinarian who treated.
8. **Cattle breeding register :** This register maintains the details of breeding practices in the farm such as cow number, date of calving, date of heat and services along with the bull number, date of successful service, pregnancy diagnosis records, expected date of calving, actual date of calving, calf number etc.
9. **Animal History sheet :** This maintains animal number, breed, date of birth, sire and dam number, lactation yield records, date of drying, date of disposal/death, cause of disposal etc.

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EXERCISE-7
JUDGING OF DAIRY CATTLE/BUFFALO BY OUTWARD APPEARANCE AND SCORE CARD METHOD

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India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it

(Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The

poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood

enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

Good seed stock is necessary/essential of profitable farming. It is well established that fertilizer application given to high yielding variety gives more production and profit than the low yielding variety. The same principle applies to dairy farming too.

Importance:

Dairy animals are kept/maintained by the people for the production of milk and young ones. The cows vary in their milk production capacity because of several factors: the most important ones are heredity or genetic makeup of animals and their feeding practice followed on the farm. It is not difficult to discover the individual cow production at least one and a half to two times the amount of milk and butter fat as compared to other cows in the same herd with same feed. It therefore requires a good judgment in selecting better cows and culling out the unproductive, aged, defective or infertile animals from the herd (called culling) to improve the overall performance of the herd. Culling and selection both requires careful judging of the animal.

Pedigree and production records are the best for selection of the animal. But such records are available only on a few organized dairy farms in our country. Therefore selection of dairy cows/buffaloes is largely done based on their general physical/outward appearance.

Physical or Phenotypic Selection

It has been found that in dairy animals certain physical characters are associated with high production e.g. wedge shape body, large capacious udder, thin skin, slender neck etc. By understanding these characters, it may be possible to judge the production capacity of individual cow,when pedigree and performance records are not available.

In USA, there are six breed associations for major breed of cattle, viz. HF, Jersey, Guernsey, Brown Swiss, Ayrshire and Milking short horn. They have developed a system of classifying individual cows on the basis of their physical appearance (type) within the breed. The animals are rated according to the standard score card by giving marks to different phenotypic characters and are placed in one of the following categories according to the total scores obtained.

Sr. No.	**Class**	**Rated Score Points**
1	Excellent	90 and above
2	Very Good	85 to 90
3	Good Plus(Desirable	80 to 85
4	Good (acceptable)	75 to 80
5	Fair	65 to 75
6	Poor	Under 65

Selection/Judging of Dairy Cows

There are 4 basic or fundamental lessons/principles or pre-requisites, which must be mastered by aperson to become reasonably proficient cattle, judge viz.

1. He must have knowledge of the ideal cow and a clear mental picture about its conformation thatcan be compared with other dairy cows under selection.
2. He must learn/know the relative importance of different body parts of a cow and their relationshipwith milk production.
3. He must learn to evaluate good and bad points of each animal and to make allowance or deductions depending upon its closeness to the ideal cow.
4. He must learn to balance the goodness and lacunae of a cow under selection against the rest of thecows in the herd or group for appropriate ranking.

Criteria for Judging

While selecting a dairy cow, we have to carefully observe and analyze the animal giving major consideration to the following four factors. We should give only the deserving marks/points against the maximum assigned to each factor.

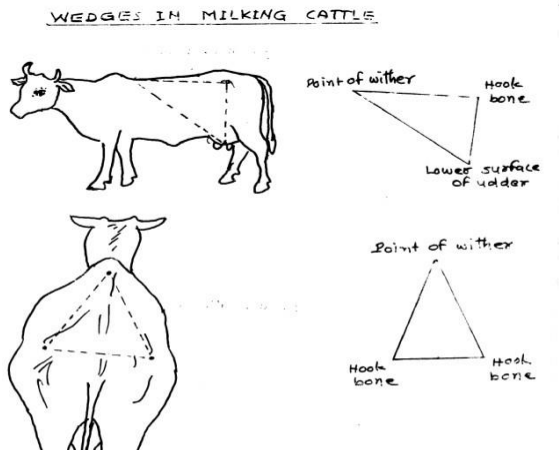
General Appearance	30 points
Dairy Characters	20 points
Body Capacity	20 points
Mammary system	30
points Total	100
Points	

1. General Appearance: The cow should be true to the breed characters with angular body. It should have good size, style, graceful walk and attractive look. It should have clear cut head. Large muzzle and bright eyes that is prominent and spaced wide apart. The shoulder blades should be smoothly set into sharp withers. The top line (from the Point of wither to the root of tail) should be well levelled. Good feet and legs are important in selection dairy cows. The legs/feet should be squarely set and wide apart. The hind shanks should be flat a moderate in size. The pasterns should be springy and not weak or too straight. The hind legs should be perpendicular from hock to pastern. Cows with weak
back, sloppy rump and high tail head are undesirable and should be rejected. Similarly the cows with sickle hock or crooked legs are also not good as such lumpy legs become worst with age.
The body of the dairy cow should be of an angular shape as viewed from front, side and top. The angularity of body is referred to as wedges. In dairy type cows, the wedges are as follows.

(A) Front wedge (B) Side wedge (C) Top wedge

(A) Front wedge: It is a triangle, formed by joining the point of wither with the floor of the chest along with the shoulders. Broader the base, better it is. Broad base of the triangle shows that the vital organs like heart and lungs are well developed. If these organs are well developed the cow has sound health to produce more milk.

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(B) Side wedge: This wedge is formed by joining the point of wither, hook-bone and lower surface of the udder. If we consider the line joining hook-bone and lower surface of udder as base and if it is broad, it indicates that mammary system is well developed, indicating higher production of milk.

(C) Top wedge: It is formed by joining two hook-bones with the point of wither. The line joining two hook-bones will be the base. Broad base indicates more space for the development of digestive system. More capacious the digestive system, the milk production will be more.

2. Dairy Characters: Dairy characters are usually related with high milk production. Cows with good dairy characters have angular wedge shaped body (prominent bones and joints because of lesser fleshy and fattiness) and long lean neck, which bends smoothly at withers. These are also reflected by sharpness of withers and spacing of ribs. The ribs should be wide apart, flat, long and well sprang in animals with excellent dairy characters. A dairy cow should have deep, arched and refined flanks indicative of plenty of room for digestive organs. Such animals can consume and digest large quantity of feed. A thin mellow, medium, loose pliable skin and smooth glossy hair coat is also a very good indicator of dairy character. The thighs of high producing cows are usually incurving to flat from the side and wide apart from the rear. Fleshy brisket, short thick neck and coarseness of body are associated with beef characters. Beef cow are blocky rather than angular in shape. Similarly, coarse flat top shoulders are related with the beefiness. Cows with shallow flank have poor/lower capacity to consume large amount of feed.

3. Body Capacity: A dairy cow must consume large quantity of feed (grains, roughness and pasture grass) in order to be heavy milk producer. She must have sufficient room in the body to handle these bulky feeds. Body capacity is usually determined from the size of the barrel (belly, girth) and by heart girth. Larger heart girth i.e. width and depth of the chest are necessary to provide greater room for the heart and lungs. Long well sprung ribs and wide chest between the forelegs are desired in dairy animals. Similarly, longer deep belly gives more room (space) for digestive organs.

4. Mammary System: The udder is a business end of the dairy cow. A good cow must have large capacious good udder. The length, width and depth of udder determine its capacity. The udder should be attached high and wide on the rear (backside) and should be carried well forward in front. It should blend smoothly with the body. There should be no tendency for the udder to break away from the body, either in front or rear, because of loose ligament (attachment). An udder lacking firm attachment with the body is known as broken udder. Broken udder is getting worst with the advancement of the age. Deep swinging/pendulous udders are hard to milk and are easily injured. The udder should have soft and pliable texture. There should not be any excess hair on, and any flesh fat or nodular growth inside. Ideally the udder of dairy cows should be bowl or cup shaped. The round and tight, goaty or broken up udder are not desirable. The floor/bottom of the udder should be levelled. The four quarter of udder should be of equal size and blend smoothly to each other. The udder with deep crevices between the quarters is known as badly quartered udder.

All four teats should be uniform in size wide apart and squarely/evenly placed. Closeness of any two teats indicates poor development of quarters. Teats should be moderate in size and cylindrical in shape. Blend teats or supernumerary teats are not desired. Too large or

too small teats are difficult to milk. Teats should not be pear shaped, bottle shaped or funnel shaped. The mammary

veins/milk veins should be large prominent and tortuous, which indicate better functioning of uddertissues towards greater synthesis of milk.

UNIFIED SCORE CARD FOR JUDGING HEIFER/COW

Breed characteristic should be considered in application of the score card

Particulars/Points to be considered for scoring	**Perfect score**	**Name/No. of Heifer/ Cow**				
1.General Appearance/Breed Characteristic	**30**					
Attractive individually with feminity, vigor, stretch, harmonious blending of all parts, and compressive style and carriage. All parts of a cow should be considered in evaluating cow's general appearance. **Head** Clean-cut proportionate to body, broad muzzle with large open nostrils, strong jaws, large bright eyes, forehead broad and moderately dished, bridge of nose straight, ears medium size and alertly carried. **Body** Shoulder blades: Sharp set smoothly and tightly against the body. Back: Straight and strong, broad and nearly level Rump: Long wide and nearly level from hook bones to pin bones, clean cuts and free from patchiness. Thurls: High and wide apart. Tail and Head: Set level with backline and free from coarseness. Tail: Slender. **Legs and feet** Bone flat and strong, pasterns short and strong hocks, cleanlymolded. Feet: Short compact and well rounded width deep heel andlevelled sole. Fore Legs: Medium in length, straight wide apart and squarely placed. Hind Legs: Nearly perpendicular from hock to pastern from the side view and straight from the rear view.						
2. Dairy Characters: Evidence of milking ability, angularity and general openness without weakness freedom and general coarseness giving due regard to period of lactation. Neck: Long lean and blending smoothly into shoulder, clean cut throat dewlap and brisket.	**20**					

Wister: Sharp. Ribs: Wide apart rib bone wide flat and long Flanks: Deep and refined. Thighs: Incurving to flat and wide apart from the rear view,providing ample for the udder and its rear attachment. Skin: Loose and pliable.						
3. Body Capacity: Relatively large in proportion to size of animal, providing ample capacity, strength and vigor. Barrel: Strongly supported, long and deep, ribs highly strong and wide, depth and width of barrel tendency to increasetowards rear. Heart Girth: Large and deep, with well sprung fore ribs, blending into the shoulders, full at elbows, wide chest floor.	**20**					
4. Mammary System: A strongly attached, well balanced, capacious udder of fine texture indicating heavy production and a long period of usefulness. Udder: Teats and mammary veins symmetrical, moderately long, wide and deep, strongly attached, showing moderate average between halves, no quartering on sides, soft pliable and well collapsed after milking, quarters evenly balanced. Teats: Uniform size of medium length and diameter, cylindrical squarely placed under each quarter. Plumb and well spaced from side and rear views. Milk Vein: Very prominent large, tortuous extending from udder to well ahead up to chest.	**30**					
Total Score	**100**					
Order of Rank of the animals assessed						

BODY CONFORMATION OF SHEEP:

- Head: It is comprises of horns, ears, face, eyes, nostrils, mouth and lips. Head carried well above the shoulders and kept raised, gives majestic appearance to the animal. It must be famine in a ewe and masculine in a ram. Head with open face is desirable. Both the jaw should be even and the teeth of lower jaw should meet the dental pad near its extremity. No teeth should be missing.
- Neck: It should be of moderate length, without too many neck folds and wrinkles.
- Body: Fine wool sheep has angular body, whereas, mutton type sheep looks more blocky, compact and low-set appearance. However, it should have broad and deep chest. The brisket must be prominent. The ribs should be well sprung and the back reasonably level. The tail should be well set. Drooping rumps are objectionable. The quarters (limbs) should have

proper length and should be full down to the hocks. The legs should set well on the body and spaced well apart. Crooked or sickle shaped hocks are undesirable. The hoof should not be over grown. The genital organs in rams and the mammary glands in ewes give some indication of their reproductive and/or nursing ability. The body should be well covered with fleece. The wool should be bright in colour without too much dirt and grease. Sheep must have wool of good quality, length and optimum density. The general appearance of an animal must be impressive and should look impressive.

The distinctive characters of wool type and mutton type sheep are:-

Wool type sheep	**Mutton type sheep**
1. They have angular body conformation.	1. They are blocky, compact and barrel in shape.
2. They have heavy, dense fleece. Fibre length - 5 to 7 cm and fibre diameter 17 to 22 micron.	2. They have light fleece. Wool fibre length -4 to 5cms and fibre diameter 23 to 33 micron.
3. They have relatively lesser growth rate.	3. They reach maturity earlier as they have faster growth rate.
4. They have strong flocking instinct. E.g. Merino, Rambouillet.	4. They produce more lambs in a year. E.g.Dorset, Southdown, Suffolk.

BODY CONFORMATION OF DAIRY TYPE GOAT:

- Head should be long and of moderate width.
- Neck and shoulder–the neck should be long and sloppy and good depth.
- Chest- should be moderately deep and good width giving the appearance of strength.
- Fore-legs should be straight, strong and possess good bone.
- Foot- the animal should stand well its legs without the tendency to turn walks on heels.
- Body- good depth is an important feature the back should be level from the shoulder to the hips and then drop slightly at the tail region.
- Ribs- should be well sprung to give a barrel effect. Large barrel indicates capacity to take more feed.
- Bones should give the appearance of strength with the hocks slightly bent.
- Udder and teats should be carried well under the body and should be large and proportional to sized of the body. It should undergo considerable shrinkage after milking. The teats should be considerably apart of moderate length and of suitable sized to be conveniently held in hand during milking.
- Milk veins should be well developed.

Questions:

1. What is the importance of judging of dairy cattle?

2. What are the pre-requisites/basic principles of judging of dairy cows?

3. What are the different objectives of judging of dairy cattle?

4. Point out the important dairy character of a milch cow.

5. What are the different indicators of body capacity of a cow?

6. Define angularity of body, mention the different wedges of a dairy cattle.

7. Mention the important points about body conformation of sheep and goat.

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EXERCISE-8

CULLING OF LIVESTOCK

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India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and

source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in

Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

Culling is elimination or weeding out of undesirable animals from the herd, for reasons of uneconomic, poor production, or very poor reproductive ability, with sterility problems and

breeding, irregularities, very poor conditions, stunted growth, suffering from incurable illness, or disease animals found to be positive for serious infectious diseases like Tuberculosis, Johne's disease, Brucellosis, lost one or more quarters and teats of the under due to chronic mastitis resultingin marked reduction in milk production.

Undesirable breed characters present in young animal. When the herd is a pure bred herd leading to disqualifications of family lines, exhibiting heritable characters like supernumerary teats, loose horns in cows of certain breeds. Disable animals due to injury or loss of organ, extreme lameness leading to unmentionable conditions, unhealed fractured animals etc. come under the animal proposed or culling. The culled animals carry lower values and a separate list is made for such culled animals and it is known as culling list. When the culling cows for poor production, the entire lactation at yield is considered and preferably first two lactations are observed and if the lactation yield is less than what is expected from the breed or herd, the animal is included in the culling list. Very old animals are culled, as their maintenance will be uneconomical.

Male animals or other animals surplus in the farm or not useful in the farm and they are culled. Calves born with congenital defects like congenital fibrosis of the eye, total blindness or some other defects are included in the culling. Calves born much below the normal birth weight are included in the culling. Yearlings animals male or females, stunted much below their normal body weight, potbellied conditions, and bad conformation are culled. Dairy animal management valuation and culling is done on the farms every year at least once in year. In some farms culling is done twicea year however doing it once a year is must.

Cull in This Order Until You Reach Your Desired Herd Size

Disposition: Some producers can tolerate more disposition problems than others. Disposition should be evaluated both in the pasture and in the pen because some cattle will react differently once corralled. Make a note of those animals that make it difficult to gather the herd or rotate pastures. Any animal that is aggressive should make the list.

Open Females: All open females should be culled. It will be very difficult for an open cow to make up for a year of lost production. In addition, if a heifer does not settle in the same period as her contemporaries, she is telling you that she does not fit your management environment.

Structural Soundness: Evaluate the structural soundness of each cow based on her ability to raise a calf. Anything that limits her ability should be noted. Look for bad feet or toes, a history of prolapse, eye problems and poor udder conformation, including bad quarters and big teats.

Age: Typically, a cow is most productive between the ages of 4 and 9. The condition of a cow's teethis indicative of her age. A cow with broken or missing teeth should probably be culled. Those with badly worn or separated teeth would be next on the list. At this point, it becomes increasingly difficult to make culling decisions because you will have to cull productive animals.

Bred Cows Older than 9 Years of Age: These cows will likely be culled in the near future and are close to the end of their most productive years. Within this group, cull the thin cows first.

Replacement Heifers: First, cull yearling heifers that have not been exposed to a bull. These animalshave very good value as feeder heifers. Bred heifers would be next in the culling order.

Phenotype: Use this as an opportunity to make your herd more uniform. Any cow that does not fit due to breed, size or low productivity should be culled next.

Bred Cows 3 to 9 Years of Age: These are your most productive cows. If you must cull out of this group, 3-year-olds and those cows that are 8 to 9 years old would go first. The decision about

which animals to cull can be difficult. Each operation will have different goals and, therefore, may need to adjust accordingly. Use this list as a guideline for developing a culling order for your herd.

Culling in Dairy Animals 10 points:

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

Questions:

1. What are the objectives of culling?

2. Mention the factors which affect the culling.

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EXERCISE-9

PLANNING AND LAYOUT OF HOUSING FOR DIFFERENT TYPES OF LIVESTOCK

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India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition,

which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility,

and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

HOUSING FOR DAIRY CATTLE

An efficient management of cattle will be incomplete without a well planned and adequate housing ofcattle. Improper planning in the arrangement of animal housing may result in additional labour charges and that curtail the profit of the owner. During erection of a house for dairy cattle, care should be taken to provide comfortable accommodation for individual cattle.

Livestock is provided housing for following purposes/objectives:

- To protect the animals from adverse climatic conditions, predators and theft
- To provide clean and comfortable shelter
- To improve productive and reproductive efficiency
- To ensure proper feeding and management

Location of Dairy Farm 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 the surrounding ground to offer a good slope forrainfall and drainage for the wastes of the dairy to avoid stagnation within. A levelled 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 soils 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 criterion 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, loose hinges, protruding nails, smooth finished floor in the areas where the cows move and other suchhazards 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 reasonable price.

10. Electricity

Electricity is the most important sanitary method of lighting a dairy. Since a modem dairy always handles electric equipments which are also economical, it is desirable to have an adequate supply of electricity.

11. Facilities, Labour and 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 are contribute not only to greater milk yield of cows and make the work of the operator easier also minimizes feed expenses. The relative position of the feed stores should be quite adjacent to the cattle barn.

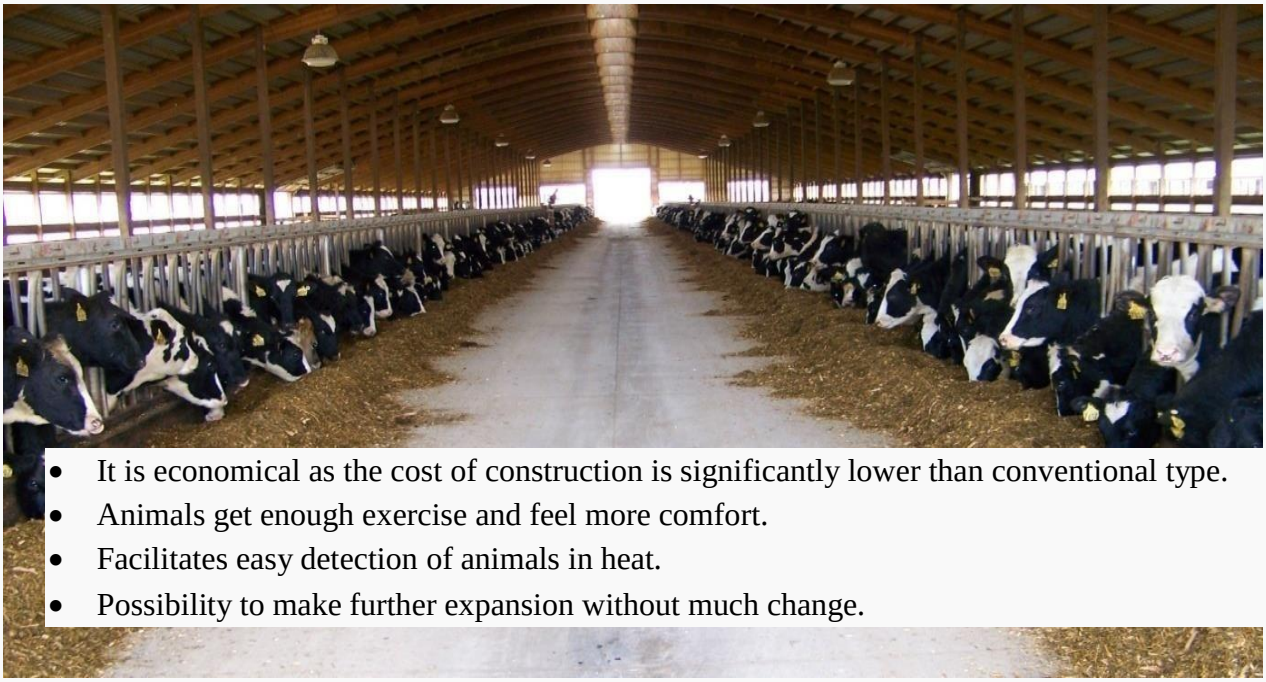
Noteworthy features of feed stores are given:

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

DAIRY CATTLE HOUSING:

Loose Housing System:-Loose housing may be defined as a system where animals are kept loose except milking and at the time of treatment. The animals are provided with a shed for f
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t

- More space (10-20% extra) is required than conventional type of housing.
- Individual feeding attention is not possible.
- Herd cannot be displayed easily.
- The animal in heat is disturbed by fellow animals.



- It is economical as the cost of construction is significantly lower than conventional type.
- Animals get enough exercise and feel more comfort.
- Facilitates easy detection of animals in heat.
- Possibility to make further expansion without much change.

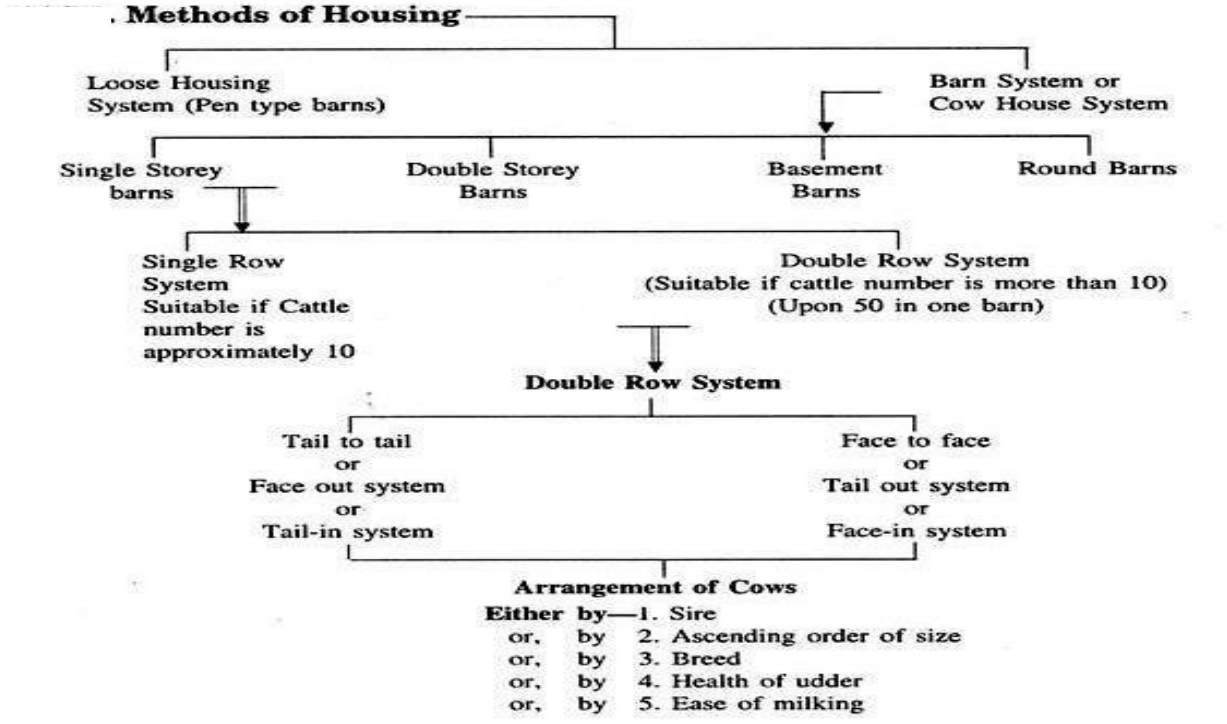
(Cattle Shed)

Conventional Housing System: - They are standards stalls with facilities for feeding, watering and housing of individual animals. The conventional dairy barns are comparatively costly but animals are more protected from adverse climatic conditions. In this system, cow sheds can be arranged in a 'single row'

(if cattle number is more than 10 or up to 50). In double row system, the cows can either be faced in (face to face system) or faced out (tail to tail system). The system consists of various unitsfor successfully layout for proper housing of different classes of dairy cattle and buffaloes on the farm.

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:

Under the average conditions, 125 to 150 man hours of labour are required per cow per year. Study of time: Time motion studies in dairies showed that 40% 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.

In cleaning and milking the cows, the wide middle alley is of great advantage.

Lesser danger of spread of diseases from animal to animal.

Cows can always get more fresh air from outside.

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 gowala.

Any sort of minor disease or any change in the hind quarters of the animals can be detected quickly and even automatically.



Tail to Tail System

Advantages of Face to Face System:

Cows make a better showing for visitors whenheads are together.

The cows feel easier to get into their stalls.

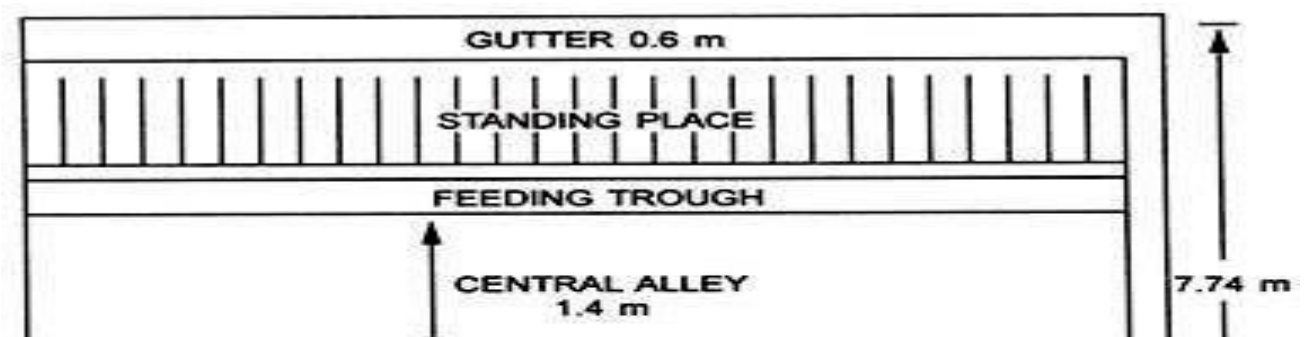
Sun rays shine in the gutter where they areneeded most.

Feeding of cows is easier; both rows can be fed without back tracking.

It is better for narrow barns.



Face to Face System



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 concretefloor is still better. The surface of the cow shed should be laid with a gradient of 1" to 14" from manger to excreta channel. An overall floor space of 65 to 70 sq.ft. per adult cow should besatisfactory.

Walls:

The inside of the walls should have a smooth hard finish of cement, which will not allow any lodgement of dust and moisture. Comers 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 aluminium painted tops to reflect sunrays and bottoms provided with wooden insulated ceilings can also achieve the objective. 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 tropical conditions. To make ventilation more effective continuous ridge ventilation is considered most desirable.

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 1/2' is sufficient for a good manger.

Alleys:

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

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 cow shed should be 5 feet wide with a height of 7 feet and for double rowshed the width should not be less than 8 to 9 feet. All doors of the barn should lie flat against the external wall when fully open.

Calving Boxes:

Allowing cows to calve in the milking cow shed is highly undesirable and objectionable. It leads to insanitary in 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, itshould be provided with sufficient ventilation through windows and ridge vent.

Isolation Boxes:

Animals suffering from infectious disease 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 adults 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. As far as possible the shed for the young calves should be quite close to the cow shed. 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 forevery 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:

1. 20-25 square feet per calf below the age of 3 months,
2. 25 -30 square feet per calf from the age of 3-6 months,
3. 30-40 square feet per calf from the age of 6-12 months and over, and
4. 40-45 square feet for every calf above one year, should be made available for the sheltering. 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 troughs inside each calf shed and exercise yard should never be neglected.

Bull or Bullock Shed:

Safety and ease in handling a comfortable shed 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 will 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. Theexercise yard should also communicate with a service crate via a swing gate which saves the use ofan attendant to bring the bull to the service crate.

Floor Space Requirement for Cattle and Buffalo:

Type of Animals	**Floor space required (sq. met/animal)**		**Max. no. of animal/pen**	**Height of shed (cm)**
	Covered area	**Open paddock**		
Bulls	12.0	120.0	1	175 in medium andheavy rainfall area and 220 in semiarid and arid areas
Cows	3.5	7.0	50	
Buffaloes	4.0	8.0	50	
Down calvers	12.0	12.0	1	
Young calves	1.0	2.0	30	
Older calves	2.0	4.0	30	

HOUSING FOR SHEEP AND GOAT

Normally, sheep and goat do not require elaborate housing facilities but minimum provision will definitely increase productivity by protecting the animals against bad weather conditions. Shed should be provided with gunny bags or thatching material and bamboos. The roof of shed should be made up of asbestos sheet and supported by angle iron.

Generally, loose housing is practiced which is having following sheds:

- General flock shed
- Shed for rams/bucks
- Lambing/kidding shed
- Lamb shed/kid shed
- Sick animal shed

HOUSING FOR SHEEP:

The sheep should be protected from adverse climatic conditions particularly during winter and rainy weather. The sheep barn should be located on dry, well drained site with yard space and paved area adjacent to it. A floor space of 12 square feet/ewe is sufficient in barn having the facility for feeding and watering. The feeding pasture should be fenced to protect the sheep from dogs and predators. Feed racks may be placed in zigzag fashion along the fence. The hay racks 16’ long and 2 ½’ to 3’ height with and 8” opening at about 1’ from the bottom are sufficient for a flock of 40 ewes. The grains are fed from separate trough which may be of 10”x12”x4” in size and may be kept at about 8- 10” from the ground. A watering trough of similar size may also be constructed.

Fro lambs, a 12’ long water tank equipped with float valve may be constructed. Dipping vat made up of cement concrete with a size of 16’ x 4’ x 10’-12’ inside width at bottom and 20-

24’ insidewidth at top is sufficient. The top of vat should be 8-12’ above the ground level. The inclined ladder and a ramp for exit of sheep should be 6’-7’ long for a 3’ deep vat. At the exit end, a drain plateform is built.

Shearing room should be made for shearing the sheep which should be well lighted and ventilated. On either side of shearing room, there should be 2 simple fenced lofts for collection of sheep before and after shearing with a passage of 1.5’ width leading to shearing room should also be there. There should be provision for sheds for breeding rams and lambs and an isolation box for sick animal. A lambing pen for pregnant ewe should be provided for safe lambing pen for pregnant ewe should be provided for safe lambing. Other accessory units like store for wool, feed and fodder, farm equipments, clinic, etc. should also be provided.

Sheep house should have the following sheds and facilities:

1	Sheep barn/general flock shed	6	Stores	11	Grain trough
2	Ram shed	7	Shearing room	12	Watering tank
3	Lambing shed	8	Feed racks	13	Dipping vat
4	Lamb shed	9	Loft/yard		
5	Isolation box	10	Grazing pasture area		

HOUSING FOR GOAT:

Goat housing is somewhat similar to sheep housing. In close housing pen an area of 1.80 square meter par animal with feeding and watering through is sufficient. In open house an area of 4.5 square meter/goat is sufficient. The milch goat shed may be partitioned with brick wall, stone slab or iron tubing install for each done for individual milking and feeding. The kidding pen should be of 6’x5.5’ dimensions enclosed with a fence of 4’-4.5’ height. Large flocks of goats are usually kept in groups except adult male, pregnant doe, and heavy milkers which are housed individually or in small groups.

Kids may be housed in a loose box or in a large wooden box. Sufficient hay racks and wateringthrough should be provided in every shed.

Sheds and facilities under conventional housing:

1	Doe shed	4	Kid shed	7	Milk storage room
2	Buck shed	5	Weaned sheep	8	Stores
3	Kidding shed	6	Milking shed	9	Isolation box

Floor space, feeding and watering space for sheep and goat:

Sr. No.	Types of animal	Floor space per animal (m^2)	Feeding space per animal (cm)	Watering spaceper animal (cm)
1.	Kid/lamb	½-1	30	3
2.	Adult female	1-1½	40	4
3.	Pregnant and lactating animals	2	50	5
4.	Adult ram	2	50	5

Feeding/watering space requirements (cm) for different categories of livestock:

Type of animal	Space per	Total manger length in a pen /	Length of watertrough in a	Manger/water trough (cm)		
				Width	Depth	Height of inner wall

	animal	100 animal	pen/100 animal			
Adult cattle and buffalo	60-75	6000-7500	600-750	60	40	50
Calves	40-50	4000-5000	400-500	40	15	20
Adult sheep andgoat	40-50	4000-5000	400-500	50	30	35
Lambs andkids	30-35	3000-3500	300-350	50	20	25

Questions:

1. What are the objectives of housing system? What are the points you will consider whiledeciding the location of dairy building?

2. Give the diagrammatic representation of loose housing system.

3. Point out the difference between loose housing system and conventional barn system.

4. What are the basic differences between housing of sheep and goat?

5. Give the difference between face to face and tail to tail system of housing.

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EXERCISE–10
COMPUTATION OF RATION FOR LIVESTOCK

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Objectives:

- To provide balanced ration to farm animals in view of production.
- Scientific approach for feeding of farm animals.
- To make economical use of available feed resources.

Principle:

Computation of ration includes translating the recommendations contained in feeding standards into actual formulation of feed mixture and feeding practices. In formulation of ration for ruminants DM, DCP, energy in terms of TDN, minerals and vitamin A is given consideration.

Formulation of Ration:

Ration may be defined as total allowance of the feed given to an animal during 24 hrs period to perform the various functions. The ration of animal may be divided for the sake of convenience into two parts, one for maintenance and other for production or reproduction whatever the case is.The word "balanced ration" means feeds or mixture of feeds which contain all essential nutrients in right quantity and in optimum proportion to meet the needs of the animal for maintenance and production.

Desirable Characteristics/Qualities of a Ration:

- Liberal Feeding: Dairy cows need all nutrients liberally incorporated in the ration for exploiting inherent capacity to the maximum. However, they should not be overfed, as it is wasteful and sometimes harmful.
- Individual Feeding: To obtain maximum profits, cows must be fed individually according to their production and physiological status instead of group feeding, because in group feeding, weaker or sicker animals get lesser feeds as against powerful ones.
- The ration should be well balanced for all nutrients required by animals. Excess of nutrients are wasteful. Any deficiency of nutrient affects health and production.
- Palatable Feeds: This affects feed consumption. Evil/bad smelling, mouldy, dusty, spoiled and inferior feeds are unpalatable.
- Variety of feed should be included in the ration: By combining many feeds in a ration, better and balanced mixture of proteins, vitamins and other nutrients are furnished. Moreover, variety of feeds in the ration makes it cheaper and palatable.
- The feeds used in the ration should be free from foreign materials like mould, dust, nails, toxins, gravel etc. It is better to clean them if necessary.
- The ration should be fairly laxative and not constipating. Otherwise it may lead to digestive trouble and depression of appetite/hunger.
- The ration should be fairly bulky, so that the hunger of animal is satisfied. If ration is more bulky, animal cannot eat sufficient quantity to fulfill its nutrient requirement.

- Allow much of green fodders: As they are rich in carotene, slightly laxative, more palatable and easily digestible. Feeding only green fodder may not supply sufficient dry matter for satisfying hunger.
- Avoid sudden changes in the diet: These may cause digestive troubles.
- Maintain regularity in feeding timings. Otherwise animals become restless and go down in production.
- Feed must be properly prepared/processed by chaffing, soaking, grinding, boiling, pelleting, mixing etc. These have special advantages associated with them.

Points to be Considered while Formulating the Ration:

a. Live weight of the animal
b. Age of the animal
c. Condition of the animal
d. Producing or non-producing
e. Production level-high or low
f. Types of the feed and fodders available

Ration for Dairy Cattle:

The computation of ration must be done in a systematic manner otherwise it will be a cumbersomeexercise. The steps involved in ration formulation are:

Step-I	Determination of dry matter requirement.
Step-II	Distribution of required DM to different category of feeds.
Step-III	Determination of DCP and TDN requirement of animal for maintenance.
Step-IV	Determination of the DCP and TDN requirement for production or reproduction functions over and above the maintenance requirement.
Step-V	Sum up the maintenance requirement of nutrients with production/reproductionrequirement. This will be total requirement of the nutrients for particular animal in a day for maintenance and production/reproduction.
Step-VI	Refer the chemical composition of the available feed resources to fulfill the DCP and TDN requirement as per the allocation of DM to particular feed category andat the cheapest price.
Step-VII	Calculate the nutrients supplied through roughage and concentrate according toDM allocation and also calculate the quantity of individual feedstuff on fresh and dry basis.
Step-VIII	Match the supply of nutrients with their requirement for one day. It should be exactly same or somewhat higher than the requirement but, if anyone is deficit then re-adjust the level of individual feed ingredient within the category and according to deficit nutrient.
Step-IX	Preparation of ration.

Note: Mineral mixture @ 2 per cent and salt @ 1 per cent of the ration should be given to the animal.

Chemical composition of feedstuffs: The quantity of individual feedstuff in the ration can not befixed until unless you have the idea about its chemical composition. Different

principles of the composition may be analyze in the laboratory or may refer from the books. The composition of somecommon feed ingredients in terms of DCP and TDN is given below.

DCP and TDN content of some common feedstuffs

The nutritive value of some important feeds are as follows:

FEEDS	DM	DCP	TDN
Wheat straw	90	0.0	42
Bajra straw	90	0.8	48
Jowar straw	90	1.0	50
Rice straw	90	0.0	35
Berseem hay	90	9.0	60
Lucerne hay	90	14.0	50
Green bajra	30	1.0	15
Green jowar	30	0.8	16
Green maize	30	1.2	17
Green berseem	20	2.8	13
Green Lucerne	20	3.0	12
Guar	90	29	71
Moth	90	8	78
Barley grain	90	19	72
Wheat bran	90	10	62
Cotton seed cake	90	17	72
Groundnut cake	90	42	72
Til oil cake	90	30	78
Linseed cake	90	28	65
Gram	90	12	75
Guar churi	90	38	74
Moth churi	90	25	75
Gram churi	90	38	72

CALCULATION OF WATER AND FEED REQUIREMENT FOR DAIRY HERD

Objectives:

- To calculate nutrient requirement of cattle and buffaloes for maintenance in terms of DCP and TDN.
- To determine the requirement of DCP and TDN for bovines to perform various productive functions like growth, milk production, field work and pregnancy.

Introduction:

The nutrient requirements viz. DM, DCP and TDN vary with body weight, intensity of production, intensity of work, average daily gain and gestation month etc. The requirement of a particular animal for performing a specific function is compile in tabular form which is known as feeding standard. Thus, the feeding standard may be defined as tabulated statement of the requirement of nutrients of animals for performing various body functions. Feeding standards broadly are divided into three categories namely comparative, digestible nutrient type and production type feeding standards. There are various agencies in the world such as NRC, ARC, CNCPS, ICAR etc. which provide the information about the nutrients requirement of animal. The Indian feeding standards prepared by ICAR is basically based on the average value of

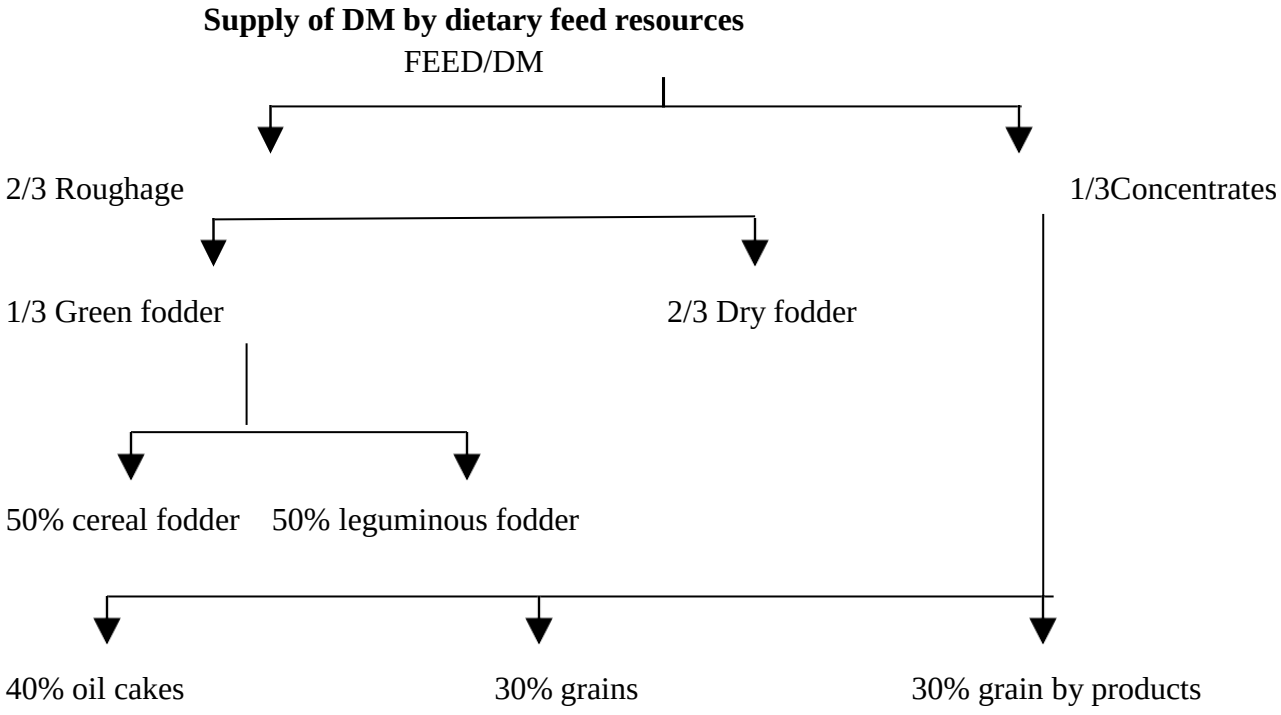
Morrison feeding standard. ICAR (1985) feeding standard describe the nutrient requirement in terms of DM, DCP, TDN, Ca and P based on recommendations of scientific panel on nutrition and physiology. This standard includes recommendation based on experimental work carried out in India over the past several years. The figures given for TDN can be converted to DE and ME by taking 4.4 Mcal DE and 3.6 Mcal ME per kg TDN, respectively. The requirements for maintenance are the same for buffaloes as that for Indiancattle.

Requirement of Nutrients for Dairy Bovine:

(1) DM Requirement:

DM Requirement of different animals depends on the body weight of animal and species.For indigenous cattle: 2.0-2.5kg/100kg BW

For cross bred cattle and buffalo: 3.0 kg/100kg BW



The DM supplied by the dietary feed ingredients will furnish the nutrients required by the animal for different body functions viz. for maintenance, milk production, pregnancy, field work etc. Therequirement of DCP and TDN, which are the measures for expressing the protein and energy need of the animal, respectively, depend on the body weight and intensity of production.

a) Maintenance Requirement:

This is the minimum requirement of the nutrients for the animal to perform various vital functions of the life like respiration, circulation, transportation of nutrients, metabolism of nutrients and secretion of hormones etc. The maintenance requirement of particular animals depends on its body weight. The nutrients requirement in terms of DCP and TDN at different body weight has been compiled in the below given table.

Daily Maintenance Requirement for Various Nutrients:

B.W. (kg)	DCP (g)	TDN (kg)	Ca (g)	P (g)
250	168	2.02	6	6
300	197	2.36	7	7
350	227	2.70	8	8
400	254	3.03	9	9
450	282	3.37	10	10

b) Production Requirement: Production requirement varies animal to animal and species to species e.g. in cow and buffalo additional allowance of nutrients required to produce milk while in sheep it is for wool production and in goat for meat production. The production requirement in dairy animal get change with the level of production and not only with quantity of milk but the quality is also important specifically the fat per cent. The production requirement is given to the animal in addition to the maintenance requirement. Nutrients requirement in terms of DCP and TDN for producing 1litre of milk with varying level of fat has been given below.

Nutrient Requirement for Milk Production:

Fat %	DCP (g)	TDN (g)
3.0	48	275
3.5	51	300
4.0	55	325
4.5	58	350
5.0	62	375
5.5	65	400
6.0	68	425

Growth: growth is a function of the nutrients, which require protein and energy in addition to the maintenance. The requirement of DCP and TDN depends on the daily gain in body weight. The table given below gives an idea about the nutrient requirement for growth at different body weight and different average daily gain.

Daily Nutrient Requirement in Terms of DCP and TDN for Growth:

B.W. (kg)	DCP (g)	TDN (g)
45	150	800
70	220	1300
100	260	1900
200	400	3000
300	470	4000

Work Allowance: The allowance for working bullocks depends on the intensity of work. The nutrient requirement describing the protein and energy requirement in the form of DCP and TDN is given in the table as under for normal working bullocks.

Daily Nutrient Requirement for Working Bullocks:

B.W. (kg)	DCP (g)	TDN (g)
200	240	2000
300	330	3100
400	450	4700
500	560	4900
600	660	5800

Pregnancy Allowance: In addition to the maintenance requirement, an additional allowance should be given to female animals during pregnancy especially in last three months for the development of foetus. Generally 140 g of DCP and 700 g of TDN daily is sufficient for the pregnant animal.

Breeding Bull: The nutrient requirement for nutrients again depends on the body weight of animal, which must be given in addition to the maintenance requirement.

Daily Allowance for Breeding Bull over and Above the Maintenance:

B.W. (kg)	DCP (g)	TDN (kg)
400	380	3.6
500	450	4.5
600	530	5.4

India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number

of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of

mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming,

poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

Questions:

1. Mention the important characteristics of ration.

2. Give the partitioning of dry matter requirement of a dairy animal in chart form.

3. Calculate the nutrient and water requirement of an animal weighing 400 kg and giving 10 liters of milk and animal is in advanced pregnancy stage?

4. Compute a balanced ration for a cow weighing 500 kg and producing 10 liters of milk/day with 5% milk fat. The feedstuffs available are wheat straw, green maize, concentrate feed and ground nut cake.

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EXERCISE–11
FORMULATION OF CONCENTRATE MIXTURE

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India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma,

2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly

affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

Concentrates:

They are characterized by high nutrient density, high dry matter, less bulkiness, longer lifespan and low crude fibre. Concentrate can broadly be divided into two categories; Energy source and Protein source: Energy sources includes: different cereals and pulse grains, roots and tubers, grain by-products and mill by-products while protein sources are different oil cakes, maize gluten feed/meal, cotton seed meal, sunflower, groundnut meal, soya meal, copra meal, yeast, fish meal etc.

Compound Feeds:

a) **Commercial Dairy Feeds:** This is produced on an industrial scale that involves the combination of many ingredients blended and mixed in proportions in accordance with dairy cattle feeding specification.

b) **Home-Made Dairy Feeds:** These are formulations by the farmer on the farm using locally available raw materials as well as external ingredients.

Concentrates are low-fiber, high-energy feeds. They may be low, medium, or high protein. Mostoften they are fed to raise the energy level of the ration for dairy cattle and to compensate for any other deficiencies that remain beyond those provided by the forage portion of the ration.

1. Energy—Non-fibrous carbohydrates (NFC) and fat
2. Protein—Crude protein, degradable intake protein (DIP), soluble protein (SP), and undegradableintake protein (UIP)
3. Fiber—Neutral detergent fiber (NDF) and acid detergent fiber (ADF)
4. Macrominerals—Calcium, phosphorus, magnesium, potassium, sodium, sulphur and chloride
5. Microminerals—Manganese, copper, zinc, iron, selenium, cobalt and iodine
6. Fat-soluble vitamins—Vitamins A, D, and E

Concentrates may serve as carriers for various feed ingredients such as vitamins and minerals (macro and micro), as well as a variety of feed additives. Proper preparation and processing of grains, feed ingredients, or a concentrate mix are essential. Concentrates must be palatable to attain required levels of feed intake. Proper processing and attention to particle size are important for palatability and ruminal degradation of nutrients. Concentrates should meet nutritional and performance needs at a reasonable cost. Purchased feed, including limited amounts of forage, may represent 40 to 55% of thetotal expenses on farms.

Types of Concentrate Ingredients:

Concentrate ingredients can be divided into three basic groups: energy sources/cereal grains, protein sources, and by-product feeds. The feed type and the manner of preparation influence how the dairy cow uses these ingredients.

1. Energy sources - Cereal grains, barley, corn, milo, oats, rye, triticale, and wheat are the most common cereal grains. The general nutritive characteristics of these grains are: high in energy and low in fiber and protein. Comparable level of phosphorus when compared to forages and low in calcium. The energy that cereal grains supply comes in the form of fats, starches, and sugars.

2. Protein sources - the most commonly used protein sources come from either plant or animal origins. Using sources that are high in protein quality are essential when formulating concentrate mixtures. Protein quality refers to the types, amounts, and ratios of peptides and amino acids that are in a feedstuff. Therefore, it is recommended to feed various protein sources to animals so they receive adequate levels, both ruminally and post-ruminally, of the essential and limiting amino acids. Urea is the exception because it is not a protein supplement, but a

source of nitrogen. This nitrogen is converted to ammonia, which is used by the rumen bacteria for protein synthesis. Urea works well in mixtures with plant proteins if soluble protein is needed, and it often lowers feed costs. There are numerous sources of protein supplements available to producers that can be fed to meet an animal's requirement for crude protein.

3. By-products - The most commonly used by-products are derived from cereal grains. The processused to produce the by-product feed will determine how it can be used in ration formulation(s). Somecontain high levels of fat, which can make a ration more energy dense. Others may supply the dietwith undegradable, degradable, or soluble protein at various levels. Some contain relatively highNDF (Neutral Detergent Fibre) content and are used to balance rations for total NDF. Some supplyhigh levels of minerals or vitamins to the ration. By-product feeds often are available in wet form.Higher variability in moisture content may necessitate periodic testing of dry matter and nutrientcontent. These products are usually economical if trucking costs are not prohibitive. **Example/Composition of a concentrate mixture:**

Ingredient	**%**
Maize germ	43
Wheat pollard	16
Wheat bran	26
Sunflower meal	5.5
Cotton meal	6.75
Lime	0.5
DCP	1
Common salt	1
Premix	0.25
Total	100

Nutritional value: 10.5 ME/Kg (Energy), CP=14-16%, Cal = 0.7% & P=0.5%

Importance of Compound Cattle Feed in Milk Production: Concentrate or compound cattle feedis a balanced source of essential nutrients required for body maintenance, growth and milk production. It is manufactured using good quality grains, oil cakes/meals, brans, molasses, common salt, minerals and vitamins. It is comparatively cheaper and highly palatable to the animals.

Recommendations for Feeding Concentrate/Compound Cattle Feed:

- Compound cattle feed of appropriate quality keeps animals healthy and increases milk production.
- Compound cattle feed contains protein, energy, minerals and vitamins required for the growth, maintenance and milk production of animals. It is advantageous to feed extra cattle feed to pregnant animals for proper development of foetus.
- It increases reproductive efficiency, milk production as well as fat content of milk.
- Growing animals should be fed 1 to 1.5 kg of compound cattle feed daily.

- Milking animals should be fed 2 kg of compound cattle feed for body maintenance and additional 400 g to cows and 500 g to buffaloes for every litre of milk produced.
- In addition to this quantity, 1 kg compound cattle feed and 1 kg good quality oil cake should also be given to pregnant animals during the last two months of pregnancy.

Questions:

1. Define concentrates and mention the importance of concentrate feeding in dairy livestock.

2. What are the different feed ingredients required for formulating the concentrate mixtures.

3. Formulate the concentrate mixture from the locally available feedstuffs.

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EXERCISE–12
CLEAN MILK PRODUCTION AND MILKING METHODS

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and

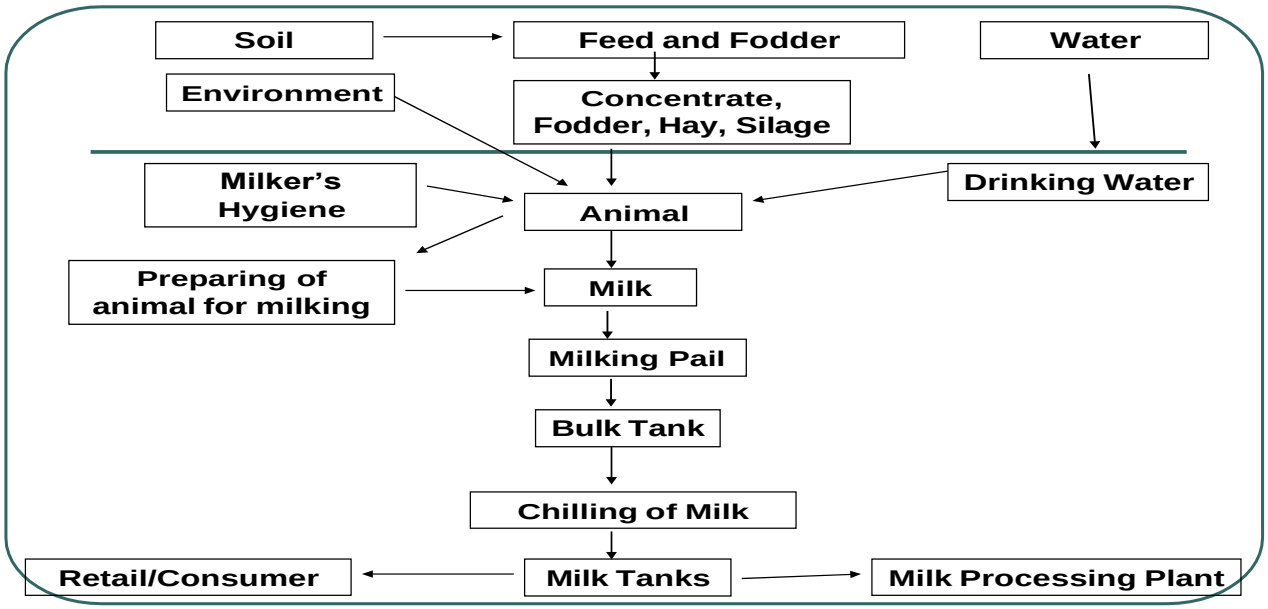
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Milk is an important food commodity and there can be adverse effect on its quality if proper care is not taken during production, procurement and transit. Milk is a raw material, and from it milk products like ghee, powder, butter, paneer, curd, buttermilk, sweets etc is being manufactured. Quality of all products depends on process and raw material. If raw material has good quality, then finished product will have better quality.

"Clean milk" – Milk drawn from the udder of healthy animals, which is collected in clean, dry milking pail and free from extraneous matter like dirt, dust, flies, hay, manure etc." Clean milk has a normal flavour with low bacterial count and is safe for human consumption.

Clean Milk production is very important for dairy farms maintained on commercial lines. Milk is highly perishable commodity. Unclean milk deteriorates quickly and produces diseases if consumed. Therefore utmost care has to be taken in production, storage and transport of milk. The animals should be maintained in hygienic environment for production of quality milk. Without production of clean milk there is no use of maintaining high yielding cows and good feedingpractices.

- Clean Milk Production – beneficial to both producers and consumers.
- Safe for human consumption.
- Better keeping quality.
- High commercial value.
- Protection against diseases like typhoid, dysentery, diphtheria, septic sore throat etc.
- Helps to produce good quality dairy products.
- Transportation over long distances.



Source of contamination of milk

Several Practices should be Practised for Production of Clean Milk:Maintenance of Sheds:

The sheds should be maintained in good hygienic conditions to keep the animals clean. The dung should be disposed off immediately and there should be proper drainage for the dung, urine, and waste waters going out of the sheds. The manure pit should be a little far off to prevent flies and insects entering into the sheds. Before milking the animals, the sheds should be kept clean and dry. After every day milking the sheds should be cleaned thoroughly, dried and disinfected.

Cleaning of the Animal:

At the time of milking, the animals should be cleaned thoroughly to remove any dirt and dung sticking on the thighs and udders. Potassium permanganate solution can be used to clean the udders. After cleaning the thighs, udders and teats should be dried with a clean towel. The animals should be kept quiet during the milking process. A soft music in the sheds can be played to keep the atmosphere serene and quiet. Further the milking should be practiced at fixed hours every day so that the animals get accustomed for milking at that time. Feeding concentrates at the time of feeding also helps to make the animals quiet and cooperate with the milking people.

Cleanliness of the Milking Personnel:

Along with the animals the milkers should maintain cleanliness. They should wash their hands with an antiseptic solution and kept dry. They should cut their nails close to prevent any injuries to the teats. They also should wear a cap to prevent hair falling into the milk. They should be free from infectious diseases. It is better to avoid any form of coughing or sneezing during milking hours.

Cleanliness of the Milking Pails:

The milking pails used for milking should be cleaned well with warm water and washing soda. After washing they are again washed with plain water thoroughly and dried by keeping upside down. The mouths should be closed with lids and kept ready for the next milking. While transferring the milk into the transport cans the milk should be strained through a clean cloth to remove any particles. After milking, the milk pails should be kept in a cool

place and should not be exposed to direct sunlight. If the milk is to be transported to long distance it is cooled in a refrigerated room to prevent spoilage.

Milking Methods:

Milking should be done using the full hand method. Pressing the teats using the thumb (Knuckling method) is not a good practice. It should be avoided otherwise the teats get damaged and mastitis may develop. The milking should be completed as quickly as possible in about 5-8 minutes. Milking should be done completely and if milk is left in the udder it will become a source of infection and causes mastitis to develop. The first milk should be tested for presence of mastitis everytime prior to milking. If suspected for mastitis the particular quarter should not be milked and treated.

Pre-Requisites for Good Milking:

- Milking is an art requiring experience and skill.
- Milking should be done gently, quietly, quickly, cleanly and completely.
- Cows remaining comfortable yield more milk than a roughly handled and excited cow.
- Maintenance of clean conditions in the milking barn results in better udder health and producing milk that remains wholesome for longer period.
- The milking process should be completed within 5 to 8 minutes.
- Complete milking has to be done. If any residual milk is left it may act as nidus for mastitis causing organism and the overall yield also getting affected.

Preparation for Milking - Dairy Cows and Sheds:

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

Preparation for Milking - Milkers and Pails:

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

Methods of Milking

1. Hand milking
2. Machine milking

1. Hand Milking

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

- Wet hand milking
- Dry hand milking

A. Wet Hand Milking

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

B. Dry Hand Milking

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

Types of Dry Hand Milking

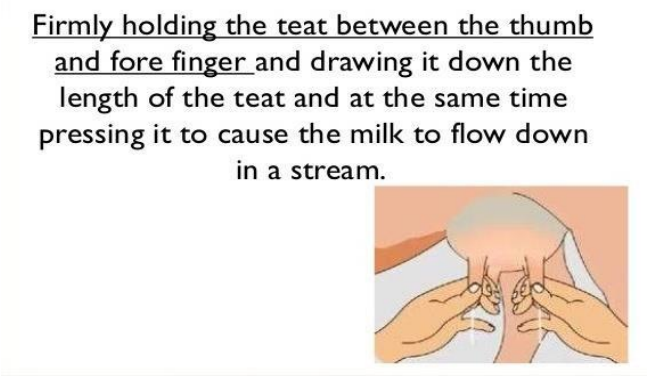
- Full hand milking
- Stripping
- Knuckling

Full Hand Method:

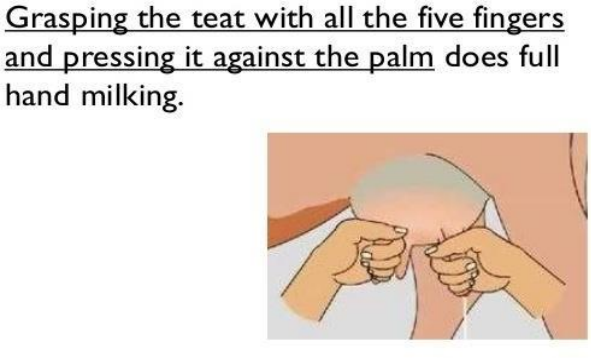
It is the best method as it causes minimum injuries to the teats. In this method teat is circled with index finger and thumb at the junction of teat and udder, the other portion of teat is closed with remaining fingers and pressed on all sides against the palm. Full hand milking stimulates natural suckling of a calf. Cows with large teats and buffaloes are milked with full hand method. Full hand method removes milk quicker than stripping because of no loss of time in changing the position ofthe hand. Even by efficient method of milking only 85% of milk comes out from udder and 15% still remains in udder which is called residual milk.

Stripping Method:

It consists of firmly seizing the teat at its base between the thumb and forefinger and drawing them down. The entire length of the teat is pressed simultaneously to cause milk ejection and to flow down in streams. The process is repeated in succession. Generally stripping method is adopted in small cows with narrow teats. Sometimes it is followed to draw the last strips of milk containing more fat. A combination of initial full hand milking method followed by stripping at the end is a good method of milking.



Stripping Method



Full Hand Method

Knuckling Method:

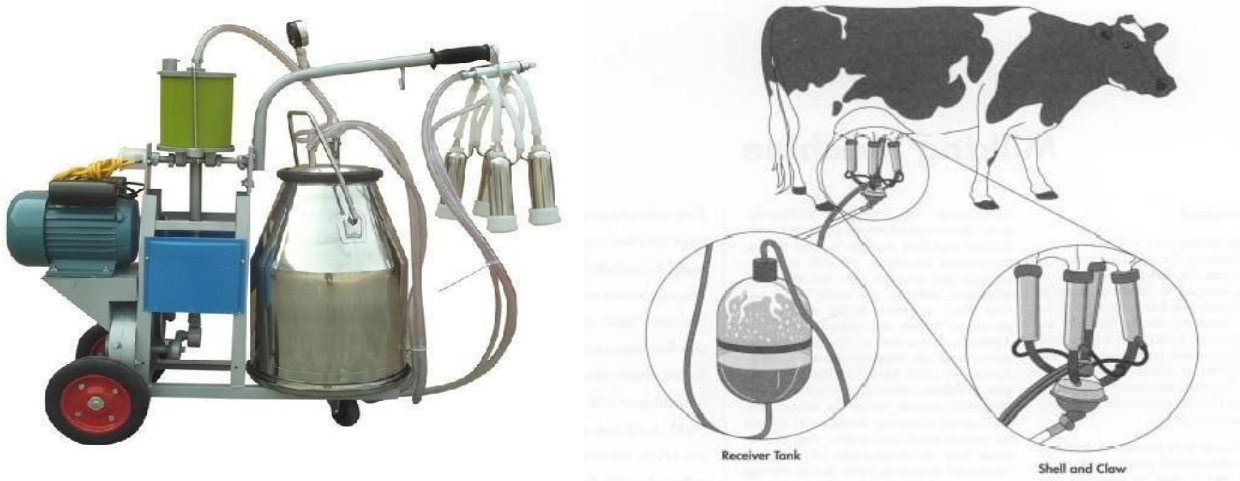
It is pressing the thumb against the teats while the teats are in between thumb and fingers. It may cause injury to the teat. This method is not advisable and is least recommended of all milking methods



Knuckling **Stripping** **Full Hand**

2. Machine Milking

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



Machine Milking

Factors Influencing the Efficiency of Milking Machine

Vacuum level: The degree of vacuum in a milking system during operation, expressed as inches of mercury/Kilo Pascal (mmHg/kpa) differential measured from atmospheric pressure and indicated by the vacuum gauge.

Pulsation rate: The number of cycles of alternating vacuum and atmospheric air which occur per minute. It may vary between 40 to 60 cycles per minute on most machines.

Milking or Pulsation ratio: The proportion of time spent under vacuum and atmospheric air and is usually approximately 60:40.

Ideal Practices Used in Machine Milking

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

India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose

intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally

expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods

in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

Questions:

1. Mention the advantages and disadvantages of different milking methods.

2. How machine milking is different from hand milking?

3. Write the advantages and disadvantages of machine milking.

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EXERCISE–13

MANAGEMENT OF CHICKS, GROWERS AND LAYERS

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Indian farmers generally experience crop failures due to unfavorable weather conditions. But poultry raising is not influenced by the weather. Mixed farming can be practiced to have both crops and poultry farms to balance the income. As poultry requires small investment and limited space and the returns are within a short period, small farmers, labourers and unemployed youth are encouraged to maintain poultry farms. Poultry man should use better feed, laying stock and Methods of production in order to make a reasonable profit. Hence it is necessary to combine scientific principles with the art of poultry keeping to get the best results.

There are five ways of increasing the profit from laying flock –

• by increasing production.
• by reducing production cost.
• by good marketing.
• by decreasing Mortality.
• by the combination of all the above, feed and labour cost more than 65% of the production cost of eggs.

Feed cost can be decreased with increased production. By proper management labour cost can be decreased.

I. Management of Chick

1. Purchase of young chick: The young chicks of high quality and good yielding variety should be selected and purchased from a reputed Hatchery where the young chicks are duly vaccinated against viral diseases.

2. Brooding (0- 6 weeks): • After getting the young chick, they should be placed in a well heated brooder. • The Temperature of the brooder should be maintained from 90 - 95°F with dry litter on the floor covered by thick paper to avoid litter eating by the chicks for the first 4 or 5 days. • The brooder should be provided with chick guard to prevent the chicks straying away from the heat zone. • During the first six weeks, the temperature of the brooder should be reduced by 5°F every week. Precautions: • The brooding chicks should be isolated as far as possible from the older flock

to avoid spread of infection. • Visitors should not be allowed. • The equipment should be kept clean - washed with disinfectant and dried. • Brooding management should be entrusted to a special attendant. • It is essential to observe the chick daily - 4 times during the day and 3 times during night in order to see that the chicks are within the heat zone and move around evenly. • The brooder house should be well ventilated with good circulation of air in the brooder house. • Temperature of the brooder is to be reduced at the rate of 5°F every week starting from 95°F. • Room temperature should be maintained by fixing room heaters. • As the chicks grow, the area of space should be expanded. • Clean, cool water should be supplied. • The chick guard area should be expanded gradually (after 3 days) after 7 -10 days the brooder guards should be removed.

3. Housing: The poultry house is an important part of the poultry enterprise. The chicks need a clean, dry, well ventilated, Quiet and comfortable house. • Overcrowding results in the outbreak of diseases. • The litter should be dry and clean without moulds. • The wet mouldy material should be replaced by fresh dry material. • 0. 23 - 0.27 Sq.M. of floor space should be provided for each bird for light breeds and 0.27 Sq.M. for heavy breeds. 4. Feeds and Feeders: • The young chick should be provided with a balanced diet for proper growth. • The young chicks are provided with crushed maize on paper, chick boxes or on plastic filler plates. • Trough type feeders are ideal. First 2 or 3 days, small quantities of feed should be supplied at a time, but often. • The chicks should be fed on starter mash containing 22% protein on the first 6 weeks. Rovisol to be fed to the chicks, two days in a week (5 m1/5 1 of water / 100 birds). • Just before they are released into the brooder, their beaks are dipped in a water fountain containing vitamins, Antibiotic and glucose D (2 Tea spoons / 100 chicks). • Water should be filled with lukewarm water with glucose or sugar should be placed in the brooder before the arrival of chicks. • Feed, water and light should be provided at proper time. • Sudden changes will affect the production of birds as they are very sensitive and nervous during the laying period.

4. Vaccination Programme a) 1st day - F1 or Merek's vaccine b) 4th day -F1 strain vaccine against Rainkhet disease through nasal drops. c) 6th week - R2 B against Rainkhet disease to protect them for life. d) 8th week - Fowl pox vaccine. e) 17th week - At the end of 17th week - a booster dose of R2 B vaccine before the growers are transferred to layer house. Source. https://www.flickr.com/photos/ilri/26166827490 II. Management of Grower The period between brooding and sexual maturity is referred to as the growing period and the chicks are known as Growers. Management during this period is critical because the performance of the layers depend on how the pullets are reared in the growing period. 1. Housing: The grower house should be clean, well ventilated and protected. The floor space requirements are as given in the table - Type of birds Floor space requirement / bird Sq.M. Egg type pullets (small) Up to 18 weeks 0.13 21 weeks 0.18 Egg type pullets (Medium) Up to 18 weeks 0.18 21 weeks 0.20 Egg type breeder pullets 0.22 Cockerels 0.25 Meat type pullets 3-0 Meat type cockerels 4-0 2. Feeds and Feeders: • The feeding and watering space should be increased as the birds grow older. • The growing birds should be provided with a balanced diet with 5 - 10 percent fibre, proper vitamins and minerals in convenient feeders. • Feeder space for bird is 2.6 inches and one tubular feeder for 25 birds. • The feeder height should be kept adjusted to avoid wastage of feed as the birds grow. • One inch of water space should be provided for drinking water. • Cool, clean water should be supplied and the waterers are cleaned every day. • The feed should be supplied in a convenient feeder, so that all birds get their share and the flock grows uniformly.

5. Change of Ration

• Chick mash can be changed to growing Mash in between the beginning of 6th week to the beginning of 8th week.
• Growing mash can be continued up to 21 weeks using controlled or restricted feed programme. b.

Controlled or Restricted feed programme In recent years, restricted feeding is given importance during the growing period.

• It will reduce the body weight of pullets at the time of placing in laying house
• Delay sexual maturity
• Increase the intensity of egg production
• Lower layer house mortality
• Increase egg size
• Increase in profit. It is by two methods

1. Skip every other day
2. Limit every day.

• Each programme gives excellent results.

c. Feeding hard grain

• In order to maintain good litter condition, and to keep them active, the birds grow on 'skip every other day' programme may be given small grains on no feed day. Hard grain should not be fed on very hot days.

d. Feeding grit

• From 7th week onwards, feed one pound of grit per hundred birds on a feed day in hanging tube feeders.

e. Feed Amounts

• During the growing period, feed intake levels are furnished for each week of age. This may be depending on the feed formulation, weather conditions and stress factors.
• The chicks should be fed to maintain the recommended body weight for that age level.
• Birds should be weighed on the same day of every week at approximately the same time of the day preferably afternoon.
• As feed is the most important cost factor, the feed wastage should be reduced.

3. Culling

• Weak, diseased and undesirable pullets are removed or culled as early as possible during growing periods to save labour, feed cost, space and avoid contamination of certain diseases.

• Males coming in the female line as sexing errors are culled out and may be sold as broilers.

4. Avoid overcrowding

• Overcrowding should be avoided to decrease disease outbreaks.
• It is a poor economy to over crowd the growers. They should be provided with required space. Automatic Feeder

III. Management of Layer One of most profitable practice in poultry farming is to follow " All in-all out " practice i.e. The farm should be having birds of only one age group. It helps in disease control which results in increased egg production Birds of one age group simplify the management.

1. Housing The laying house is an important part of the poultry management. •The house should be south to south east facing to get morning sunlight. •The poultry house should be warm in winter and cool in summer and should be well ventilated. • It is a poor economy to over crowd the hens in the laying house. 0.23 -0.27 Sq. meter of floor space for each bird should be provided for light breeds and 0 - 27 Sq.m. for heavy breeds. • The poultry house should be comfortable and safe.

2. Feeders • It is important that feed should be distributed uniformly so that all birds get their share. • There should be 13 cm of feeder space hen. • Four large feeders are necessary for 100 birds. • The feed requirement depends on the weight of the layer and the rate of egg production and feed quality such as proteins and caloric value of feed. • Generally the birds require more feed in winter and less in summer. • Hanging feeders are more popular.
3. Ventilation • It is necessary to provide fresh air for the hens and to remove moisture exhaled during breathing and through the droppings.
4. Lighting • It stimulates the egg production and growth in poultry birds. • Lighting encourages the chicks to take more food to grow and to lay more eggs. • Light should be 8 feet above the floor. Generally 14 -17 hours of light per day is used.
5. Culling • Culling is a constant job. Culling during night is desirable, when 10-15 percent of birds are to be removed. • It avoids stress on birds due to excitement and handling. • Flash light may be used to catch the birds showing traces of yellow pigment at the base of the beak, shrunken and scaly combs and loss of primary and secondary tail feathers • The inactive, lightweight birds and early moulters are usually poor layers. • Yellow pigmentation due to xanthophyll pigment provides an indication about the laying capacity of the hen. • During egg production, the birds lose their pigment in the order Vent, Eyelids, Ear lobes, Beak - Starting from the base and Shanks - first in front and then at the rear. • Slow de pigmentation results in increasing egg production and otherwise the birds are poor layers which can be culled out. Debeaking is to be done to avoid cannibolism and also controls feed wastage.• • The birds that mature early are good layers. This genetic trait controlled by two dominant genes - One Autosomal and the Debeaking & Dubbing

IV Management of Broiler

1. Broiler chicks The chicks hatched from the egg weighing 52g. or more were good for-rearing. The chicks of broilers must show faster growth, high feed efficiency, good body, early feathering, low mortality. Presently in our markets there is great demand for the broilers of 1kg. wt. They reach that size within six weeks. Broilers are the fowls of either sex reared for meat production. Rearing of broilers was not known in India till 1962. Nowadays poultry farmers are interested in broiler farming due to high profits and quick returns. Broilers grow rapidly by converting the feed into flesh effectively and reach marketable sizes of about 8 weeks of age.

3. **Feed** • The feed given to broilers is of two types namely, broiler starter mash and broiler finish mash. • The feed given to broilers upto 5 weeks is called broiler starter mash (contain 23 - 24% proteins) and the fee
4. Given to broilers from sixth week onwards is broiler finisher mash (contain 20-21% proteins).

5. **Management a) Brooding:** • Broiler chicks need about two weeks of brooding. The comfortable temperature will be 95° F b)

Ventilation: • The shed where broilers are rearing must be well ventilated, in such a way that fresh air always replaces the still air of the shed. c)

Lighting: During brooding period, 24 hrs lighting is necessary. There after the shed must be kept dark to reduce the activity so that the feed consumed will be converted into flesh. Moreover the problem of cannibalism is also minimised. d)
Vaccination: Vaccination for newcastle disease (i.e. Ranikhet disease) and mareck's disease should be given to one day old chicks. e)

Males and females: • Males grow at a faster rate. Hence rearing of males and females in separate sheds is recommendable.

India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting

tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab).

Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

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EXERCISE–14

DEBEAKING, DUSTING AND VACCINATION

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Beak Trimming

Beak trimming is the removal of part of the top and bottom beak of a bird. It is also called "debeaking", although this term is inaccurate as only part of the beak is removed. It is an animal husbandry practice commonly carried out in the poultry industry. Farm managers have their flocks beak-trimmed to blunt the beaks enough to prevent the occurrence of damaging pecking. **Re-trimming** may also be carried out if a bird's beak grows back enough to cause pecking damage. Birds are often re-trimmed at 8–12 weeks of age to avoid this happening. Some non-trimmed adult birds may need trimming if a pecking outbreak occurs.



A beak trimmed bird

Why Is Beak Trimming Done?

Beak trimming is performed early in the life of commercial hens to decrease injuries caused by cannibalism, bullying, and feather and vent pecking. Birds naturally peck at the environment and each other to investigate and work out where they fit into the flock (pecking order). This behaviour can become a problem in commercial situations and many deaths have been recorded among untrimmed hens. Feather pecking and cannibalism affects all birds in all production systems. When laying birds are kept in systems that give the opportunity for aggressive birds to contact many other birds, cannibalism and feather pecking can spread rapidly through the flock and result in injuries and mortality. Mortality of up to 25–30% of the flock can occur and cause huge mortality and morbidity problems as well as financial losses to the farmer.



Bird seriously injured through pecking

When Is Beak Trimming Done?

Beak trimming is carried out at various ages depending on the preference of the farm manager. The most common ages for birds to be beak-trimmed are:

- Day-old (most common)
- 5–10 days old
- 4–6 weeks
- 8–12 weeks
- Touch up trim of adult birds (mainly in alternative systems)

Who Does Beak Trimming?

Hot blade beak trimming is performed by contract teams, individual farmers and some large poultry companies. The majority of birds are trimmed by contract teams. Birds must be beak-trimmed by an accredited beak-trimmer to ensure that nationally agreed standards are maintained and the welfare of the birds is not compromised. The infrared treatment machine is installed by the supplier and leased by hatcheries. It is monitored and controlled by the supplier via a communication system and on-site computer.



Infrared beak trimming machine

How Is Beak Trimming Done?

An **infrared beak trimming** method, using a non-contact, high intensity, infrared energy source to treat the beak tissue, is the most common method now in use. Initially, the beak surface remains intact but after a few weeks, the sharp hook of the beak erodes. Experiments have also been conducted using lasers for beak trimming, however, this technology is not used for beak trimming on farms. A **hot blade** beak trimming machine, with an electrically heated blade, is another method that has been commonly used in the past, now being surpassed by infrared.



Hot blade beak trimmer

Hot Blade Beak Trimming Versus Infrared Beak Treatment

	Hot Blade Beak Trimming		Infrared Beak Treatment	
	Advantages	***Disadvantage***	***Advantages***	***Disadvantages***
Biosecurity		Beak trimmers move from farm to farm-potential biosecurity issues with personal hygiene and equipment cleanliness.	Equipment located in a clean hatchery. Staff maintain high levels of biosecurity.	
Bird catching		Birds can be stressed from catching and restraint on the farm.		
Equipment set up	Different set up for equipment when beak trimming different ages of bird, shed type or location.	Equipment located in the hatchery.	Settings adjusted easily using a keypad on the processor	
Trimming	Experienced operators can judge the amount of beak to remove. Accurate beak trimming minimises problems later in bird's life.	Physical damage to the birds while being handled for beak-trimming. Exposed cauterised wound. Potential for bleeding from the beak. Excessive beak trimming can impair beak function. Insufficient beak trimming results in beak regrowth.	A predetermined amount of beak tissue is exposed to a defined amount of infrared energy. The exposed tissues remain intact and there are no open wounds or blood loss.	Restrained by head on an automated carousel for 15 seconds. Excessive energy can damage soft tissues and impair beak function. Insufficient beak treatment results in beak regrowth and the need to re-trim. Dark pigmentation in the beak can lead to split beaks.
Retrimming	Birds can be re-trimmed at any age with the hot blade.			Re-trimming can only be performed with a hot blade.
Quality of beak trimming	Quality assurance checks on beaks have been documented in an accreditation program referred to in the Australian Code of practice for Domestic Poultry.		In-house quality assurance program developed.	Quality assurance program needs inclusion in the Australian Code of Practice for Domestic Poultry.
Records	Records kept on beak trimming quality and bird performance.		Records kept on beak trimming quality and bird performance.	
Evaluation	Beak trimmers and farmers evaluate the performance of birds after trimming.		In house records of beak treatment and bird performance.	
Summary	Open wound, re-trimming commonly practised to control pecking.		No open wounds; more reliable treatment, beak condition superior. If beaks regrow re-trimming required with a hot blade to avert cannibalism.	

Alternatives To Beak Trimming

Beak trimming has been banned in some European countries and others are working towards banning the practice, following an EU welfare directive on the issue. In some production schemes, for example, 'Freedom Food Eggs' (UK), infrared beak treatment is permitted but not hot blade trimming. Even before the EU directive was released, research was being undertaken to identify practical, effective and affordable **alternatives to beak trimming**. Selective breeding strategies are underway to produce strains that are not cannibalistic. In addition, a number of nutritional, management and environmental strategies are being promoted as an alternative to beak trimming. The alternatives have some potential to be effective in various management situations, but there is no guarantee that cannibalism and feather pecking will be prevented.

Genetic Selection

There are large differences in feather pecking and mortality in strains indicating the potential for developing commercial strains that require less severe beak-trimming or no trimming at all. Selection for low mortality reduces the propensity of birds to develop feather pecking and

cannibalism. Molecular technology has the potential for improving welfare by manipulating genes involved in the control of pecking behaviour.

Light control

Chickens have colour vision and different colours and light levels affect chicken behaviour. Green and blue light improves growth and lowers the age of sexual maturity, while red, orange and yellow light increases the age of sexual maturity and red and orange light increase egg production. Birds are calmer in blue light. For many years it was the practice to brood and rear chickens under red light to prevent cannibalism, based on the concept that red light makes it difficult for a potentially cannibalistic bird to see red blood vessels and blood on other birds. Currently, the most useful method to prevent feather pecking and cannibalism is to house birds under very dim white light. The birds cannot see each other well which is thought to reduce aggressive behaviour among them. This requires light proof shedding, however low light levels can cause eye abnormalities.

Use of devices to restricting vision and beak use

The use of spectacles (fitted to the nares of birds) controls feather pecking. It only allows birds to look to the side or down but not directly ahead. Spectacles can only be put on birds of pullet size or larger, cannot be used in cages and are easily dislodged. Red contact lenses have been used for layers as an alternative to beak-trimming. They cause eye irritation, eye infections, and abnormal behaviour and are not retained well. Bitting devices have been developed for use in game birds, which are held in place by lugs inserted in the nares. The use of fitted devices as a preventative measure against feather pecking is not permitted in many countries.



Using shade with free range flock
Environmental enrichment
Environmental enrichment aims to increase desirable behaviours, reduce harmful ones, sustain the birds' long-term interest, and enable them to cope with challenges. Enrichment involves increasing environmental complexity to encourage birds to interact with their environment.

Practical enrichment devices to minimise feather pecking

A wide range of objects can be fitted to cages to enrich the environment for poultry. The 'Agrotoy' (blue plastic frame with red and blue moving parts) reduces aggression and mortality in caged layers. Likewise, a small silver bell was found to attract pecking. Cereal based 'Peckablock' also reduced the amount of aggressive behaviour. Adult laying hens will peck at bunches of plain white propylene string, which reduces both gentle and severe feather pecking.

Enriched rearing facility

Less feather pecking in layers is seen if farmers do their own rearing, provide sufficient perch space, adequate drinkers and provide high quality litter. **Stimulating use of the range** Infrequent and uneven use of the hen run is one of the main problems in all free range systems for laying hens. Birds do not feel safe in an open unroofed run area. When the range has cover, trees or hedges, birds are more evenly distributed and risk of feather pecking is reduced.

Use Of Anti-Pick Compounds
Applying anti-pick compounds (commercial anti-pick, pine tar or axle grease) to wounded areas reduces pecking. Likewise treating the everted vent of hens suffering vent trauma with a stock wound spray can prevent other birds pecking at the vent. Incidence of vent trauma can be reduced by raising flocks of birds with an even body weight. A range of predator scents and other agents are being considered for use as repellents against predators and may have application to prevent feather pecking in layers.

Nutrition
The main strategy to prevent feather pecking is to provide an adequate substrate. Substrate conditions during the rearing period affect the development of feather pecking. Use of scratch grain is recommended. During the rearing period, placing semi-solid milk blocks in the house, hanging green leafy vegetables and spreading grass clippings can prevent feather pecking. An adequate amount of insoluble fibre in the layer diet is important for minimising the outbreak of cannibalism in chickens. Millrun, oat hulls, rice hulls and lucerne meal are effective sources of fibre. The physical properties of the fibre modulate the function of the gizzard making the birds calmer. Providing adequate calcium, manganese, arginine, zinc, protein, sulphur amino acids (methionine and cysteine), trytophan, B group vitamins, thiamine and dietary electrolytes minimises pecking mortality.

Beak Abrasives
Abrasive materials applied to the feed trough may enable the bird to blunt the hooked end of the beak while feeding and reduce the effectiveness of pecking. The beak blunting technique can be applied to growing pullets and during the laying period. Utilising the blunting procedure early in the rearing period may prevent the formation of the hooked end of the beak.

Summary

When birds are not beak trimmed, increased incidences of mortality and morbidity will occur due to cannibalism. Welfare problems associated with cannibalism can be devastating. When performed correctly to industry standards, beak trimming has advantages. These include reduced:

• Feather pecking

• Mortality

• Vent pecking and prolapse

• Bullying

• Stress on the bird

When beak trimming is not done correctly, birds can suffer from:

• Reduced ability to eat and drink

• Short and long term stress

• Reduced social status

There are production techniques which may reduce the need for beak trimming, although none of these can guarantee against an outbreak of damaging pecking and cannibalism. These techniques include:

• Light control

• Devices to restrict vision

• Devices to restrict beak use

• Environmental enrichment

• Anti-pick compounds

• Nutritional amendments

• Beak abrasives

Vaccination plays an important part in the health management of the poultry flock. There are numerous diseases that are prevented by vaccinating the birds against them. A vaccine helps to prevent a particular disease by triggering or boosting the bird's immune system to produce antibodies that in turn fight the invading causal organisms.

A natural invasion that actually causes the disease will have the same result as the bird will produce antibodies that fights the current invasion as well as to prevent future invasions by the same causal organisms. Unfortunately birds that become diseased usually become unthrifty, non-productive or even die. An infection caused by natural invasion will be uncontrolled and therefore has the

possibility of causing severe damage, however vaccination provides a way of controlling the result with minimal harm to the birds.

Vaccines are generally sensitive products, some of which are live but in a state of suspended animation. Others are dead. All have a finite life that is governed by the way they are handled and used. Handling and administration procedures also influence the potency of many vaccines and consequently the level of immunity the bird develops.

Types of vaccines

Live vaccine – the active part of the vaccine is the live organism that causes the disease. As such, it is capable of inducing the disease in birds that have not had previous contact that organism. Vaccinated birds, in many cases are able to infect non-vaccinated birds if housed together.

Attenuated vaccine – with this type of vaccine the organism has been weakened by special procedures during manufacture so that it has lost its ability to cause the serious form of the disease. At worst, the birds may contract a very mild form of the disease, however, the vaccine still has the ability to trigger the immune system to produce antibodies.

Killed vaccine – with this type of vaccine the organism has been killed and is unable to cause the disease, although the ability to trigger the immune system remains. In many cases, the level of immunity produced by this form of vaccine is weaker than that produced by live and attenuated vaccines.

Vaccine production

Vaccines are produced mainly in three forms:

1. Liquid vaccine – it is in fluid form ready to use.

2. Freeze dried vaccine – the vaccine is stored as one pack of freeze dried material and one pack of diluent, often a sterile saline solution. These have to be combined before use.

3. Dust – where the vaccine is prepared for administration in the dry form.

Vaccines are sold in dose lots, the number of doses being the number of fowls that may be vaccinated with that amount of vaccine when using the recommended technique. In the case of many vaccines there are differences in the disease organism strains that they are effective against. It is important that the correct vaccine strain be used and this can only be determined by veterinary advice.

Handling vaccines on the farm

Vaccines are fragile in many respects and require very careful handling to ensure they retain their potency. Poor handling procedures will, in most cases, result in a rapid decline of potency.

The important handling requirements on the farm are:

On receipt of the vaccine on the farm, check and record:

1. That the vaccine has been transported in the recommended manner which is usually in the chilled or frozen state. Prolonged exposure to atmospheric temperature will result in rapid loss of potency.

2. Type of vaccine – is it the vaccine ordered.

3. The number of doses – has the correct amount been delivered.

4. The expiry date of the vaccine – vaccines have a date by when there is a significant risk that they will no longer retain their potency and will not produce the immunity required. The expiry date is based on the vaccine being handled and stored in the recommended manner.

· As soon as possible place the vaccine into recommended storage conditions. Read the instructions to find out what these are. However, freeze dried material should be kept at a temperature below freezing and its diluent at a temperature just above freezing. Liquid vaccines are generally kept at temperatures just above freezing.

· Remove the vaccines from storage immediately prior to their being used. Only remove and re-constitute enough for immediate needs and repeat this through the day if more is required. Do NOT mix what is required for an entire day at the start of the day and leave it stand until required, as the vaccine will rapidly lose it efficacy.

· Protect the vaccines after mixing by holding them in an ice bath. Place ice in a small container and place the container of mixed vaccine in the ice. Some vaccines have a very short life once mixed. For example, Marek's Disease has a life of about 1.5 hours after mixing IF HELD IN AN ICE BATH. It is much shorter if held in higher temperatures.

· Use the recommended administration techniques and do not vary these without veterinary advice.

· Always clean and sterilise the vaccinating equipment thoroughly after use.

· Always destroy unused mixed vaccines after the task has been completed. Some vaccines have the potential to cause harm if not destroyed properly.

· Do not vaccinate birds that are showing signs of disease or stress.

Vaccination procedures

There are a number of ways that vaccines may be administered to poultry and it is very important that the correct method be used for each vaccine. To use the wrong method will often result in failure of the vaccine to produce the desired immunity. Some of the methods require the operator to handle every bird and, consequently are time consuming and stressful to the birds and operator. Other methods involve administration by methods much less stressful and time consuming. These methods include administration via the drinking water or as an aerosol spray. The different ways that the vaccines may be administered to poultry are below.

***In-ovo* vaccination**

Using the method of *in-ovo* vaccination, the vaccine is administered into the embryo before hatch.

In general, vaccines can be applied to five different areas of the egg: the air cell, the allantoic sac, the amniotic fluid, the body of embryo and the yolk sac. Vaccine uptake and therefore the immune response of the chicken depend largely on the area of injection. While injection in the air cell has been shown to be minor/not effective, injection in the body of the embryo or the allantoic sac is effective. Therefore, the optimum period to inject the embryo is in the late stage of development, i.e. the time between the ascendance of the stalk of the yolk sac into the abdomen (about the time when the chicken tucks its head under its wings) and external pipping.

During that late stage of development, the embryo is mature enough to cope with the viral stimulus and the trauma induced by the penetrating needle is unlikely to cause severe tissue damage. Signs of too early vaccination include reduced hatch-ability, late death and increased number of culled birds. However, if vaccination is done too late in embryo-nation, the risk of egg shell breakage is significantly higher. Therefore, *in ovo* vaccination is commonly performed between days 18-19 of incubation.

The system of a larger outer needle (penetrating the egg shell) that contains an inner needle (penetrating the embryo) enables for strong but careful penetration of the egg and minimizes trauma to the embryo. In addition, the use of two needles reduces the likelihood of transferring contaminants on the outer egg shell into the sterile embryo. The needle for punching the egg shell should not penetrate the embryonic cavity (the inner shell membrane, the chorio-allantoic membrane or air cell membrane). While the penetration of the outer egg shell increased the relative pore volume about 30%, the risk for increased gas exchange of the embryo occurs.

Hygiene management including reduced air circulation, well maintained air filters, adjustment to weather conditionsand well maintained hatchery insulation has to be taken into account when performing *in ovo* inoculation. Only strict management of these environmental factors can reduce the likelihood of infections of the egg, especially with aspergillosis or other air-borne pathogens. Continuous training of reliable staff is of highest priority to prevent reduced hatchability and to maintain high hygienic standards. A sterile environment and the usage of chlorine based sanitizers are crucial. The storage and preparation of the vaccine in a separate biosecure area as well as strict precautions in using sterile devices such as containers and water should be implemented. While the cost of machine acquisition is high, the investment can pay back by its advantages.

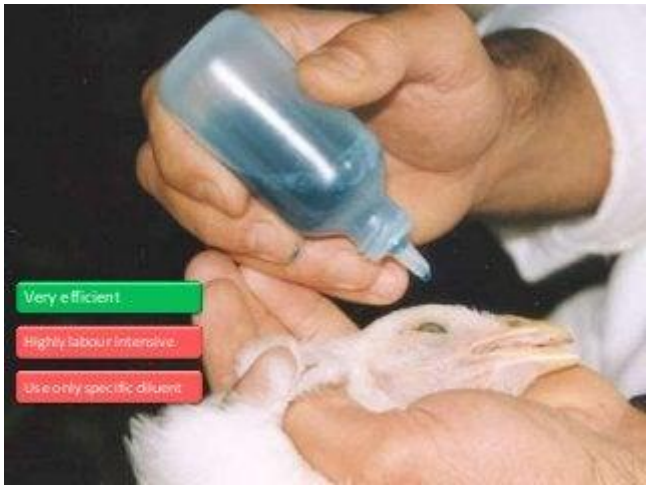
The advantage of commencing immunity development before hatch can prevent young chicks from early infection after hatch. Since high tech machines are used for *in ovo* injection, the volume and concentration of the vaccine to be administered are highly standardised, reducing human error and labour cost when compared to vaccination of chickens later in life. Furthermore, vaccination of every single chicken can be ensured resulting in better uniformity of the flock. Coming with this is improved animal welfare due to less handling of birds later in life.

Currently Marek's disease, Newcastle disease, infectious laryngotracheitis and infectious bursal disease vaccines are routinely administered using *in ovo* vaccination in various countries. *In ovo* vaccination does not interfere with maternal antibodies that may still present in the embryo. In fact, it increases the level of immunity and as a consequence one injection is sufficient to offer life-long protection against the target disease.

Intramuscular injection

This method involves the use of a hypodermic needle or similar equipment to introduce the vaccine into the muscle (usually the breast muscle) of the bird. The task is sped up greatly by the use of an automatic syringe which makes the technique relatively easy and doesn't harm the bird. Care must be taken to ensure that the correct dose is administered to each chicken and the equipment should be checked regularly to ensure this.

Care must be taken to ensure that the needle does not pass through into a key organ and that other unwanted organisms are not administered to the bird at the same time by contaminated vaccine or equipment. Contamination can be prevented by good hygiene and recommended vaccine handling procedures.









Subcutaneous injection

This method involves the use of similar equipment to that used for the intramuscular technique. The main difference between the two techniques is that, in this case, the vaccine is injected under the skin, usually at the back of the neck, and not into the muscle. Care must be taken to ensure that the vaccine is injected into the bird and not just into the feathers or fluff in the case of very young chickens. The dose being administered should be checked for accuracy frequently. Maintain good hygiene practices to limit introducing contaminating organisms during the procedure.

Ocular

This method involves the vaccine being put into one of the bird's eyes. From here the vaccine makes its way into the respiratory tract via the lacrimal duct. The vaccine is delivered through an eyedropper and care must be taken to ensure that the dropper delivers the recommended dose. If it is too little, the level of immunity may be inadequate, while if too much, the vaccine may not treat the total flock but will run out beforehand.

Nasal

This method involves introducing the vaccine into the birds' nostrils either as a dust or as a drop. Always ensure that the applicator delivers the correct dose for the vaccine being used.

Oral

With this method the vaccine dose is given in the mouth. From here it may make its way to the respiratory system or it may continue in the digestive tract before entering the body.

Drinking water

With this method the vaccine is added to the drinking water and, as a consequence, is less time consuming and is significantly less stressful on the birds and operator. Take care to ensure the vaccine is administered correctly as there is much scope for error. The recommended technique observes the following:

· All equipment used for vaccination is carefully cleaned and free of detergents and disinfectants

· Only cold, clean water of drinking quality should be used

· Open the stopper of vaccine bottle under water

· The water present in the drinking trough should be consumed before vaccination

· By ensuring that all birds drink during the vaccination phase, all should receive an adequate dose of the vaccine

Cloacal

This method involves the introduction of the vaccine to the mucus membranes of the cloaca with an abrasive applicator. The applicator is firstly inserted into the vaccine and then into the bird's cloaca and turned or twisted vigorously to cause an abrasion in the organ. The vaccine enters the body through the abrasion. The technique is time consuming and stressful to the birds and care must be taken to ensure no contamination is introduced with the vaccine particularly from bird to bird. As a rule, the technique is not used on commercial farms.

Feather follicle

With this method the vaccine is introduced into the feather follicles (the holes in the skin from where the feathers grow). The technique involves the removal of a group of adjacent feathers or fluff in young chickens, and the brushing of the vaccine into the empty follicles with a short, stiff bristled brush. Good hygiene is necessary to prevent the introduction of contaminant organisms with the vaccine.

Wing stab

With this method the vaccine is introduced into the wing by a special needle(s). These needles have a groove along their length from just behind the point. When dipped into the vaccine some of the vaccine remains on the needle to fill the groove. The needle(s) are then pushed through the web just behind the leading edge of the wing and just out from its attachment to the body of the bird. Care must be taken to select a site free of muscle and bone to prevent undue injury to the bird. Ensure that the needles penetrate the layers of skin at the ideal site. A common problem is for the vaccine to be brushed from the needles by fluff or feathers before it is brushed into the follicles.

Spray

With this method the vaccine is sprayed onto the chickens (or into the air above the chickens) using a suitable atomiser spray. The vaccine then falls onto the chickens and enters the body of other chickens as they pick at the shiny droplets of vaccine. A small quantity may be inhaled as well.

Monitoring

In the case of some vaccines, an important part of the procedure is to ascertain whether the vaccine has worked, or "taken". A good example of this is fowl pox vaccine, which is administered by wing stab. Within 7 to 10 days after vaccination a "take" should appear at the vaccination site. This is in the form of a small pimple one half to one centimetre in diameter. If the take is larger and has a cheesy core, it indicates that contaminants have been introduced either with the vaccine or with dirty vaccinating equipment. A check for takes would involve inspecting approximately 100 birds for every 10,000 vaccinated.

Another example of whether the birds are reacting satisfactorily to the vaccination is the systemic reaction found in chickens vaccinated against infectious bronchitis disease. In many cases the birds react approximately 5 to 7 days after vaccination by showing signs if ill health such as slight cough, a higher temperature and lethargy. In cases where there are no obvious signs of success, blood samples may be taken and sent to the laboratory for examination. The usual test is for the presence of an adequate number of the appropriate antibodies (called the titre) in the blood. If the vaccination has been unsuccessful, it may be necessary to re-vaccinate to obtain the desired protection.

Failure to find evidence of success could be because of:

· Faulty technique resulting in the vaccine not being introduced into the vaccination site.

· Faulty vaccine – too old or not stored or mixed correctly. It would be unusual but not impossible for the vaccine to be faulty from manufacture.

· The birds are already immune i.e. the immune system has already been triggered as a result of parental (passive) immunity, previous vaccination or other exposure to the causal organism.

India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by

heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh

and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity

of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

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EXERCISE–15
ECONOMICS OF CATTLE, BUFFALO, SHEEP AND GOAT FARM

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Dairying is an important source of subsidiary income to small/marginal farmers and agricultural labourers. In addition to milk, the manure from animals provides a good source of organic matter for improving soil fertility and crop yields. The gobar gas from the dung is used as fuel for domestic purposes as also for running engines for drawing water from well. The surplus fodder and agricultural by-products are gainfully utilised for feeding the animals. Almost all draught power for farm operations and transportation is supplied by bullocks. Since agriculture is mostly seasonal, there is a possibility of finding employment throughout the year for many persons through dairy farming. Thus, dairy also provides employment throughout the year. The main beneficiaries of dairy programmes are small/marginal farmers and landless labourers. India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et. al., 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et. al., 2013). Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005 (Singh and Sharma, 2013a). Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual (Singh et. al., 2013b). Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor (Singh and Sharma, 2014). Various government and non-government organization have also recognized the importance of poultry farming as employment generating enterprise and are engaged in motivating more and more entrepreneurs to take up this enterprise (Singh et. al., 2014a). Goats play a vital socio-economic role in Asian agriculture, particularly for resource poor people living in harsh environment (Singh et. al., 2014b). The global goat population currently stands at 921 million, of which over 90% are found in developing countries (Singh et. al., 2014c). This benefit is often not shown in national statistics because of informal trading and slaughtering (Singh et. al., 2014d). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin (Singh et. al., 2014e). The goat was domesticated as early as 6-7 BC, as evidenced by archaeological remains collected in western Asia (Singh et. al., 2014f). Major population of India is primarily depends on agricultural based system for their daily life including goat keeping that constitute an important rural business of small marginal farmers and landless labours (Singh et. al., 2014g). Reproductive management of an animal is governed through a number of parameters, viz. age at first conception, age at first calving and first gestation length etc (Singh et. al., 2014h). Goat milk contains less lactose than cow's milk, so is less likely to trigger lactose intolerance (Singh and Sharma, 2015). It has since played a significant socioeconomic role in the evolvement of human civilization around

the world (Singh and Sharma, 2015a). Farmers preferred Deda over Kona because it has more biomass (Singh and Sharma, 2015b). A very important aspect in this regard is the awareness of risk by resource-poor farmers and their emphasis on minimizing it (Singh and Sharma, 2016). The country is endowed with large and biologically diverse population of goats (Singh and Sharma, 2016a). The nutritional value of milk is closely related to its composition, which is affected by factors such as breed, diet, stage of lactation, season etc (Singh and Sharma, 2016b). Livestock production is backbone of Indian agriculture contributing 7% to national GDP and source of employment and livelihood for 70% population in rural areas (Singh et. al., 2017). Animals reared in intensive production systems consume a considerable amount of protein and other nitrogen-containing substances in their diets (Singh et. al., 2017a). Small ruminants have a large impact on the economy and food supply of people in subtropical and tropical countries (Singh and Sharma, 2017b). Goats play a vital socio-economic role in Asian agriculture, particularly for resource-poor people living in harsh environments (Singh et. al., 2025e). Non-cattle milk accounts for approximately 15% of the total milk consumption by humans worldwide (Singh et. al., 2025d). Asia contributes approximately 59% to world goat milk production (Singh et. al., 2018). Jamnapari (or Jamunapari) is a breed of goat originating from Indian subcontinent. Since 1953 they have been imported to Indonesia (popular as Etawa goat, and its mixture with a local goat called "PE", *peranakan Etawa* or Etawa mix) where they have been a great success (Singh et. al., 2025c). The name is derived from the rivers Yamuna, Jamuna (West Bengal) and Jamuna (Bangaladesh) of India and Bangladesh (Singh et al. 2025). There is a great variation in coat colour, but the typical coat is white with small tan patches on head and neck (Singh et. al., 2024e). The typical character of the breed is a highly convex nose line with a tuft of hair, yielding a parrot mouth appearance (Singh et. al., 2017c). The consequence of domestication was a change in the phenotypic characteristics of wild goats, which resulted in the development of a multiplicity of goat breeds or types (Singh et. al., 2024d). These breeds or types were distributed across the world as a result of the migration and translocation of humans, usually due to changing climatic conditions and natural resources (Singh and Sharma, 2017d). There is a large commercial chicken industry that provides us with eggs and meat (Singh, G. 2019). Milk-secreting tissues and various ducts throughout the udder can be damaged by bacterial toxins, and sometimes permanent damage to the udder occurs (Singh et. al., 2024c). Severe acute cases can be fatal, but even in cows that recover there may be consequences for the rest of the lactation and subsequent lactations (Singh and Singh, 2020). Livestock has become an integral part of all interventions aimed at reducing rural poverty and enhancing food and nutrition security (Singh et. al., 2025a). The dairy livestock owners who raise cattle and buffaloes are yet ignorant with scientific management practices (Singh and Somvanshi, 2020a). India is endowed with a significant share of the world's livestock population growing steadily and continuously (Singh et. al., 2025b). Buffalo is predominantly animal of poor countries with very high density of livestock and human population and with poor feed recourses (Singh et. al., 2024b). In tropical and subtropical regions dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during critical periods of the year, such as the winter or dry season, the animals cannot fulfill their nutrient requirements because forage is either scarce or of low quality (Singh, G., 2019a). The goat is thought to have been the earliest domesticated ruminant and of all the species of domesticated animals except dog, has the widest ecological range (Singh et. al., 2024a). Originating in Asia, goats have spread over all the continents and inhabit almost all -climatic zones from arctic - circle to the equator (Singh, G., 2024). Goat milk is rich in essential proteins, vitamins, and minerals (Singh et. al., 2023). Goat milk is widely consumed due to its high nutritional value and medicinal properties (Singh et. al., 2024f). Effective management practices, nutritional interventions, and adaptive breeding strategies can mitigate these challenges (Singh et. al., 2025e). The term Agriculture is derived from two Latin words ager or agri meaning soil and culture meaning cultivation (Singh, et., al. 2025g). The composition of mastitis milk approaches that of blood (Singh and Rodricks 2025). Feed alone constitute 60 per cent of the production cost of milk (Singh and Rodricks 2025a). The nutrient requirements are generally expressed separately for each function or an overall figure for the combined functions may also be

expressed (Singh and Rodricks 2025b). The poultry industry has developed into a highly organized and scientific sector, contributing significantly to the global food supply (Singh, G. 2025q). The poultry industry in India is one of the fastest-growing sectors in agriculture, contributing significantly to food security, employment, and economic growth (Singh, G. 2025p). Livestock nutrition depends on a variety of feeds and fodders, which can be classified based on their composition, digestibility, and utility (Singh, G. (2025o). Livestock nutrition is a crucial aspect of animal husbandry, directly affecting growth, reproduction, milk production, and overall health (Singh, G. 2025n). Distributed in Salem, Erode, Karur, Namakkal, and fewer parts of Dharmapuri districts of Tamilnadu (Singh, G. 2025m). This is otherwise called as Delhi, Kundi and Kali (Singh, G. 2025l). A cattle farming is an integral part of Indian agriculture, providing milk, meat, draft power, and manure (Singh, G. 2025k). This breed is otherwise known as Desan, Gujarati, Kathiawari, Sorthi, and Surati (Singh, G. 2025j). Goats are the number one producer of milk in the world (Singh, G. 2025i). Many farmers in India depend on animal husbandry for their livelihood (Singh, G. 2025h). Mixed farming is an agricultural practice that combines crop cultivation with livestock rearing or other supplementary enterprises like fisheries, agroforestry, or poultry (Singh and Mishra 2025r). Fisheries play a vital role in India's economy, providing livelihood to millions, contributing to food security, and earning foreign exchange (Singh, G. 2025s). Fish production plays a significant role in global food security, employment, and economic development (Singh, G. 2025t). A person working with animals should have proper knowledge of the different parts of the animal body (Singh, G. 2025u). The weight of farm animals can be work out without weighing machine (Singh, G. 2025v). While taking work from farm animals or while milking, treatment, castration, applying identification mark (Singh, G. 2025w). If a herd's man has only few animals, recognizing each animal separately is possible for differentiating them according to their external appearance (Singh, G. 2025x). Ageing means to determine the approximate age of an animal (Singh, G. 2025y). Livestock feeds are generally classified according to the amount of specific nutrients they furnish in the ration (Singh, G. 2025z). Remove the mucus from the nose and mouth and clean it (Singh G. and Garg 2025aa). Goat is a multi-use animal which is commonly reared for the meat (chevon) (Singh and Shakya 2025ab). Incubation, hatching, and brooding are three crucial stages in poultry production that determine the successful development of chicks from fertilized eggs (Singh and Singh 2025ac). Agriculture has been the backbone of India's economy for centuries, providing livelihood to a significant portion of the population (Singh and Mishra 2025ad). Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh and Mishra 2025ae). Various indicators help in assessing the sustainability, stability, and diversity of livelihood systems (Singh and Mishra 2025af). A farming system consists of various interrelated components that work together to ensure sustainable agricultural production and rural livelihood security (Singh and Mishra 2025ag). Livestock farming plays a crucial role in the livelihood of millions of people worldwide, especially in rural areas (Singh 2025ah). Agroforestry is a land-use system that integrates trees, crops, and livestock on the same piece of land to enhance productivity, sustainability, and ecological balance (Singh and Mishra 2025ai). Integrated aquaculture is a sustainable farming system that combines fish farming with livestock or crop production to maximize resource utilization and enhance productivity (Singh G., 2025aj). Integrated farming involves the combination of different agricultural enterprises such as crops, livestock, poultry, fisheries, agroforestry, and value-added products to maximize resource utilization and enhance farm income (Singh and Mishra 2025ak). Agricultural productivity and sustainability depend significantly on agro-climatic conditions. The feasibility of different farming systems varies across regions due to factors such as soil type, rainfall, temperature, and available resources (Singh and Mishra 2025al). Commercial farming is an essential driver of economic growth, rural development, and employment generation in India (Singh, G. 2025am). Farming-based livelihood systems in India are diverse and integrate various enterprises such as crop cultivation, dairy farming, poultry, fisheries, agroforestry, and value-added agribusinesses (Singh and Mishra 2025an). Government schemes and programs play a crucial role in supporting farmers and enhancing farming-based livelihoods in India (Singh and Kumar 2025ao). Farming-based livelihood opportunities are essential for the

economic and social development of rural communities (Singh, G. 2025ap). Farming-based livelihood enterprises are undergoing a transformation in the 21st century, driven by emerging global trends such as the circular economy, green economy, climate change adaptation, digitalization, and evolving consumer preferences (Singh, G. 2025aq).

Objectives:

- To increase the milk production
- To generate the self employment in rural areas
- To create awareness regarding dairy enterprise

Techno- Economic Assumptions:

- Purchase of animals: Considered animals in 2nd lactation (1st month) after calving along with female calves preferred and purchased in 2-3 batch at an interval of 3-6 months, so that herd remain in milking condition.
- Cost of animals: Crossbred dairy cows: 40,000-50,000/animal

High yielding Murrah buffalo: 40,000- 50,000/animal

- Milk production: Crossbred dairy cows: (10 litres/day/animal)

High yielding Murrah buffalo: (10 litres/day/animal)

- Milk sale price: Rs. 40/litre
- Housing: Animal shed: 500/Sq.ft

Office and other buildings: 1000/Sq.ft

- Floor space requirement:

50-60 Sq.ft/adult animals (closed)
100-120 Sq.ft/adult animal (open paddock)
20-30 Sq.ft/calf (closed)
40-60 Sq.ft/calf (open paddock)

- Lactation length: 300 days
- Dry period: 100 days
- Feeding/ration: Green fodder (20-25 kg/animal/day)-available in farm land.

Dry fodder (3-4 kg/animal/day)-available in farm land.

Concentrate (3 kg/animal/day-milking animal) - Rs.
1,000/quintalConcentrate (1 kg/animal/day-dry animal) - Rs.
1,000/quintal

- Mortality: 3% in adult animals and 10% in calves.
- Ratio of milch animals to dry cows/buffaloes: 3:1
- Depreciation: 5% on animal shed/buildings and 10% on farm machineries and equipments, respectively.
- Bull: 1 bull for service.
- Labour: 5,000-6,000/month/labour (1 labour for 10 cow other than home labour support).
- Veterinary aid: 500/cow or buffalo/year.
- Cultivable land for fodder production: 1 acre land will support fodder production for 4 adult animals.
- Loan if taken then repayment schedule: 75% of the fixed cost. Repayment in 5/10 installments.
- Interest: 10%/year.

IF PROJECT IS 100% SELF FINANCED

Fixed/Non-recurring Expenditure:

- Cost of purchase of animals - Rs. 40,000 (Cost of one animal) x 10 (No. of animals) = 4,00000 (4.0 lakh)
- Cost of animal shed/building – 50 (Sq.ft/animal space requirement) x 10 (No. of animals) x 500 (Construction cost/Sq.ft) = 2,50,000 (2.50 Lakh)
- Cost of farm machineries and equipments (Hand pipe, chaff cutter, milking pails etc.) = 1,50,000 (1.50 Lakh)

Total Fixed Cost Expenditure – 8,00000 (8.0 lakh)

Variable/Recurring Expenditure:

- Green and dry fodder for 10 animals from self cultivated fodder field (3 Acre land will support 10 animals fodder requirement throughout the year) will cost around – 1,00000 (1.0 Lakh)
- Concentrate feeding of 10 animals for a year will cost – 10 (No. of animals) x 3 (Kg/animal/day) x 300 (feeding days) x 10 (Cost of conc. feed/kg) = 90,0000 (0.90 Lakh)
- Labour cost – 1(No. of labour) x 5000 (salary/month) x 12 (month) = 60,000 (0.60 Lakh)
- Electricity and water charges for a year – 50,000 (0.50 Lakh)
- Miscellaneous expenses (veterinary aid, depreciation on building and equipments etc.) - 50,000 (0.50 Lakh)

Total Variable Cost Expenditure – 3,50,000 (3.50 lakh)

Total Cost/Expenditure = Fixed Cost (Fc) + Variable Cost (Vc) = 8,00000 + 3,50,000 = 11,50,000 (11.50 Lakh).

Income Generation:

Through sale of milk – 10 (No. of animals) x 10 (Litre of milk produced/animal/day) x 300 (Lactation length) x 40 (Milk sale price/litre) = 12,00000 (12.0 Lakh)
Sale of calves and heifers – 50,0000 (0.50 lakh)
Sale of dung – 10 (No. of animals) x 20 (Kg of dung produced/animal/day) x 365 (days) = 73,0000 kg of dung/year will cost around = 36,500 (0.36 lakh) (Rs.500/1000kg of dung)
Sale of gunny bag = 2,000 (0.02 Lakh)

Total Income Generation = 12,88,000 (12.98 lakh)

Profit (cost benefit analysis) = Total income – Total expenditure = 12,88,000 (12.88 lakh) -11,50,000 (11.50 lakh) = 1.38 lakh

Profit for first year will be – 1.38 lakh

Loan repayment (in case loan has been taken for establishment of dairy enterprise):

If project is financed by bank (bank has given loan – 75% of fixed cost that is 75% of 8.0 lakh = 6.0lakh to be paid in 5 installments at 10% interest rate): Loan repayment will be in the year end.

First installment = 6.0/5 = 1.20 lakh (Will remain same for 5 years)Interest for first year = 10 x 6,00000 /100 = 60,000 (0.60 lakh)

Interest for second year = 10 x 6,00000 -1,20,000/100 = 48,000 (Calculate similarly for remainingthree year).

Loan Repayment Schedule:

Particulars	**1st Year**	**2nd Year**	**3rd Year**	**4th Year**	**5th Year**
Loan amount (Lakh)	6.0	4.80	3.60	2.40	1.20
***Net income (Lakh)**	1.38	-	-	-	-
Installment amount (Lakh)	1.20	1.20	1.20	1.20	1.20
Interest amount (Lakh)	0.60	0.48	0.36	0.24	0.12
Installment + Interest amount (Lakh)	1.80	1.68	1.56	1.44	1.32
Net profit/year (Lakh)	-0.42	-	-	-	-

Model Scheme on Goat

Goat rearing plays an important role in the national economy. It provides gainful employment and income to the weaker sections especially the rural poor. Goat is probably the only animal which is bred for multiple objectives, viz., meat, hide, milk, manure and hair. Due to versatile characteristics and utilisation, goat is often called 'poor man's cow' in India. Goat meat is usually low in fat and is commonly called chevon. Goat meat is preferred to mutton in India. Being the principal meat producing animal in India, goat meat is commonly preferred to other meat with better prices irrespective of caste and religion.

Why Goat Farming?

Rearing of goats is considered a very lucrative animal husbandry activity and more and more farmersand educated unemployed class-persons are attracted towards this industry. The reasons are:

i) Fast multiplication of their number.
ii) Comparative low investment and assured market.
iii) Relatively less accommodation required and low cost of maintenance.
iv) Ability of goats to thrive on relatively uncommon feeds or fodder not considered by cows.
v) Lesser problems of diseases control due their clean habits in small and medium size units.

vi) High nutritive value and higher mineral content of milk making its use desirable for growing children, old and sick persons.

Objectives:

i) To undertake the task of setting up a goatery by adopting modern and scientific management.

ii) To provide gainful employment to the rural poor.

iii) To increase red meat production in the state to improve the availability and consumption of goat meat of improved variety.

iv) To generate impact employment and enhancing the scope of goat meat processing.

Techno-Economic Parameters:

Parameters	**Goat Breed**
Rearing System	Semi-intensive
Does no's	100
Bucks no's	5
Kidding interval	8 Months
Maturity age	10 to 12 Months
No of kidding per year	1.5 kid
Avg litter size (Chances of single, twinning, triplet and quadruplet per delivery)	2 no's
Kidding rate	90 %
Death rate in kids	15 %

Goat Farming Requirements

Here below are some figures of this project report:

Space required per head for does	10 sq feet
Space required per head for buck	15 sq feet
Space required per head for kid	5 sq feet
Cost of construction	Rs. 180 per sq feet
Cost of green fodder growing	Rs. 5000 per acre in a season
Cost of equipment	Rs. 20 per adult goat
Concentrate feed required for bucks (for two months)	8 kg per month
Concentrate feed require for adult does (per kidding)	7 kg per month
Concentrate feed required for kids (for one month)	4 kg per each kid
Requirement of labour	1 no's
Labour cost	Rs. 6000 per month

Total cost of buying concentrate feed	Rs. 16 per Kg
Insurance	5 % of total value of the Goats
Cost of veterinary aid	Rs. 50 per year (on each adult goat)

Income from Goat Farming:

Market price of adult buck (11 month age)	Rs 3000
Market price of adult doe (11 month age)	Rs 2500
Income from selling gunny bags	Rs. 20 per gunny bag
Manure income is not considered as it is utilized for fodder preparation	–

How much you are going to earn from your goat farm every year?

Particulars	**1st Year**	**2nd Year**	**3rd Year**	**4th Year**	**5th Year**	**6th Year**
No. of bucks purchased	5	–	–	–	–	–
No. of does purchase	100	–	–	–	–	–
No. of kidding per year	1.5	1.5	1.5	1.5	1.5	1.5
No. of female kids (newborn)	135	135	135	135	135	135
No. of male kids (new born)	135	135	135	135	135	135
No of female kids (died at 15 %)	20	20	20	20	20	20
No of male kids (died at 15 %)	20	20	20	20	20	20
Female adult (no's), available forselling	Give the kid time to grow their market age	115	115	115	115	115
Male adult (no's), available forselling	Give the kid time to grow their market age	115	115	115	115	115

Cost of Expenditures:

Specification	**Total Amount (Rs.)**
Cost of constructing low-cost Shed (for 100 Does)	180000
Cost of constructing low-cost Shed (for 5 Bucks)	13500

Cost of constructing low-cost Shed (for 230 Kids)(Space requirement for kids is 4 sq. feet)	166000
Cost of essential equipment	10000
Cost of purchasing 5 bucks	25000 (Rs. 5000 per Buck)
Cost of purchasing 100 does	300000 (Rs. 3000 per Doe)
Cost of light fitting, & etc	90000
TOTAL CAPITAL COST	784100
Cost of Working Capital	
Labour salary	84000 of 1 year (Rs 7000 per month)
Cost of shedding	13800
Insurance Cost	16250 (5 % of total goat's value)
Goat fodder cost (of Does)	21600
Goat fodder cost (of Buck per kidding)	1200
Cost of growing green Fodder (in 4 acres @ Rs. 5000 peracre in each season)	20000
Miscellaneous Cost	13050
Total Working Capital	145900
TOTAL PROJECT COST	930000

Particulars	**1st Year (Rs.)**	**2nd Year (Rs.)**	**3rd Year (Rs.)**	**4th Year (Rs.)**	**5th Year (Rs.)**	**6th Year (Rs.)**
Labour Cost	84000	84000	84000	84000	84000	84000
Insurance Cost (5 % ofTotal goat value)	16250	16250	16250	16250	16250	16250
Cost of Growing Greenfodder	40000	40000	40000	40000	40000	40000
Fodder Cost	36600	36600	36600	36600	36600	36600
Other Cost	14000	14000	14000	14000	14000	14000
Total Investment	166850	166850	166850	166850	166850	166850
Income by Selling GunnyBags	1000	1000	1000	1000	1000	1000

Income from selling (malegoats @ Rs. 3000 per buckling	–	320000	320000	320000	320000	320000
Income from selling (female goats @ Rs. 2500per buckling	–	280000	280000	280000	280000	280000
Income from Ending stock(5 buck & 100 does @ 2500 per adults and 230kids @ 1500 per kid)	–	–	–	–	–	607500
Total Income	1000	587000	587000	587000	587000	1340000
Gross profit	-166390	421000	421000	421000	421000	1200000

Goat Farming: Profit or Loss?

Specification	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
Initial Investment	784100	–	–	–	–	–
Recurring Cost	167000	167000	167000	167000	167000	167000
Total Investment	950000	170000	170000	170000	170000	170000
Benefit	1000	600000	600000	600000	600000	1400000
Pure Benefit	-940000	430000	430000	430000	430000	1230000

Questions:

1. What are the assumptions you will made before starting your dairy farm?

2. What are the assumptions you will made before starting your goat farm?

3. Why goat is known as poor man’s cow?

4. How goatery is different from dairy farming?

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