MODULE-1: LIVESTOCK IN INDIA

Learning outcomes

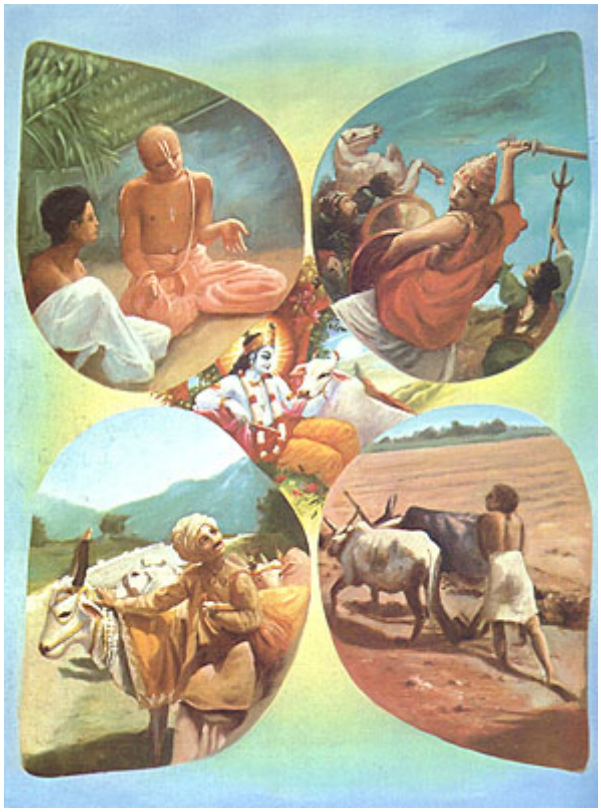
- On completion of this course, the learner will be able to understand the association of livestock to Indian society during different era and the contribution of livestock to man and deals in detail the role of animal husbandry and also the species wise livestock population in the country.

INTRODUCTION

- Dairy animals produce milk by converting the crop residues and by products from crops which otherwise would be wasted.
- Dairy sector contributes by way of cash income; draught power and manure.
- Livestock farming is an integral part of crop production and contributes substantially to the household nutritional security and poverty alleviation through increased household income.
- The returns from livestock especially dairying and mixed farming in small and medium holdings are larger and highly sustainable.
- The progress in this sector results in more balanced development of the rural economy and improvement in economic status of poor people associated with livestock.
- One fifth of the world's livestock population is in India and 70 per cent of the livestock are owned by 67 percent of small and marginal farmers.
- India has nearly 57 % of the world's buffalo population, 16% of the cattle population, 20% of goat population and 5 % of sheep population although India constitutes less than 3 % of the worlds total land area. 76 per cent of the milk is produced by weaker sections of society.

VEDIC PERIOD

- The Vedic Period (or Vedic Age) is the period during which the Vedas, the oldest sacred texts of the Indo-Aryans, were being composed.
- Scholars place the Vedic period in the second and first millennia BC continuing up to the 6th century BC based on literary evidence.
- During the Vedic Period, Cattle were considered as wealth. The economy was based on bartering with Cattle and other valuables such as salt or metals.
- Cattle were held in high esteem and frequently appear in Rig Vedic hymns. Goddesses were often compared to Cows and Gods to Bulls.
- The kshatriyas amassed wealth (Cattle). The vaishyas were pastoralist and farmers.
- The people of the early phase of the Vedic age were semi-nomadic and subsisted on large herds of domesticated cattle and farm animals.
- They moved their settlements from one pastoral area to another and lived on agrarian and dairy products obtained from cattle.
- As the requirements and needs of these communities grew with the gradual rise in population, they settled down as full-time farmers.
- They brought large tracts of fertile lands of North India under the plough, driven by Oxen.



MEDIEVAL PERIOD

- The term “medieval” comes from Latin meaning “middle age”. There was a sizeable Animal Husbandry sector during the medieval period.
- Inscriptions of the 9th and 10th centuries refer to buffaloes, oxen and milch cows in small hamlets and villages.
- The King, the monasteries and individuals all owned buffalo and cattle.
- Buffaloes were hired in the medieval period. Cattle trade was prominent. There are medieval references to the rearing of pigs, goats and poultry.
- Goats were bred for butter, meat and milk.
- Fowls for their eggs and flesh. Cows were bred solely for milk. Beef eating was forbidden and considered abominable.
- Cattle were branded with identification marks to indicate ownership. Some herds consisted of more than a thousand animals.
- There were communal grazing found and indigenous Veterinary medicines for the cattle.
- The cowherd was expected to know the exact number of cattle he was looking after.
- He was expected to take cattle to the same spot only once in five or seven days, to allow new grass to grow in pasture lands.
- Buddhagosha (5th century) referred to techniques of cattle rearing.
- The 5th century Pali commentary, Papancasudani, described the manner in which a cow should be milked to obtain the amount of milk.
- Cattle hides were used for foot wear, horns for making ornamental items.

MODERN-ERA

- In the modern era, progress in the art and science of breeding, feeding, health, and care of livestock continues to bring gains in livestock productivity and efficiency.
- The modern Indian livestock system is the endeavor of small holders.
- As a result of gradual transition from subsistence to market system, the economic dimensions of livestock keeping have assumed increasing significance in house hold behaviour.
- Over 70% of the rural house holds in India depend on livestock farming for supplementary income.
- The sector is highly gender sensitive and over 90% of activities related to care and Management of livestock are carried out by family's women folk.

SMALL HOLDER CATTLE FARM	SMALL HOLDER BUFFALO FARM
	
SMALL HOLDER GOAT FARM	**SMALL HOLDER SHEEP FARM**
	

LIVESTOCK IN INDIA

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

- It has 57 percent of the world's buffalo population and 16 percent of the cattle population.
- It ranks first in respect of cattle and buffalo population, third in sheep and second in goat population in the world.
- The livestock population shows high degree of diversity in its composition. Out of total livestock in the country, 38.2 percent are cattle, 20.2 percent are buffaloes, 12.7 percent are sheep, 25.6 percent are goats and only 2.8 percent are pigs. All other animals are less than 0.50 percent of the total livestock. The country has 97.92 million buffalo population.
- As per the figures of 2003 livestock census India has 185.18 million cattle out of which 24.68 million were crossbred.
- The states of Tamil Nadu, Maharashtra , Kerala, Uttar Pradesh, Karnataka and Punjab account for about 60 per cent of the crossbred cattle population.
- Total export earnings from livestock, poultry and related products was Rs. 5,120 crore in 2004-05, of which leather accounted for Rs. 2,660 crore and meat and meat products for Rs. 1,720 crore. The livestock sector produced 90.7 MT of milk, 45.2 billion eggs, 2.12 MT of meat and 44.5 million kg of wool in 2004-05.

The species-wise breakup of livesock population in India

- According to the National Council of Applied Economic Research (NCAER) cattle, dung in India has a fuel value equivalent to 35 million tonnes of coal or 68 million tonnes of wood.
- An estimated one-third of the dung, amounting to some 300 million tonnes, is used as fuel in rural houses. Another 340 million tonnes go back to the soil as organic fertilizer.
- The available energy from animal power is estimated at around 60,000 million kilo watt hours, valued at between Rs. 60,000 and 100,000 million form 70 million bullocks, 8 million buffaloes and one million horses and another million camels.
- To generate this amount of energy by modern industrial process would cost three times as much.
- Thus in modern - era livestock not only produces the protein rich food for human beings (milk, meet and egg) but also provides sustainable income to the rural poor through draught power, fuel and provides the only natural organic manure the dung for sustainable agriculture. (Click here to view animation "Livestock Farming Zones")

ROLE OF ANIMAL HUSBANDRY/LIVESTOCK

Animal husbandry plays an important role in augmenting rural income, health and employment as follows,

- Provides food like milk, meat and other value added products, thus preventing poverty and helping to have self-sufficiency in food security.
- Provides valuable organic manure for agriculture, thus improving soil fertility and productivity.
- Provides draught animal power for different agricultural operations and also for transportation, thus helping to conserve fossil fuel.
- Provides a platform for ensuring sustainability (biological and economic), thus bringing about a change in the social status (society).
- Provides skin and hides for leather products, thus helping to make additional income and earn foreign exchange.
- Provides other byproducts like hoof and horns, thus promoting rural handicraft industries.
- Provides wool and other natural fibres of importance, thus helping to improve income and promote industrial growth.
- Provides blood as a byproduct, thus helping to produce haematinics and other pharmacological products
- Provides gainful rural employment for many people, thus helping to have full-time self employment.
- Provides a means of storing wealth and also a way to meet social obligations, thus helping to have security and overcome difficult times
- Provides a means of controlling weeds by grazing, thus helping to keep the premises clean
- Overall, Animal husbandry can be considered as a major instrument for effecting a desirable change in the society.

CONTRIBUTION OF LIVESTOCK TO MAN

1	Food	Milk, Meat, Eggs
2	Fiber	Wool, Hair
3	Skin	Hide, Pelt
4	Traction	Power for agricultural, irrigation, transportation
5	Wastes	Fertilizer, Fuel, Cooking gas, Animal feed
6	Storage	Storage of food, Capital, Wealth
7	Weed control	Biological control of weeds / bushes
8	Cultural	Security, Self-esteem, Status symbol
9	Sports/recreation	Competition, Exhibition, Companion
10	By-products	Bone meal, Blood meal
11	Experimentation	Testing of drugs, Vaccines, Manufacture of sera, toxoid
12	Security	Use of dogs in Police, Guarding
13	AFT	Use of dogs, other pets

MODULE-2: DEMOGRAPHIC DISTRIBUTION AND LIVESTOCK POPULATION

Learning outcomes

At the end of this course one can have fair knowledge about

- The present status of cattle and buffalo production activity in India
- Care and management of cattle and buffalos
- The role of dairying in improving the rural economy and bringing social equality among the farming sector

CLASSIFICATION OF REGIONS

- On the basis of rainfall, temperature and soil type which influence the quality of livestock, the country can be divided into five animal husbandry regions.
    - Temperate Himalayan region
    - Dry northern region
    - North eastern region
    - Southern region
    - Coastal region

Click here to view animation "Livestock Farming Zones"

TEMPERATE HIMALAYAN REGION

- It comprise of the mountainous areas of Assam, West Bengal, Uttar Pradesh, Himachal Pradesh, Punjab and Jammu and Kashmir. In this region the rain fall is high and there are snow and frost during winter.
- The livestock are mainly raised on pastures and the animals are moved to high altitude and to the foot-hills depending upon the season.
- Cattle are non-descript and are low in productivity.
- Sheep and goat are the principal domestic animals and wool is the main source of income.

DRY NORTHERN REGION

- It comprises the plains of Punjab, Haryana, Delhi, Rajasthan and part of Uttar Pradesh, Gujarat and Madhya Pradesh.
- Dry atmosphere is very ideal for the development of livestock. The home tract of most of the important breeds of buffalo such as Murrah, Nili Ravi, Surti and Jaffarabadi breeds lies in this region. Cattle breeds such as Haryana, Malvi, Kankrej, Tharparkar, and Gir are present in this region.
- The famous milch breeds such as Sahiwal, Red Sindhi had their home tract in this region. Sheep breeds of this region gives mutton and carpet wool.
- Camel are found exclusively in this region. Horses and donkey found in this region are of good quality.
- Wheat straw is found in abundance and cultivation of fodder crop is commonly found in this region. Hence livestock in this region are well fed and produce more than that of other regions.

NORTH EASTERN REGION

- It comprises plains of Bengal, Bihar, Orissa, eastern U.P and part of Assam and northeastern states.
- The rainfall is above 125 cm. Rice is the main cereal crop and it is the staple food for animals of the region.
- The cattle and buffalo of this region are of poor quality and are non-descript and less productive.
- Few varieties of sheep and goat are reared for meat purpose. Pigs are important farm animal in this region.

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SOUTHERN REGION

- It comprises of parts of Madhya Pradesh, Maharashtra, Andhra Pradesh, Tamil Nadu and Karnataka States. Rainfall is generally low and atmosphere is generally humid.
- Most of the land is under millets cultivation and it also provides dry fodder to animals. Important draught breeds of cattle like Amrit mahal, Hallikar, Kangayam and Ongole are reared in this region. There are many number of sheep than any other region in the country and are mainly reared for mutton and skins.
- The famous Nellore and Bannur breeds of mutton sheep belong to this region. This is the main sheep tract in the country.

COASTAL REGION

- It comprises coastal belts of Maharashtra, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh and Orissa, bordering eastern and Western Ghats. This is a high humid heavy rainfall area, the annual precipitation exceeds 500 cm at many places.
- Buffaloes are important in east coast and crossbred cattle among west coast. Goats and pigs are also important.

Distribution of livestock in 15 Agroclimatic zones

SI.NO	REGION	SPECIES PRIORITY				REGION'S SPECIES PROFILE	REGION'S PRODUCT PRIORITY
		Very high	High	Low	Very low		
1	Western Himalayan	-	Sheep	cattle, buffalo, goat	pig	sheep-goat-cattle	Wool-meat
2	Eastern Himalayan	-	cattle, pig	goat	buffalo, sheep	cattle-goat-pig	Meat-draft
3	Lower Gangetic plains	cattle, goat, pig	Sheep	buffalo	-	cattle-goat-pig	Draft-meat
4	Middle Gangetic plains	pig	cattle, buffalo, goat	sheep	-	pig-bovine-goat	Draft-meat
5	Upper Gangetic plains	buffalo, pig	Goat	sheep	-	buffalo-pig-goat	Milk-meat
6	Trans Gangetic plains	buffalo	sheep, pig	cattle, goat	-	buffalo-sheep-goat	Milk-meat
7	Eastern plains and hills		Cattle	buffalo, sheep/goat, pig	-	cattle-all other	Draft-meat
8	Central plateau and hills	sheep, goat	buffalo	cattle, pig	-	sheep-goat-buffalo	Wool-meat
9	Western plateau and hills	-	-	cattle, buffalo, sheep, goat	-	all livestock	Supplementary
10	Southern plateau and hills	sheep	-	cattle, buffalo, sheep, goat	-	sheep-all livestock	Meat-supplementary
11	East coast plains and hills	-	buffalo, sheep	cattle, goat, pig	-	buffalo-sheep	Milk-supplementary

12	West coast plains and hills	cattle	Goat	pig	buffalo, sheep	cattle-goat-pigs	Draft-meat
13	Gujarat plains and hills	-	-	cattle, buffalo, sheep, goat	pig	all livestock	Supplementary
14	Western dry	sheep	-	buffalo, goat	cattle, pig	Sheep/others	Wool-meat
15	Islands	-	-	goat, pig	cattle, buffalo/sheep	low livestock	Supplementary

LIVESTOCK POPULATION IN INDIA

- The geographic area of our country is 32,87,263 sq.km.
- The human population in 2001 is 1027.02 million, of which rural population constitutes 72.22 % and the urban 27.78 %.
- The average population density of the country is 304 people per sq.km.
- In 2003-04, the production of milk in the country was 88.1 million tones, of egg 34 billion nos., of wool 53 million kgs.
- The country has a forest cover of 6,75,538 sq.km.
- As per the last 17th livestock census, crossbred cattle constitute 13.3% of the total cattle and 86.7% are indigenous cattle.
- There is a tremendous increase in the crossbred cattle in the country i.e.22.8% but the indigenous cattle declined by 10.2% during the inter censual period from 1997 to 2003.
- The total cattle population has decreased by 6.9% during the period.
- The buffalo population has increased by 8.9%; sheep, goat and pig population has increased by 6.9%, 1.33% and 1.72% respectively
- As per 18 th livestock census (2007), in India there are 199.08 million cattle, 105.34 million buffaloes, 71.56 million sheep, 140.54 million goats, 11.13 million pigs and 648.88 million poultry are available.

Click here to view animation "Livestock Farming Zones"

THE SPECIES-WISE BREAKUP OF LIVESTOCK POPLATION IN INDIA

SI.NO.	SPECIES	LIVESTOK POPULATION (in millions)			
		2003		2007	
		Number	%	Number	%
1	Crossbred cattle	24.69	5.09		
2	Indigenous cattle	160.49	33.09		
Total cattle		**185.18**	**38.18**	**199.08**	
3	Buffaloes	979.22	20.19		

4	Yaks	0.06	0.01	0.08	
5	Mithuns	0.278	0.06	-	
Total bovines		**283.45**	**58.44**	304.42	
6	Sheep	61.47	12.67	71.56	
7	Goats	124.36	25.64	140.54	
8	Pigs	13.52	2.79	11.13	
9	Horses & ponies	0.75	0.15	0.61	
10	Mules	0.18	0.04	0.14	
11	Donkeys	0.65	0.13	0.44	
12	Camels	0.63	0.13	0.52	
Total livestock		**485.00**	**100.00**	**529.70**	

(Source: 17th Livestock Census, 2003)
Livestock Population in India by Species (NDDB)

(Source: 18th Livestock census, 2007)

Basic Animal husbandry Statistics, Govt. of India

WORK ANIMALS AND MILCH ANIMALS

Work animals

- There is a decline in male cattle and buffaloes population used for work purposes in the country.
- During 1997 to 2003, there is a decline of 4.3 % and 14.2% in the working cattle and buffaloes respectively.
- During 2003 to 2007, there is an increase in number of adult female (+3.12%) noticed. During this period the total bovine population increased by 1.83 %.
- During the 18 th census, buffaloes(1.84%), sheep (3.87%), and goats(3.10%) showed noticeable increase in their populatuion.

Milch animals

- The crossbred milch cattle have increased heavily during the period 1997 to 2003 34.4%, as well as there is an increase of 10.5% in milch buffaloes.
- The indigenous milch cattle has decreased by 6.1% during the said period.

CHANGE IN THE LIVSTOCK POPULATION (in millions)

ANIMALS	2003	2007	% OF INCREASE OR DECREASE
Crossbred cattle	24.9		

Indigenous cattle	160.5		
Total cattle	185.2	199.08	1.83
Buffaloes	97.9	105.34	1.84
WORK ANIMALS			
Cattle	56.4		
Buffaloes	5.8		
MILCH ANIMALS			
Crossbred cattle	11.2		
Indigenous cattle	46.9		
Buffaloes	47.2		

LIVESTOCK POPULATION IN TAMIL NADU

- The southern state of Tamil Nadu has a geographic area of 1,30,058 sq.km., which is 4.0 % of the country's geographic area.
- The total human population of Tamil Nadu in 2001 is 62.11 million (6.0 % of the country's population).
- The rural population is 56.1 % and urban population is 43.9 % and the population density of 478 persons per sq.km.
- The tribal population is 1 % of the population of the state. The state has a forest cover of 21,482 sq.km.
- In 2003-04, the state produced 4752 thousand tonnes of milk, 37836 lakh nos. of egg and 750 thousand kgs. of wool.
- As per the last 17th livestock census, the state of Tamil Nadu had 4.94% of Cattle, 1.69% of buffaloes,9.1% of sheep, 6.58% of goats and 2.37% of pig population of the country.
- The poultry population is 17.71% of the country's total poultry population. The state ranks second in poultry population in the country.
- In Tamil Nadu, the crossbred cattle increased by 46.6% but indigenous cattle decreased by 27.8% during the period between 16th and 17th census.
- There is a decline of 1.0% in total cattle population during the inter-censal period.
- The buffalo population has decreased heavily by 39.5%, sheep and goat population has increased by 6.4% and 27.5% respectively. The pig population has decreased by 47.3%.
- The total livestock in the state has increased from 24.126 million to 24.941 million between these two censuses showing an increase of 3.4%.

CHANGE IN THE LIVESTOCK POPULATION IN TAMIL NADU (in millions)

ANIMALS	1997	2003	% OF INCREASE OR DECREASE
Crossbred cattle	3.5	5.1	46.6
Indigenous cattle	5.5	4.0	-27.8
Total cattle	9.0	9.1	1.0
Buffaloes	2.7	1.6	-39.5

Total bovine	11.8	10.99	-8.4

CURRENT SCENERIO

- Livestock farming is an integral part of crop production and contributes substantially to the household nutritional security and poverty alleviation through increased household income.
- Dairy animals produce milk by converting the crop residues and by products from crops which otherwise would be wasted.
- Dairy sector contributes by way of cash income; draught power and manure.
- The returns from livestock especially dairying and mixed farming in small and medium holdings are larger and highly sustainable.
- The progress in this sector results in more balanced development of the rural economy and improvement in economic status of poor people associated with livestock.
    - One fifth of the world's livestock population is in India and 70 per cent of the livestock are owned by 67 percent of small and marginal farmers.
    - India has nearly 57 % of the world's buffalo population, 16% of the cattle population, 20% of goat population and 5 % of sheep population although India constitutes less than 3 % of the worlds total land area.
    - 76 per cent of the milk is produced by weaker sections of society.

CATTLE AND BUFFALO POPULATION - CENSUS (2003) x 1000 numbers

STATES/UTs	CATTLE			SHEEP	GOATS	TOTAL LIVESTOCK
	Crossbred	Indigenous	Total			
Andhra Pradesh	1107	8193	9300	21376	6277	38895
Arunachal Pradesh	13	445	458	19	231	799
Assam	440	7999	8440	170	2987	5390
Bihar	1274	9455	10729	382	9490	16432
Chhatisgarh	253	8629	8882	121	2336	4610
Goa	12	63	76	-	11	136
Gujarat	639	6785	7424	2062	4541	14231
Haryana	573	967	1540	633	460	7345
Himachal Pradesh	677	1559	2236	926	1125	2881
Jammu & Kashmir	1320	1764	3084	3411	2055	6816
Jharkhand	145	7513	7659	680	5031	8167
Karnataka	1602	7936	9539	7256	4484	16082
Kerala	1735	387	2122	4	1213	1358

Madhya Pradesh	317	18595	18913	546	8142	16704
Maharashtra	2776	13527	16303	3094	10684	20460
Manipur	69	349	418	6	33	553
Meghalaya	23	744	767	18	327	785
Mizoram	9	27	36	1	17	245
Nagaland	243	208	451	4	175	898
Orissa	1063	12840	13903	1620	5803	9489
Punjab	1531	508	2039	220	278	6568
Rajasthan	464	10390	10854	10054	16809	38284
Sikkim	80	79	159	6	124	178
Tamilnadu	5140	4001	9141	5593	8177	15800
Tripura	57	702	759	3	472	698
Uttar Pradesh	1634	16917	18551	1437	12941	39980
Uttaranchal	228	1961	2188	296	1158	2755
West Bengal	1119	17794	18913	1525	18774	22704
A& Nicobar	13	51	64	0	64	132
Chandigarh	5	1	6	-	1	24
D & Nagar Haveli	1	49	50	-	21	28
Daman & Diu	0	4	4	-	4	5
Delhi	58	34	92	3	17	282
Lakshadweep	2	2	4	0	47	47
Pondicherry	63	16	78	3	48	56
All India	**24686**	**160495**	**185181**	**61469**	**124358**	**485002**

MILK PRODUCTION / PER CAPITA AVAILABILITY IN INDIA

PRODUCTION IN INDIA		
Year	**Production (Million Tonnes)**	**Per Capita Availibilty (gms/day)**

1991-92	55.7	178
1992-93	58.0	182
1993-94	60.6	187
1994-95	63.8	194
1995-96	66.2	197
1996-97	69.1	202
1997-98	72.1	207
1998-99	75.4	213
1999-2000	78.3	217
2000-01	80.6	220
2001-02	84.4	225
2002-03	86.2	230
2003-04	88.1	231
2004-05	92.5	233
2005-06	97.1	241
2006-07	100.9	246
Source: *Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, GoI*		

SHARE OF AGRICULTURE AND LIVESTOCK SECTOR IN GDP (At current prices in Rs. Billion)

Year	GDP (Total)	GDP (Agriculture)		GDP (Livestock Sector)	
		Rs.	% Share	Rs.	% Share
1980-81	1,224	425	34.72	59	4.82
1985-86	2,338	700	29.94	139	5.95
1986-87	2,600	744	28.62	156	6.00
1987-88	2,949	835	28.31	183	6.21
1988-89	3,527	1,041	29.52	217	6.15
1989-90	4,087	1,154	28.24	275	6.73
1990-91	4,778	1,352	28.30	308	6.45
1991-92	5,528	1,593	28.82	375	6.78

1992-93	6,307	1,779	28.21	432	6.85
1993-94	7,813	2,218	28.39	507	6.49
1994-95	9,170	2,552	27.83	577	6.29
1995-96	10,733	2,778	25.88	650	6.06
1996-97	12,435	3,340	26.86	747	6.01
1997-98	13,901	3,535	25.43	819	5.89
1998-99	15,981	4,065	25.44	911	5.70
1999-00	17,865	4,097	22.93	947	5.30
2000-01	19,254	4,091	21.25	1,047	5.44
2001-02	21,002	4,429	21.09	1,092	5.20
2002-03	22,653	4,261	18.81	1,148	5.07
2003-04	25,494	4,843	19.00	1,183	4.64
2004-05	28,559	4,850	16.98	1,258	4.41
2005-06	32,509	5,362	16.49	1,372	4.22

Source: *National Accounts Statistics-2007;Central Statistical Organisation; M/O Statistics & Programme Implementation* Quick*

MODULE-3: POPULATION DYNAMICS OF LIVESTOCK AND ROLE IN ECONOMY

Learning outcomes

- After the completion of this module the learner will be able to analyse livestock population dynamics, milk production in the country and appreciate the role of dairying in India.

INTRODUCTION

- Livestock sector plays an important role in socio-economic development of rural households.
- It contributes about 6 percent to the Gross Domestic Product and 25 percent to the Agricultural Gross Domestic Product.
- Over the last two decades, livestock sector has grown at an annual rate of 5.6 percent, which is higher than the growth of agricultural sector (3.3 percent).
- This suggests that livestock is likely to emerge as an engine of agricultural growth in the coming decades. It is also considered as one of the potential sector for export earnings.
- The importance of livestock goes beyond its food production function. It provides draught power and organic manure to crop sector and hides, skin, bones, blood and fibers to the industrial sector.
- Livestock sector also makes significant contributions towards conservation of environment. Livestock sector supplements income from crop production and other sources and absorbs income shocks due to crop failure. It generates a continuous stream of income and employment and reduces seasonality in livelihood patterns particularly of the rural poor.

- Rural Poverty is largely concentrated among the landless and the marginal households comprising about 70 percent of rural population.
- In India, over 70 percent of the rural households own livestock and a majority of livestock owning households are small, marginal and landless households.
- Small animals like sheep, goats, pigs and poultry are largely kept by the land scarce poor households for commercial purposes because of their low initial investment and operational costs.

MILK PRODUCTION

LIVESTOCK POPULATION IN INDIA (millions)						
YEAR	**CATTLE**	**BUFFALO**	**SHEEP**	**GOAT**	**PIG**	**POULTRY**
Million numbers						
1992	204.6	84.2	50.8	115.3	13.0	307.1
1997	198.9	89.9	57.5	122.7	13.3	347.6
2003	185.2	97.9	61.5	124.4	13.6	489.0
2007	199.08	105.34	71.56	140.54	11.13	648.88
Annual growth, %						
1992-1997	-0.6	1.3	2.5	1.3	0.8	2.5
1997-2003	-1.0	1.2	1.2	0.2	1.0	7.0
2004-2007	1.83	1.84	3.87	3.10	-4.74	7.33
Source: *Livestock Census (various issues), Ministry of Agriculture, Government of India*						

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LIVESTOCK POPULATION DYNAMICS

- India has huge livestock population with 199.08 million cattle, 105.34 million buffaloes, 140.54 million goats, 71.56 million sheep, 11.13 million pigs and 648.88 million poultry birds (18th Livestock census, 2007).
- Out of the total livestock in the country, around 38.2 percent are cattle, 20.2 percent are buffaloes, 12.7 percent are sheep, 25.6 percent are goats and only 2.8 percent are pigs.
- All other animals are less than 0.50 percent of the total livestock population.
- The composition of livestock population in broad groups like bovine (cattle and buffaloes), ovine (sheep and goats), pigs and poultry, however, has changed over the last two decades.
- Cattle population that had been increasing until 1992 has started declining and between 1992 and 2003, it declined by 9 percent.
- The decline in the cattle population is confined to indigenous stock that comprised 87 percent of the total cattle population in 2003.
- The number of indigenous cattle declined by 15 percent, while that of the crossbred increased by 62 percent. Within the indigenous stock, decline was drastic for males (22%).
- The main reasons for decline in indigenous cattle population are: increasing substitution of draught animals with mechanical power and low milk yield.
- The buffalo population has increased from 70 million in 1982 to 98 million in 2003.

- There has been a small decrease in total bovines in the country by 1.9% between 1997 and 2003.
- Total ovine population has increased from 144 million in 1982 to 186 million in 2003.
- The number of goats increased from 95 million in 1982 to 124 million in 2003, but at a decelerating rate throughout.
- During 1997-2003, the growth in goat population remained almost stagnant. Sheep population though has been increasing but with considerable variations in the trend.
- Poultry is gaining importance in India due to growth and availability of poultry feed at reasonable prices.
- Between 1982 and 2003, poultry population increased more than double, from 207 million to 489 million.
- Except during 1992-97, poultry population has maintained a steady growth of above 4 percent a year.
- Between 1997 and 2003, poultry witnessed an all time high growth of 7 percent a year.
- Pig population has increased from 10 million in 1982 to 14 million in 2003.
- Growth in pig population, however, has decelerated sharply since 1992, due to lack of widespread demand for pork.
- The contribution of the livestock sub-sector to Gross Domestic Product (GDP) of India has increased from 4.8% to 5.9% between 1980 and 1998, while the share of agriculture sector has declined from 35% to 25%. Consequently the contribution of livestock sub- sector to the Agricultural GDP has increased impressively from 13.9% to 23.4%.)
- The livestock sub-sector registered an annual compound growth rate of 7.3% compared to 3.1 % for crops sub- sector.
- In value terms milk continues to dominate livestock production structure and its share has increased between 1980 and 1999 from 43% to 57%.
- In 1997- 99 milk has become the number one farm commodity exceeding the value of paddy.
- In contrast the share of draught power declined from 33% to 10%. Meat and meat products share in 1997- 98 exceed the share of draft power.
- Species wise cattle outputs (milk, meat and draught power etc.) dominated the shares in early eighties but by 1997 the share of buffalo exceeded share of cattle and now has the highest share (42%) in total livestock value from all species.

MILK PRODUCTION

World level contribution

- India ranks first in milk production (100.9 million metric tonnes) followed by USA (70.8 million metric tonnes), Russia (39.3 million metric tonnes), Germany (28.0 million metric tonnes) and France (25.00 million metric tonnes).
- From 2001 India ranks first in world milk production, closely followed by USA .
- More than 50% of the milk is produced from buffalo and India have three times more number of dairy animal than USA but the annual milk yield per animal is about one tenth of that achieved in USA and one fifth of that achieved in New Zealand.

National level contribution

- The total GDP during 2005-2006 was 32,509 billion rupees of which the share of agriculture was Rs. 5362 billion (16.49 per cent).
- The livestock sector accounts for 1372.00 billion rupees which is about 4.22 per cent of total GDP.
- The value output from milk during 2005-2006 was Rs. 1,24,520 crore. The value output from beef trade was Rs. 3599 crore.

- Besides the value output from dung was estimated as 15,803 crores (As fuel 6,311 crore; as manure 9,492 crore from total livestock).
- The milk production showed a phenomenal growth from 55.7 million tones during 1991-92 to 100.9 million tonnes during the year 2006-2007.
- The per capita availability also improved from 178 g/day (91-92) to 246 gm/ day during 2006-2007, which is still deficit to meet the ICMR recommendation (280 g/day).
- Vide variation in per capita availability of milk among different states were noticed. It was high in Punjab (961 gm/day), Haryana (633 gm/day), Rajasthan (408 gm/day) and Gujarat (374 gm/day). The per capita availability in Tamil Nadu is 232.
- The per capita availability is very low (less than 100 gm/day) in almost all north-eastern states.
- Among the states UP produce more milk (18.09 million tonnes), followed by Punjab (9.1 million tonnes) and Rajasthan (9.3 million tonnes)

Production status

- Though the cattle wealth is quite abundant in terms of population the production from these animals is very poor viz., 987 kg per lactation whereas the world average is 2,038 kg per lactation. The average daily milk yield of our animals is 1.5 litres per day.
- An increasing shift to milk production as a major objective of rearing bovines and replacement of animal power with mechanical power in developed regions of the country is noticed.
- Increasing proportions of crossbred cattle in the total cattle population is observed in states like Kerala and Punjab , crossbred cattle have virtually replaced indigenous cattle; they account for over three-quarters of the total milk cattle population in Punjab and 70 percent in Kerala (GOI, 2003).
- The other states with high crossbred cattle populations are Haryana, Uttar Pradesh, Tamil Nadu, Maharashtra , and West Bengal , though breedable female crossbreds account for less than 10 percent of total breedable females in Uttar Pradesh and West Bengal .
- The average number of dairy animals hardly exceeds three to four in most parts of the country. However, in certain parts of Punjab , Haryana, Gujarat , and Uttar Pradesh, dairy animal holdings are larger.

DAIRYING IN TAMIL NADU

- Milk is the prime product of dairying. India is the largest milk producing country in the World, in which Tamil Nadu is one of the frontline States in milk production and ranks as number one in the country in the coverage of more than 50% of revenue villages under Co-operative ambit. There are 8246 functional primary milk societies with 22.29 lakhs members.The milk production in Tamil Nadu per day is 145.88 Lakh litres.
- The milk production which was 55.60 lakh tonnes during 2006-07 increased to 56.73 lakh tonnes during 2008-09, an increase of 2%.The State contributes 5.23 % of total milk production and stands 9th in milk production in the country.
- During the year 2008-09, the per capita availability of milk is 235 grams per day.

ROLE OF DAIRYING IN INDIA

- More than 70 per cent of population depends on income from agriculture and animal husbandry is an adjunct to crop agriculture and cattle and buffaloes are kept for milk production, motive power of various farm operations. The animals are generally maintained on agricultural byproducts.
- Cattle and buffalo convert larger quantity of agricultural wastes and byproducts into milk and provide gainful employment to large agricultural labour force.
- The cattle rearing are mainly in the hands of small and marginal farmers whose land holding is meager, being ½ to 2 acres. Dairy farming provides sustainability to the landless labourers, small and marginal farmers.
- Dairying contributes abut 65 per cent to the total income of landless labourers and 35 per cent to that of marginal and small farmers.

- Dairy is an important sub-sector of the Indian agriculture accounting for nearly 17 percent of the value of output from agriculture and allied activities. India is the largest producer of milk in the world with production of more than 100 million tonnes followed by the USA , although in terms of milk yield, the performance of Indian dairy sector is dismal.
- The livestock sector accounts for 1372.00 billion rupees which is about 4.22 per cent of total GDP.
- The value output from milk during 2005-2006 was Rs. 1,24,520 crore. The value output from beef trade was Rs. 3,599 crore.
- Milk production over the last decades had increased by about 4 to 5 per cent per annum.
- The per capita availability of milk has improved from 128 g/day in 1980 to 246 g/day during 2005-2006.
- The milk production was almost doubled from 1990-91 (55.7 million tonnes) to 2006-2007 (100.9 million tonnes) which showed the improvement in milk production.
- The milk is the single largest item which is estimated to fetch Rs.450 billion way ahead of rice and wheat.
- The estimated value of milch animals alone is around Rs.35 billion. Dairy animals also contribute to hides/skin and dung valued at Rs.60 billion.
- About 84 million draught animals producing 50 million horse power in the farm sector and additionally contributed 7 to 10% of the total freight carried by motorized trucks and Indian Railways, are indespensively involved in agricultural operations.
- Draught animal power (DAP) investment in animal energy sector is more than Rs.35 billion.
- Currently DAP contributes 57% of total farm energy requirement through about 72 million bullocks.
- Similarly the estimated value of 75 million tones of dry dung would come to around Rs.4000crores.
- In addition to that a good part of dung is used as FYM. In terms of nutrient nitrogen when its value is estimated in terms of fertilizer the value comes to about Rs.3,300 crores, (World Bank report on energy sector in India).
- Apart from manurial value biogas can be produced from livestock dung and poultry droppings.
- 32 kg of cow dung/20 kgs of pig faeces/12 kgs of poultry droppings can produce 1 m^3 to 34 m^3 of bio-gas.
- The calorific value of bio-gas is 500 to 700 BTU per cft in comparison to natural gas, which is about 850 BTU/cft.
- 1 m^3 of slurry fed to biogas plant produces on an average 0.15 to 0.20 m^3 of biogas daily. Based on equivalent effective heat produced 2 m^3 biogas plant replaces in a month fuel equivalent of 26 kgs of LPG contained in standard gas cylinder or 37 litres of kerosene or 88 kgs of charcoal or 210 kgs of fuel wood or 740 kgs of animal dung.

Conclusion

- It can be summarized that the dairy farming once a subsidiary occupation has now become central to lives of millions of families.
- It is symbiotically associated to crop farming Sustained largely on crop residues and byproducts.
- In low rainfall areas like arid and semi-arid & hill areas, dairying serves as food security and draught proning.
- Dairying in India is thus an environmental friendly activity.
- It maintains the quality of environment through milk, bio-fertilizer, farm power and fuel energy.

SHARE OF AGRICULTURE AND LIVESTOCK IN GDP

SHARE OF AGRICULTURE AND LIVESTOCK IN GDP (At current prices in Rs.Billion)

Year	GDP (Total)	GDP (Agriculture)		GDP (Livestock Sector)	
		Rs.	% Share	Rs.	% Share
1980-81	1,224	425	34.72	59	4.82
1985-86	2,338	700	29.94	139	5.95

1986-87	2,600	744	28.62	156	6.00
1987-88	2,949	835	28.31	183	6.21
1988-89	3,527	1,041	29.52	217	6.15
1989-90	4,087	1,154	28.24	275	6.73
1990-91	4,778	1,352	28.30	308	6.45
1991-92	5,528	1,593	28.82	375	6.78
1992-93	6,307	1,779	28.21	432	6.85
1993-94	7,813	2,218	28.39	507	6.49
1994-95	9,170	2,552	27.83	577	6.29
1995-96	10,733	2,778	25.88	650	6.06
1996-97	12,435	3,340	26.86	747	6.01
1997-98	13,901	3,535	25.43	819	5.89
1998-99	15,981	4,065	25.44	911	5.70
1999-00	17,865	4,097	22.93	947	5.30
2000-01	19,254	4,091	21.25	1,047	5.44
2001-02	21,002	4,429	21.09	1,092	5.20
2002-03	22,653	4,261	18.81	1,148	5.07
2003-04	25,494	4,843	19.00	1,183	4.64
2004-05	28,559	4,850	16.98	1,258	4.41
2005-06	32,509	5,362	16.49	1,372	4.22

Source: *National Accounts Statistics-2007;Central Statistical Organisation; M/O Statistics & Programme Implementation* Quick*

MODULE-4: ANIMAL HOLDING AND LAND HOLDING PATTERNS IN DIFFERENT AGRO-ECOLOGIES

Learning outcomes

- ***On completion of this module, the learner will be able to discuss the different land holding patterns in our country, differentiate between different categories of farmers and their animal holdings.***

LAND HOLDING PATTERN IN INDIA

- In India, agricultural land holding pattern can broadly be classified as, marginal (below 1.00 hectare), small (1.00 to 1.99 hectare), semi-medium (2.00 to 3.99 hectare), medium (4.00 to 9.99 hectare) and large (10.00 hectare and above). The average land holding of marginal farmers in India is 0.4 hectare whereas small farmers has 1.42 hectare, semi-medium farmers 2.72, medium farmers 5.81 and large farmers posses 17.12 hectares of land.
- In livestock sector, 46.5 per cent of livestock holding is in the hands of marginal farmers. Small farmers posses 22.5 per cent of livestock and semi-medium farmers posses 17.5 per cent of livestock. The role of medium and large farmers in livestock is less viz., 10.6 and 2.9 per cent, respectively. The livestock per holding is comparatively less in marginal, small and semi-medium category(3.6 cattle & buffalo and 1.5 sheep & goat). Whereas it was high in medium and large holding (7.4 cattle/buffalo and 3.0 sheep)

DISTRIBUTION OF OPERATIONAL HOLDING (2001-02) - All India

Sl. No.	Category of Land Holdings	Distribution of Livestock (%)	Number of Holdings (000)	Operated Area (000 ha)	Area per Holding (ha)	Livestock per Holding	
						Cattle & buffalo	*Sheep & Goat*
1	Marginal (below 1.00 ha)	46.5	65285.85	27380.472	0.42	2.9	1.3
2	Small (1.00 to 1.99 ha)	22.5	21498.80	30503.723	1.42	4.4	1.7
3	Semi-medium (2.00 to 3.99 ha)	17.5	13349.71	36242.071	2.71	5.7	2.1
	Sub Total	86.5	100134.4	94126.3	0.94	3.6	1.5
4	Medium (4.00 to 9.99 ha)	10.6	6374.39	36617.616	5.74	7.1	2.7
5	Large(	2.9	1197.713	18649.027	15.57	8.9	5.0

	10.00 ha & above)						
	Sub Total	13.5	7572	55267	7.30	7.4	3.0
	All Size Classes	100.0	107706	149393	1.39	3.9	1.6
Figures within bracket indicate percentages, ***Source:*** *Department of Agriculture & Cooperation, Input Survey 2000-01, M/O Agriculture*							

- Based on the classification of Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India (ICAR 2004), the classifications of land holding of Indian rice farmers are as follows:
    - Majority of Indian farmers in this study were small holding (1-2 ha; 34.00%), followed by semimedium holding (2 – 4 ha; 26.00%), and medium holding (4 – 10 ha; 24.00%). Farmers with large holding (10 ha & above) were 10 per cent and the marginal farmers (below 1 ha) were 6.00 per cent.

For further readings: See "NATIONAL SAMPLE SURVEY ORGANISATION's Information"

ANIMAL HOLDING PATTERN

- Dairying in India is in the hands of small/marginal landholders and agriculture laborers. The national average land holding is 1.68 hectares per farm family and cattle and/or buffalo is a part of family. Eighty per cent of 97.7 million farm families in India posses cattle and/or buffalo. Even agriculture labourers (11.5% of 97.7 million) posses one or two dairy cattle / buffalo.
- Indian agriculture is also characterized by scarcity of land. Nearly two-thirds of milk producers are “small and marginal” farmers and landless agriculture workers.
- On the other hand, around 73 per cent of the “medium and large” farmers who own more than two hectares of irrigated land. The medium and large farmers own only about 35 per cent of the cattle and buffalo population.
- Milk production in India is, therefore, essentially a small farmer activity based on family labour and a long tradition of rearing milk animals as part of the household.

Land and Animal Holding Patterns in India.

CATEGORY	FARMERS (%)	PERCENTAGE OF		MILK PRODUCTION (%)
		Land owned	Milch animals	
Landless agricultural workers	26.0	-	22.5	22.6
Small and marginal	49.3	27.0	41.8	41.9

farmers				
Medium and large farmers	24.7	73.0	35.7	35.5

DISTRIBUTION OF LIVESTOCK ACCORDING TO SIZE OF THE HOLDING

DISTRIBUTION OF LIVESTOCK ACCORDING TO SIZE OF THE HOLDING DURING 2001-02 (All India) (millions)

Sl. No.	Category of Land Holdings	Cattle		Buffaloes		Sheep	Goats	Horses & Ponies	Mules	Donkeys & Asses	Pigs	Camels	Total
		Males	Females	Males	Females								
1	Marginal	57.83	71.2	13.7	46.3	23.3	60.4	0.63	0.11	0.152	3.77	0.314	277.802
2	Small	33.49	29.4	7.3	24.9	12.8	24.62	0.235	0.03	0.057	1.505	0.19	134.524
3	Semi-medium	24.98	23.0	6.1	21.5	10.5	16.986	0.186	0.026	0.0524	1.11	0.2	104.5814
4	Medium	13.61	13.5	3.9	14.4	7.4	9.6	0.09	0.011	0.049	0.65	0.27	63.429
5	Large	2.7	3.6	0.9	3.5	2.7	3.3	0.065	0.0015	0.037	0.21	0.21	17.2275
	All Classes	132.6	140.8	31.8	110.6	56.7	114.9	1.2	0.2	0.3	7.2	1.2	597.6

Source: *Department of Agriculture & Cooperation, Input Survey 2000-01, M/O Agriculture*

AVERAGE SIZE OF HOLDING BY MAJOR SIZE CLASSES IN INDIA DURING ALL AGRICULTURE CENSUS YEARS

AVERAGE SIZE OF HOLDING BY MAJOR SIZE CLASSES IN INDIA DURING ALL AGRICULTURE CENSUS YEARS

SI. No	Major Size Classes	AVERAGE SIZE OF HOLDING (in hectares) DURING							Percentage
		1970-71	1976-77	1980-81	1985-86	1990-91	1995-96	2000-01	Change in 2000-01 over 1995-96

1	Marginal	0.40	0.39	0.39	0.39	0.39	0.40	0.40	0.0
2	Small	1.44	1.42	1.44	1.43	1.43	1.42	1.42	0.0
3	Semi-medium	281.00	2.78	2.78	2.77	2.76	2.73	2.72	-0.4
4	Medium	6.08	6.04	6.02	5.96	5.90	5.84	5.81	-0.5
5	Large	18.10	17.57	17.41	17.21	17.33	17.21	17.12	-0.5
	All classes	2.28	2.00	1.84	1.69	1.35	1.41	1.33	-5.7
Source: *Agricultural Census —Dept. of Agri. and Cooperation. Ministry of Agriculture.*									

MODULE-5: INTRODUCTORY ANIMAL HUSBANDRY

Learning outcomes

- On completion of this module, the learner will be able to categorize different common terms for animals, know the livestock population and zoological classification of different domestic animal and bird species.

INTRODUCTION

- Livestock sector plays an important role in socio-economic development of rural households.
- It contributes about 6 percent to the Gross Domestic Product and 25 percent to the Agricultural Gross Domestic Product.
- Over the last two decades, livestock sector has grown at an annual rate of 5.6 percent, which is higher than the growth of agricultural sector (3.3 percent).
- This suggests that livestock is likely to emerge as an engine of agricultural growth in the coming decades.
- It is also considered as one of the potential sector for export earnings.
- The importance of livestock goes beyond its food production function .
- It provides draught power and organic manure to crop sector and hides, skin, bones, blood and fibers to the industrial sector.
- Livestock sector also makes significant contributions towards conservation of environment.
- Livestock sector supplements income from crop production and other sources and absorbs income shocks due to crop failure.
- It generates a continuous stream of income and employment and reduces seasonality in livelihood patterns particularly of the rural poor.

COMMON ANIMAL HUSBANDRY TERMS

DETAILS	CATTLE	BUFFALO	SHEEP	GOAT	PIG	HORSE
Species	Bovine	Bovine or Bubaline	Ovine	Caprine	Swine	Equine
Groups of animals	Herd	Herd	Flock	Flock or band	Drove or herd or stock	Pack
Adult male	Bull	Buffalo bull	Ram or tup	Buck	Boar	Stallion

Adult female	Cow	She buffalo or buffalo cow	Ewe	Doe	Sow	Mare
Young male	Bull calf	Buffalo bull calf	Ram lamb or Tup lamb	Buckling or male kid	Boarling	Colt
Young female	Heifer calf	Buffalo heifer calf	Ewe lamb or gimmer lamb	Goatling	Gilt	Filly
New born	Calf	Buffalo calf	Lamb	Kid	Piglet or pigling	Foal
Castrated male	Bullock or steer	Buffalo bullock	Wether or wedder	Castrated	Hog or stag or barrow	Gelding or geld
Sterilized female	Spayed	Spayed	Spayed	Spayed	Spayed	Spayed
Female with its offspring	Calf at foot	Calf at foot	Suckling	Suckling	Suckling	Foal at foot
Act of parturition	Calving	Calving	Lambing	Kidding	Farrowing	Foaling
Act of mating	Serving	Serving	Tupping	Serving	Coupling	Covering
Cry	Bellowing	Bellowing	Bleating	Bleating	Grunting	Neighing
Chromosome number	60	50	58	60	38	64

POPULATION TREND (millions)

SPECIES	1951	1961	1982	1989	1991	1995	2003
Cattle	144.5	175.6	192.4	195.5	198.0	204.0	185.1
Buffaloes	42.9	51.2	69.8	73.7	77.0	82.00	97.9
Sheep	38.9	40.2	48.8	53.5	58.0	62.0	61.5
Goats	47.1	60.2	95.2	107.0	112.0	125.0	124.3
Pigs	4.4	5.2	10.1	10.3	10.0	11.5	13.5
Poultry	--	95.8	207.7	270.0	380.0	434.0	489.0

LIVESTOCK POPULATION IN MILLION [2003 Census]

Sl.NO.	SPECIES	INDIA	TAMIL NADU
1	Cattle	185.1	9.1

2	Buffaloe	97.9	1.65
3	Sheep	61.5	5.5
4	Goat	124.3	8.2
5	Pig	13.5	0.35
6	Poultry	489.0	86.5

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LIVESTOCK MANAGEMENT

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

Animal production involves

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

But better management includes

- Economic feeding
- Identification of better breeding stock
- Maintenance of their records and implementation of mating plan
- Monitoring the reproductive efficiency
    - By way of combining above criteria an ideal management should yield profitable product to the producer.
    - The aim of the animal production and management is to interrelate the operations and making the animals to produce more at lowest cost

GENERAL PRINCIPLES OF ANIMAL MANAGEMENT

- The basic requirements for the welfare of livestock are
    - Provision of readily accessible fresh water
    - Nutritionally adequate feed as required
    - Provision of adequate temperature and ventilation
    - Adequate freedom for movement and to stretch their body
    - Sufficient light for satisfactory inspection and also for feeding
    - Rapid diagnosis and treatment of injuries and disease
    - Emergency provision in the event of break down of essential mechanical equipment
    - Flooring which neither harms nor cause undue stress to the animal
- Domestication and rearing of animals for production causes considerable strain on the body of the animals.
- It is therefore essential that these animals should be looked after well.

LIVESTOCK IMPROVEMENT

The universally recognized essential methods for livestock improvement [four pillars] are

- Breeding: Both the male and female should be of superior genetic merit
- Weeding: Culling unwanted and uneconomical animals
- Feeding: Animals should be fed for their maintenance and production
- Heeding: Implies good animal management and general supervision including housing, care and maintenance of hygiene

ROLE OF LIVESTOCK IN THE LIVES OF THE SMALL FARMERS

- Livestock buffers the risks due to crop failure, unemployment and under employment.
- Enhances family nutritional status, allows some domestic consumption of essential nutrients.
- Provides regular cash income.
- Renders services like draft, manure and fuel.
- Helps to enhance socio-economic status.

CONSTRAINTS IN LIVESTOCK ENTERPRISE

- Farmers possess meager resources.
- They have limited access to resources, services, technology and market, due to their low socio-economic status.
- They are poorly organized.
- They are distributed over a wide area, with no/poor transport and communication facilities.
- They are generally tradition/taboo/apathy bound to allow big change in technology towards the better.

SCOPE OF DIFFERENT LIVESTOCK ENTERPRISES

The scope of different livestock enterprise for different regions of the country can be as follows

- Cattle
  - Milk - milk shed areas, near towns and cities
  - Female calf rearing – near milk shed area, near town and cities
- Buffalo
  - Milk – milk shed areas , near town and cities
  - Female calf rearing – near milk shed area and near town and cities
  - Male calf rearing - around slaughter house areas
- Bullock - for hiring, any where
- Camels - for hiring, any where
- Donkey - for hiring, any where
- Mule - for hiring, hill tract
- Sheep
  - Wool Himalayan and North West India
  - Meat any dry area
- Goat
  - Milk any area
  - Meat any dry area
- Pigs
  - Pork near cities [for specific area and people]
- Poultry
  - Eggs poultry shed areas, near cities and towns

    - Meat any area
- Rabbit
    - Meat any area
    - Fur hilly area

ZOOLOGICAL CLASSIFICATION OF DOMESTIC ANIMALS

- *Kingdom* - Animal
- *Phylum* - Chordata (with back bone animals, birds and fish)
- *Class* - Mammalia
    - Mammals possess mammary gland or udder, give birth to a fully developed young one and nurse their young ones with milk producced in the mammary gland or warm blooded hairy animals that produce their young alive and suckle mammary gland.
- *Sub class* - Eutheria (with placenta)
- *Order* - Ungulata (cloven hoofed animals)
- *Sub Order* - Artiodactyla and Perissodactyla.

Artiodactyla

- Cloven hoofed animals, the major group of herbivorous animals, stomach compounded and with intestines, enlarged for plant digestion.
- There are about 105 species.

Perissodactyla

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

CATTLE AND BUFFALO

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

GOAT, SHEEP AND PIG

CLASSIFICATION	GOAT	SHEEP	PIG
Kingdom	Animalia	Animalia	Animalia

Phylum	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia
Sub-Class	Eutheria	Eutheria	Eutheria
Order	Ungulata	Ungulata	Ungulata
Sub-Order	Artiodactyla	Artiodactyla	Artiodactyla
Family	Capridae	Ovidae	Suidae
Genus	Capra	Ovis	Sus
Species	Hircus	aries	domesticus

CAMEL, HORSE AND DONKEY

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

DOG, CAT AND RABBIT

CLASSIFICATION	DOG	CAT	RABBIT
Kingdom	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia
Sub-Class	Eutheria	Eutheria	Eutheria
Order	Carnivora	Carnivora	Lagomorpha
Sub-Order	—	—	—
Family	Canidae	Felidae	Leporidae
Genus	Canis	Felis	Oryctolagus

Species	Familiaris	Domesticus	Cuniculus

MODULE-6: COMMON ANIMAL HUSBANDRY TERMS

Learning outcomes

- On completion of this module, the learner will be able to differentiate between cattle and buffalo; sheep and goats, terms for groups, sounds act of mating, meat of different animal species.

COMMON ANIMAL HUSBANDRY TERMS - 1

Sheep

Family - Ovidae
Species - Ovine

- Sheep - Common gender.
- Ram or Tup - An adult male sheep used for breeding .
- Ewe - An adult female sheep.
- Lamb - A young one of either sex.
- Ram lamb - A male young one.
- Ewe lamb - A female young one.
- Wedder or Wether - An adult castrated male sheep.
- Crone - An old broken mouthed ewe which has been retained in a breeding flock because of her excellent breeding performance.
- Gimmer - A female sheep which is between 1 and 2 shearing.
- Seggy - A ram castrated after service.
- Yeld or Eild - A barren or non lactating animal.
- Shearing - Removal of wool.
- Lambing - The act of giving birth to a young one.

Goat

Family - Capridae
Species - Caprine

- Goat - Common gender
- Buck or he-goat - An adult male goat used for breeding.
- Doe - An adult female goat.
- Buckling - A male goat over 1 year but not exceeding 2 years of age.
- Goatling - A female goat over 1 year but not exceeding 2 years of age.
- Kid - A young one of goat of either sex.
- Kidding - The act of giving birth to a young one.

Pig

Family - Porcidae or Suidae
Species - Porcine

- Farrowing - The act of giving birth to a young one.
- Boar - An adult uncastrated male pig used for breeding.
- Sow - An adult female pig used for breeding.

- Stag or Hog or barrow - A castrated male pig.
- Gilt - A young female pig kept for breeding.
- Open Gilt - A young female pig which has not been served
- Closed Gilt - A Young female pig which has become pregnant.
- Store Pig - Pigs between weaning and fattening usually between 8 and about 15 weeks old.
- Runt or cad or crit or critling - The last young one farrowed in a litter. It is usually small.

Dog

Family - Canidae
Species - Canine

- Dog - Common gender.
- Dog - An adult male dog.
- Bitch - An adult female dog.
- Pup - A young one of either sex of dog.
- Whelping - The act of giving birth to a young one.

Cat

Family - Felidae
Species - Feline

- Cat - Common gender
- Tom Cat - An adult uncastrated male cat.
- Queen Cat - An adult female cat.
- Neuter - A castrated cat
- Kitten - A young one of either sex of cat.
- Queening - The act of giving birth to a young one.

Rabbit

Family - Leporidae
zoological Name - Oryctolagus cuniculus

- Buck - An adult male rabbit used for breeding.
- Doe - An adult female rabbit.
- Bunny - A young one of either sex of rabbit.
- Kindling - The act of giving birth to a young one.

SHEEP

1	Sheep	Common gender.
2	Ram or Tup	An adult male sheep used for breeding .
3	Ewe	An adult female sheep.
4	Lamb	A young one of either sex.
5	Ram lamb	A male young one.
6	Ewe lamb	A female young one.

7	Wedder or Wether	An adult castrated male sheep.
8	Crone	An old broken mouthed ewe which has been retained in a breeding flock because of her excellent breeding performance.
9	Gimmer	A female sheep which is between 1 and 2 shearing.
10	Seggy	A ram castrated after service.
11	Yeld or Eild	A barren or non lactating animal.
12	Shearing	Removal of wool.
13	Lambing	The act of giving birth to a young one.

GOAT

1	Goat	Common gender
2	Buck or he-goat	An adult male goat used for breeding.
3	Doe	An adult female goat.
4	Buckling	A male goat over 1 year but not exceeding 2 years of age.
5	Goatling	A female goat over 1 year but not exceeding 2 years of age.
6	Kid	A young one of goat of either sex.
7	Kidding	The act of giving birth to a young one.

PIG

1	Farrowing	The act of giving birth to a young one.
2	Boar	An adult uncastrated male pig used for breeding.
3	Sow	An adult female pig used for breeding.
4	Stag or Hog or barrow	A castrated male pig.
5	Gilt	A young female pig kept for breeding.
6	Open Gilt	A young female pig which has not been served
7	Closed Gilt	A Young female pig which has become pregnant.
8	Store Pig	Pigs between weaning and fattening usually between 8 and about 15 weeks old.
9	Runt or cad or crit or critling	The last young one farrowed in a litter. It is usually small.

DOG

1	Dog	Common gender

2	Dog	An adult male dog
3	Bitch	An adult female dog
4	Pup	A young one of either sex of dog
5	Whelping	The act of giving birth to a young one

CAT

1	Cat	Common gender
2	Tom cat	An adult uncastrated male cat
3	Queen cat	An adult female cat
4	Neuter	A castrated cat
5	Kitten	A young one of either sex of cat
6	Queening	The act of giving birth to a young one

RABBIT

1	Buck	An adult male rabbit used for breeding
2	Doe	An adult female rabbit
3	Bunny	A young one of either sex of rabbit
4	Kindling	The act of giving birth to a young one

DIFFERENCE BETWEEN CATTLE AND BUFFALO

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

DIFFERENCE BETWEEN SHEEP AND GOAT

SHEEP	GOAT
Usually only one young one is born	Triplets and twins are often produced
Sheep are short	Goats are tall
Female sheep has no horns but male twisted	Both sexes have horns but not have twisted horns
Wattles and beards are absent	Wattles and beards are present

Sheep have dense growth of wool on body surface	Moderate growth of hair
Tail is shorter	Tail is longer
Body conformation is rounded	Body conformation is angular and laterally flattened

GROUP OF ANIMALS

- Cattle and buffalo : Herd
- Sheep and goat : Flock / Band
- Pigs : Drove / Stock / Herd
- Dogs : Pack
- Horse : Pack
- Rabbit : Colony

HOUSE OF ANIMALS

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

SOUND PRODUCED BY ANIMALS

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

ACT OF MATING

- Cattle and buffalo : Serving
- Sheep : Tupping
- Goat : Serving
- Pigs : Coupling
- Horse : Covering

MEAT OF ANIMALS

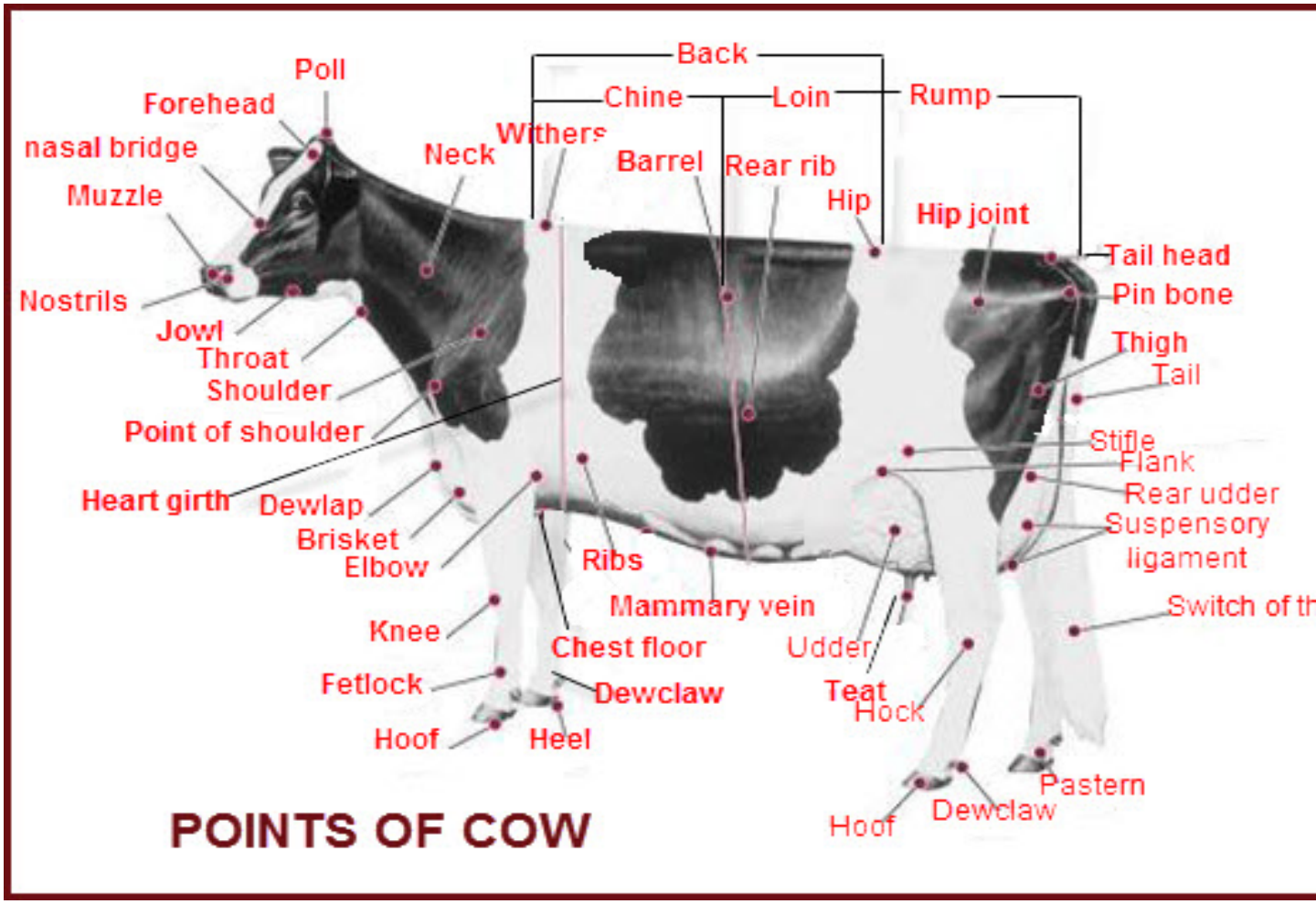
- Cattle : Beef
- Buffalo : Carabeef
- Sheep : Mutton
- Goat : Chevon
- Pigs : Pork
- Rabbit and Poultry : White meat

MODULE-7: BODY CONFORMATION AND IDENTIFICATION

Learning outcomes

- After the completion of this module, the learner will be able to describe the different body parts of the animals, different identification methods used for farm animals and also about periodical farm operations.

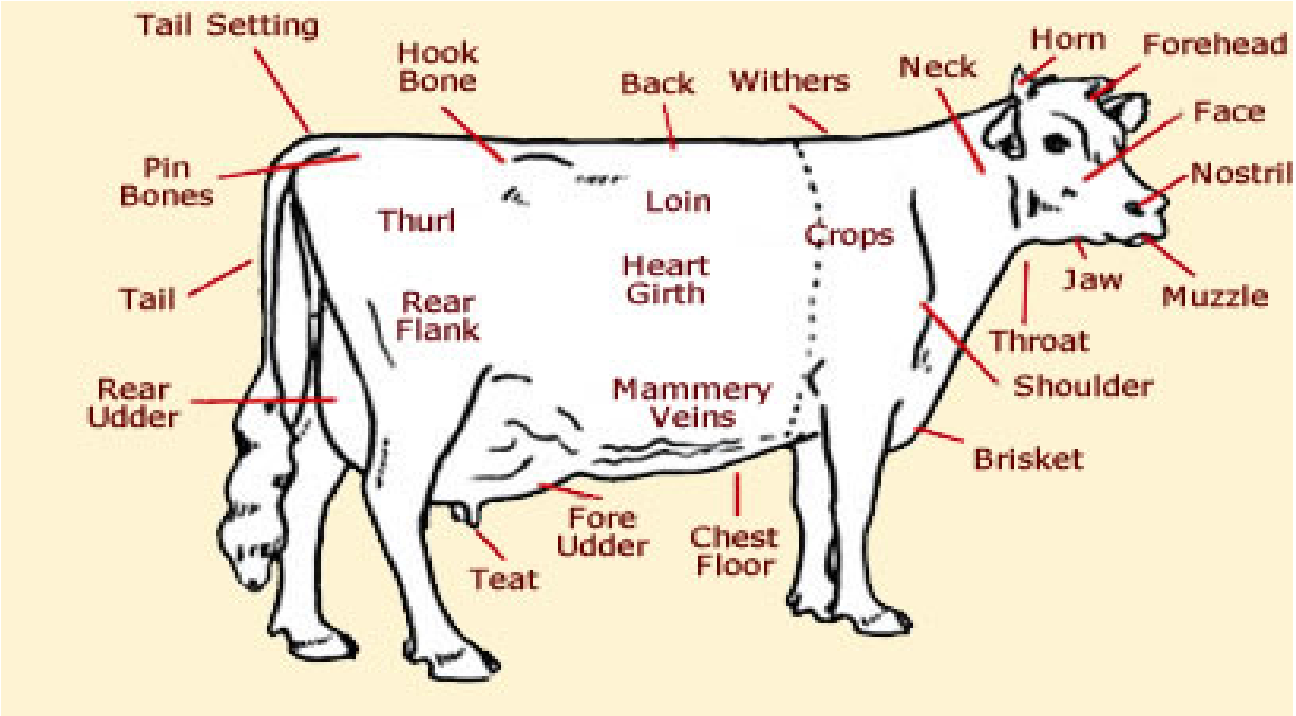
POINTS OF COW



PARTS OF HEAD

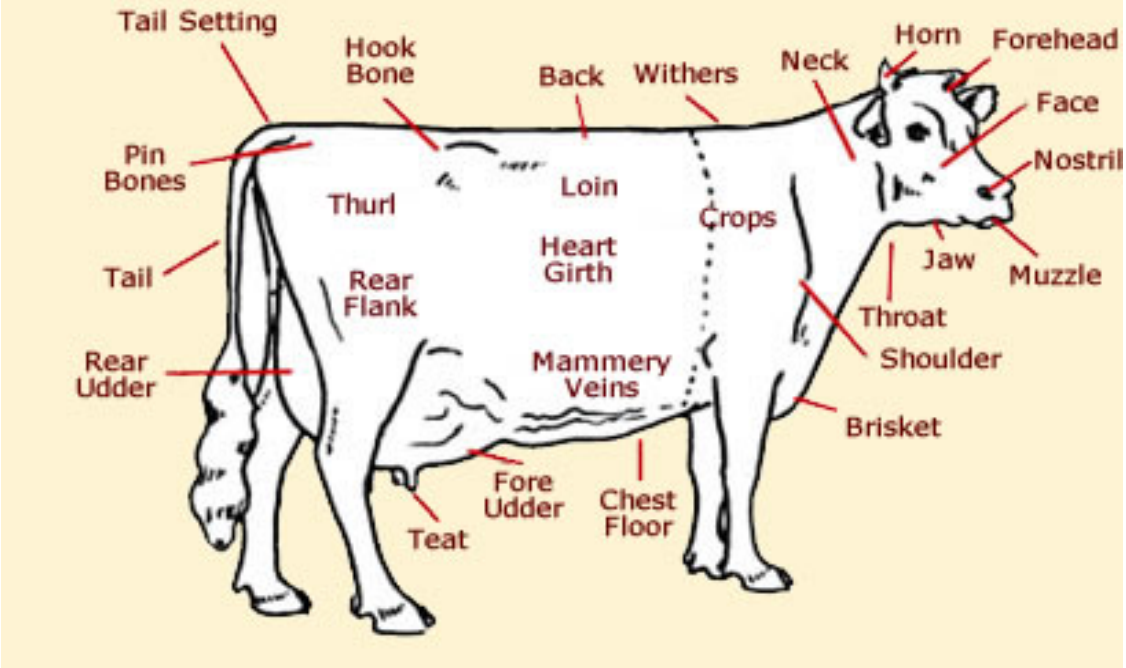
- *Poll:* It is the bony prominence found inbetween and little behind the ears and is formed by the Nuchal crest of the occipital bone.
- *Forelock:* It is the tuft of hairs growing between the ears and falling over the forehead.
- *Forehead:* It is the rectangular area found inbetween the eyes and ears and frontal bone forms the bony part.

- *Nasal Bridge:* It is the linear space found below the forehead, inbetween the eyes and extending up to the muzzle.
- *Nasal Peak:* It is the highest point on the nasal bridge found at the lower third of it
- *Muzzle:* It is the soft portion in the form of an inverted trapezium below the nasal bridge inbetween the nostrils.
- *Nostrils:* It is the external opening of the respiratory system situated on either side of the muzzle.
- *False Nostrils:* It is a blind pouch situated at the upper border of the nostrils.
- *Upper Lip:* It is the upper border of the opening of the mouth (Rima-oris).
- *Lower Lip:* It is the lower border of the Rima-Oris.
- *Opening of Mouth:* It is the anterior opening of the digestive system.
- *Chin:* It is the anterior portion of the lower jaw.
- *Chin Groove:* It is the depression found behind the chin.
- *Ramus of the Mandible:* These are projections or extensions of the body of the mandible on either side of the lower jaw.
- *Jowl:* It is the soft area in between the Ramus of the Mandible.
- *Parotid:* It is the triangular portion found behind the angel of lower jaw where the head meets the neck.
- *Throat:* It is found at the posterior end of the jowl where head meets the neck.
- *Ear:* It is the external opening of the auditory system.
- *Temporal Fossa:* It is circular depression found below the base of the ear.
- *Supra Orbital Fossa:* It is the depression found above the orbit of eye-ball.
- *Supra Orbital Crest:* It is the linear bony prominence found above the orbit of eye-ball.
- *Upper Eyelid:* It is the upper border of eye-ball.
- *Lower- Eyelid:* It is the lower border of eye-ball.
- *Third Eyelid:* It is situated in the inner canthus of eyelid.
- *Inner Canthus:* It is the inner angle where the upper and lower eye-lids meet respectively.
- *Outer Canthus:* It is the outer angle where the upper and lower eye-lids meet respectively.
- *Eye Lashes:* They are hairs growing from the border of eyelids.
- *Zygomatic Ridge:* It is the linear bony part commencing a little below and infront of the eyeball and directed obliquely downwards and forwards.



PARTS OF NECK

- *Apex of Neck:* It is a point or angle where the head joins the neck.
- *Base of Neck:* It is the imaginary line where the neck joins the body.
- *Crest of the Neck:* It is a top line of the neck and ligamentum nuchae is in contact with it.
- *Bottom of the Neck:* It is the lower border of the neck.
- *Jugular Furrow:* It is longitudinal depression found parallel to the lower border of the neck and the jugular vein is situated in this groove.
- *Hollow of the Neck:* It is the shallow depression found on the side of the neck.
- *Mane:* It is the tuft of hairs growing over the crest of the neck and falling towards one side.



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PARTS OF DORSAL ASPECT

- *Withers and Point of Withers:* It is the highest point on the top line and is formed by the supra spinous process of 3^{rd}, 4^{th}, 5^{th} thoracic vertebrae.
- *Back:* It is the portion behind the withers upto the point where the last rib gets attached. It is formed by the thoracic vertebrae is in contact with this region.
- *Lion:* It is the region formed between the back and the point of the croup.
- *Point of Croup:* It is the highest point behind the loins and is formed by the two internal angels of ilium.

- *Croup:* It is that part behind the point of croup upto the base of the tail and is formed by the supraspinous process of the sacral vertebrae.
- *Dock of the Tail or Base of the Tail:* It is the point at which the tail commences.
- *Body of the Tail:* It is the main structure of the tail and is formed by Coccygeal vertebrae.
- *Switch:* Switch of the tail is the bunch of hairs growing from the body of the tail.

PARTS OF VENTRAL ASPECT

- *Brisket:* It is the muscular bulges found on either side of the midline in between the forelimbs.
- *Floor of the Chest Wall:* It is the lower portion of the chest wall and is formed by the body of the sternum.
- *Xiphoid Sternum:* It is called the keel bone or xiphoid cartilage. It is the terminal portion of sternum.
- *Umbilicus or Naval:* It is a dark depression found in the middle of the abdominal wall. It is the points where the umbilical cord is attached during the foetal life.
- *Prepuce or Prepucial Opening:* Prepuce is the fold of skin found in the posterior part of the abdomen and penis is situated inside this prepuce. Prepucial opening is the opening of prepuce.
- *Scrotum:* It is the pouch of skin inside which the testicles are situated.
- *Perenial Region:* (In the case of male) It is the area in between the prepucial opening and the anus.

PARTS FROM THE SIDE VIEW

- *Side or Chest Wall:* It is the lateral boundary of thoracic cavity.
- *Hollow of the Flank:* It is a triangular depression found behind the last rib infront of the external part of Ilium.
- *Flap of the Flank:* The fold of the skin infront of the hind limb on the lower aspect of abdominal wall.
- *External Ilium:* It is the bony prominence on the lateral aspect of the pelvic cavity behind the hollow of the flank.
- *Hind Quarters:* It is a rectangular area behind the external angle of ilium.

PARTS OF FORELIMB

Shoulder: The triangular area through which the forelimb is directed downward and forwards. The scapula forms the bony part of this region.

- *Shoulder Joint:* It is formed between the glenoid cavity and the head of the humerus.
- *Point of the Shoulder:* The bony prominence formed in front of the shoulder joint and is formed by the acromian process of the scapula and the head of the humerus.
- *Arm:* It is the region between the shoulder joint and elbow joint below directed obliquely downwards and backwards humerus forms the bony part of this region.
- *Elbow Joint:* Formed between the lower end of the humerus and upper end of radius and ulna.
- *Fore arm:* The vertical region between the elbow joint above and knee joint below, radius and ulna forms the bony part of the region.
- *Knee Joint:* It is formed by the lower end of the radius, ulna, carpal bones and the upper end of the metacarpal bone.
- *The Fore Cannon:* It is the region below the fetlock joint.
- *The Fetlock Joint:* The lower end of large metacarpal bone and upper end of the first phalanges and a sesamoid.
- *Pastern and Pastern Joint:* It is the region below the fetlock joint.
- *Coronet:* A bulged portion found at the place where the skin joints the hoof.
- *Toe:* It is the anterior portion of the hoof.
- *Point of Elbow:* The body prominence found at the back of the elbow joint and formed by the olecranon process for ulna.
- *Bend of Knee:* It is the transverse depression behind the knee joint where the place joint bends.
- *Suspensory Ligaments:* It is the ligament connecting the large metacarpal.

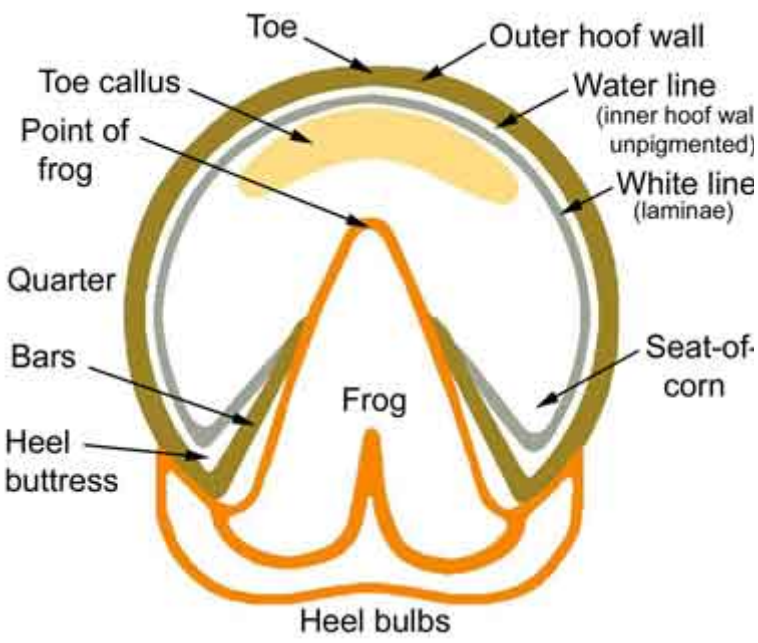
- *Ergot:* The horny growth behind the fetlock joint.
- *Bulbs of the Heel:* The two bulges in either side of the midline at the posterior aspects of the hoof.
- *Hollow of the Heel :* The depression between two bulbs of the heels.

PARTS OF HINDLIMB

- *Hip Joint:* It is formed between the acetabulum of the os-coxae or hip bone or pelvic girdle and the head of the femur.
- *Thigh:* The region between the hip Joint above and stifle joint below.
- *Stifle Joint:* It is formed between the lower end of femur and upper end of tibia, fibula and patella.
- *Gaskin or Lesser Thigh:* The muscular bulge between the stifle joint above and the hock Joint below.
- *Hock Joint:* Lower end of tibia, tarsal bone and upper end of metatarsal.
- *Point of Hocks:* Bony prominence formed behind the hock.
- *Hind cannon:* Between the hock joint, below fetlock joint formed by the large metatarsal bone.
- *Fetlock Joint:* Formed by lower end of metatarsal bone and upper end of first phalange and sesamoid bone.
- *Coronet:* A thick muscular region around the top of the hoof in the form of a ring.
- *Hamstring:* Thick muscular tendon. At the back of the lower thigh there is a very strong tendon called Hamstring.
- *Back Tendon:* Behind the metatarsal bone.
- *Chest Nut:* The horny growth situated below the hock on both the hind limb.
- *Suspensory ligament:* Muscular portion between back tendon and the metatarsal bone.

PARTS OF HOOF

- *Horny Wall:* Outer horny layer of the foot which rest on the ground.
- *White line:* The demarcating line between the wall and sole.
- *Sole:* Concave part of the foot behind the white line and does not come in contact with the ground.
- *Frog:* The central elevated portion from behind the foot.
- *Base of Frog:* It is the region from which the frog originates.
- *Body of Frog:* The frog has a central elevated bulged part called the body fit.
- *Tip of the Frog:* It is the region in which the frog ceases.
- *Hollow or cleft of Frog:* It is the region which is depressed in the middle of frog.



- *Bar:* It is the inturned portion of the wall and white line.
- *Buttress:* The angle formed between the wall and the bar.
- *Lateral Commissure:* It is the deep depression between the bar and the frog.
- *Corn:* The bulging formed in buttresses due to a bacterial infection.
    - False nostrils is present only in horse
    - Dew lap is present and well developed only in cattle
    - Hump is present and well developed only in Indian cattle
    - European cattle are popularly known as humpless cattle

OBJECTIVES

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

Reasons

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

METHODS OF IDENTIFICATION

- Neck chain/Neck rope
- Ankle band
- Brisket tag
- Tail tag

Temporary methods

  - Chalk/grease marker
  - Potassium permanganate
  - Black/light coloured paints
- Pictures/sketches
- Photographs
- Ear tattooing
- Ear Notching
- Branding
  - Cold/freeze
  - Hot iron
- Ear tagging
- Aluminium wing band in birds
- Leg band in birds
- Plastic Wing Badges in birds

EAR TATTOOING

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

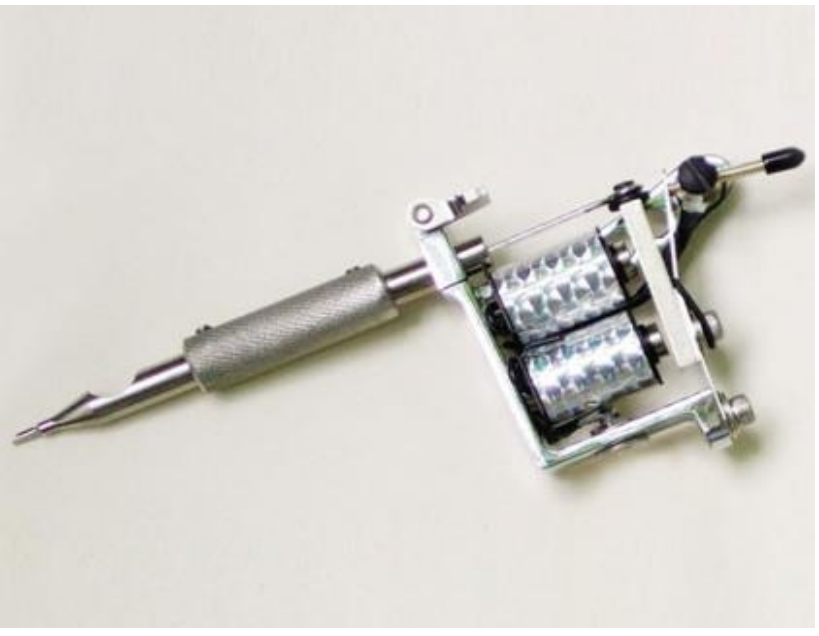
Instruments Required

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

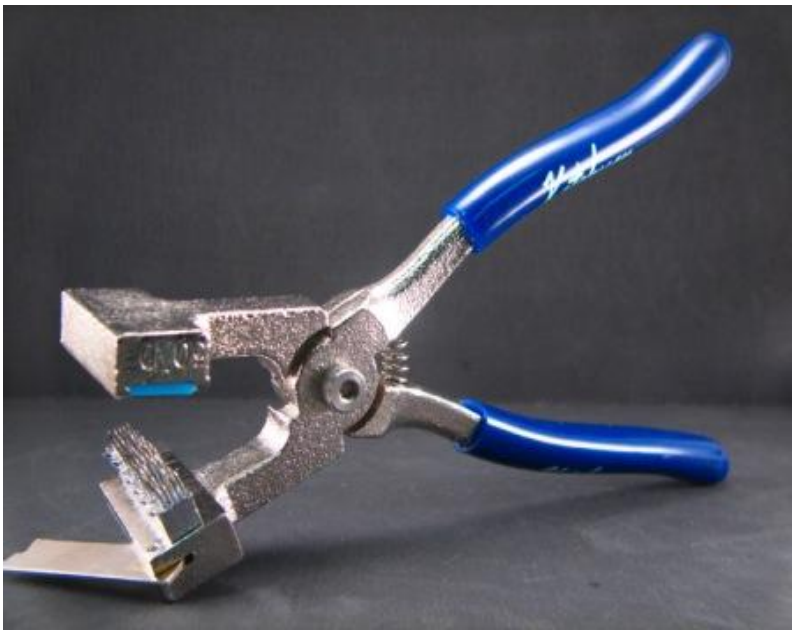
Procedure

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

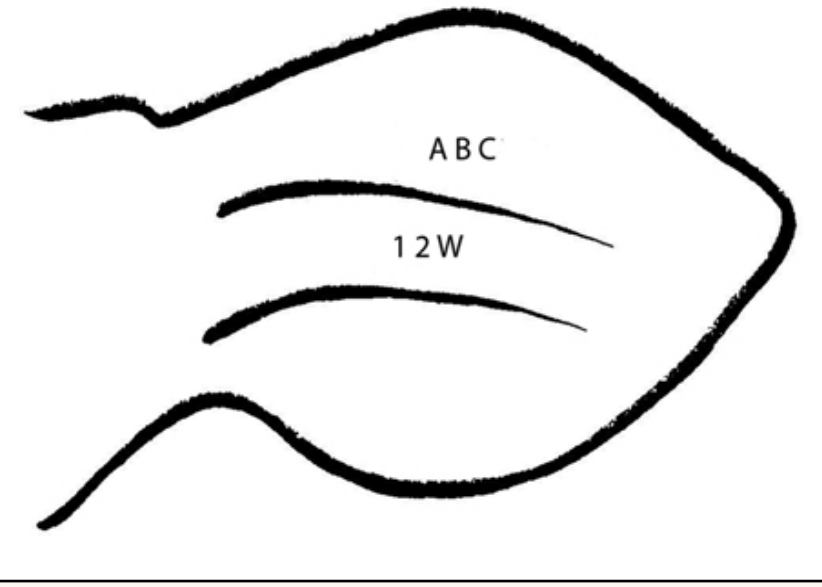
MODERN TATTOOING MACHINE	CONVENTIONL TATTOOING FORCEPS



IDEAL LOCATION IN THE EAR



TATOO NUMBER



Tatoo number

EAR TAGGING

- Most popular method of identification system.

Equipments required: Tagging forceps & tags

Procedure

- Select the tag type (Single piece / Double piece).
- Use the contrasting ink and style based on the skin colour of the animal.
- Invert the ear tag into the appropriate applicator.
- Locate the area in the ear for tagging) (half the way between base and tip of the ear).

- Puncture the ear with applicator if the tags are non-piercing type.
- Apply the ear tag by puncturing the ear with the applicator.

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

BRANDING

- It is one of the permanent method.

Hot Iron branding

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

Required

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

Procedure

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

Freeze branding

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

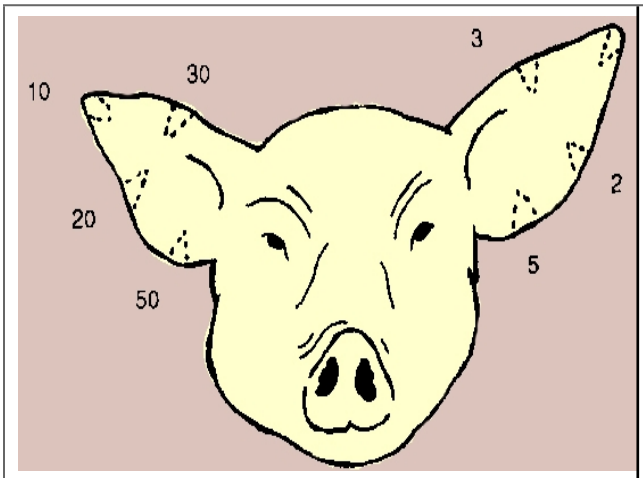
Equipments Required

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

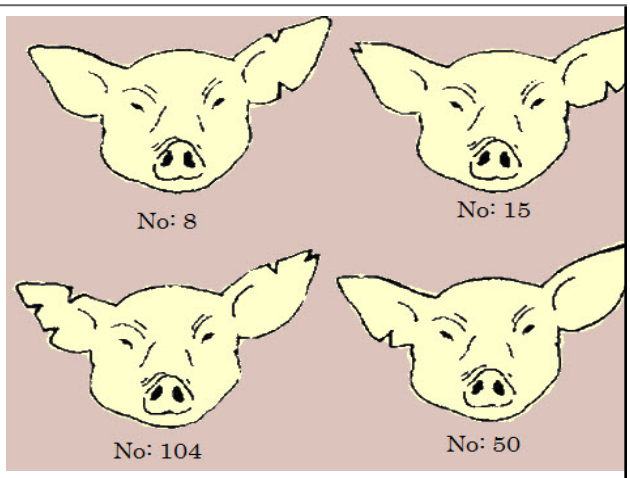
Branding rod for cattle

EAR NOTCHING

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



NUMBER STANDARD FOR NOTCHING



MODEL NUMBERS BASED ON THE STANDARD

MODULE-8: DENTITION AND AGEING OF ANIMALS

Learning outcomes

- On completion of this module, the learners are familiarized with the structure of teeth, terms in dentition and they will be able to judge the age of animals by seeing the dentition of cattle, buffalo, sheep and goats.

DENTITION AND AGEING OF LIVESTOCK

- The age of an animal can be estimated from the date of birth available in registers or by
  - Dentition
  - Horn rings
  - Number of young one produced by the animal.
- Age of the horse and other species can be estimated by noting the structure and conformation of the tooth. Ageing is important for the following reasons.
  - To issue soundness certificate
  - To select and purchase livestock
  - To know the breeding status of the animal
  - To estimate the value of the animal

OBJECTIVES

- The age of the animal may be told with practical accuracy by the appearance of incisor teeth.
- The use of the examination of teeth to determine age is of value in non-pedigree animals.
- Further it is impossible for the following reasons.
    - To issue soundness certificate
    - For valuation of livestock
    - For selection and purchase

DEFINITIONS

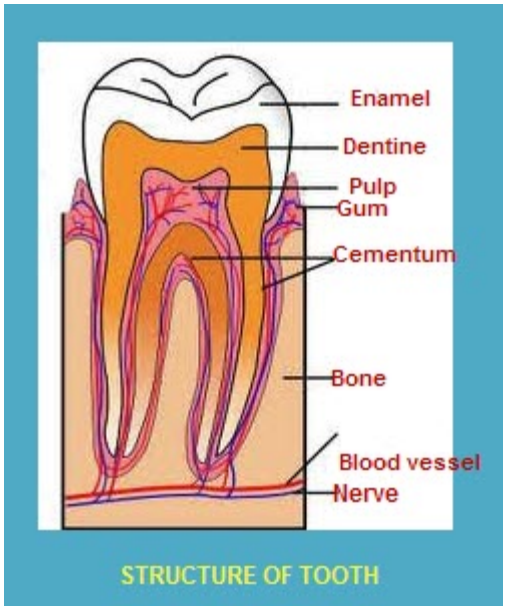
- *Alveolus:* The bony cavity in which the fang of the tooth is embedded.
- *Buccal Surface:* The outer surface of tooth that is next to the check.
- *Central Incisors:* The 2 incisors immediately on each side of middle line
- *Check Teeth:* Premolars and molars are often spoken off collectively as cheek teeth
- *Corner Incisor:* The outer or most lateral pair
- *Crown:* The part of the tooth which appears above the gum
- *Deciduous or milk teeth or temporary teeth:* These are temporary teeth which are pushed out by the growth of corresponding permanent teeth.
- *Erupting or cutting:* Means the teeth has cut through the mucous membrane of the gum.
- *Fang hole of Dental star:* The upper extremity of pulp cavity
- *Fang or Root:* Part of tooth under the gum
- *Galvayne's Groove:* The part of the groove running down the labial surface of the ground of the upper corner incisors of the horse. It normally appears near the gum at 10 years, is ½ way down at 15 years, extends down the whole length of tooth at 20 years, has grown ½ way out at 25 years, and has disappeared at 30. Simultaneously appearance of star and disappearance of mark takes place.
- *Infundibulum:* Dark depression on the table in the incisor it is called as mark
- *Inwear:* the hole of the table of tooth is in contact with opposite teeth of other jaw.
- *Labial surface:* The surface next to the lips of the incisors
- *Lateral Incisors:* The second pair that is those between central and corners.
- *Lingual surface:* The inner surface of tooth i.e. next to the tongue
- *Mandible:* The lower jaw
- *Mandibular cheek teeth:* Lower premolars and molars
- *Maxilla and premaxilla:* Constitute the upper jaw
- Maxillary sinus: A cavity in the skull situated in horse above the last 3 or 4 cheek teeth into which their roots project.
- *Molars:* The last 3 cheek teeth. These are permanent and not represented in the milk dentition.
- *Neck:* Joins the crown to the fang.
- *Pulp Cavity:* A hollow part of tooth containing nerves and blood vessels.
- *Shelly:* The newly cut incisor teeth either temporary or permanent.
- *Table or wearing surface:* The part of tooth which grinds the food and comes in contact with tooth of other jaw.
- *Tush:* The canine tooth of the horse present in stallion or gelding but absent or rudimentary in mark. It is situated near the incisors in the lower jaw than in the upper jaw.
- *Tusk:* The canine tooth of a pig
- *Wolf Tooth:* Small vestigial tooth in the position of the first premolar.
- *Full Mouth:* Strictly speaking, this means that all permanent teeth (both molars and incisors) have fully erupted. It is customary, however to consider only the incisors. Full mouth is seen in the case of horses at $4^{1/2}$ to 5 years. In cattle (exotic) 3 years and in pig 1- $1^{1/2}$ years. A horse is said to be aged, when it is over 15 years.

STRUCTURE OF THE TOOTH

- From within outwards the tooth is comprised of 4 tissues.
    - The pulp is the soft gelatinous tissue occupying the pulp cavity in the centre of the tooth. The pulp is well supplied with blood vessels and nerves.

- *Dentine:* Covers the pulp and is hard and yellowish white in colour.
- *Enamel:* It is the hardest tissue in the body and covers the dentine of the crown. It is clear and bluish white in colour.
- *Cement:* Covers the dentine of the roof. The embedded portion of tooth is firmly attached to the alveolus, periosteum by layers of connective tissue.

- There are 2 complete sets of incisors.
  - Temporary, milk or Foal teeth and permanent teeth. The difference between temporary and permanent teeth are as follows,
    - The temporary teeth is small and white, has a distinct neck., and a short fang which practically disappears as the tooth gets older.
    - The permanent teeth are longer, stronger and brown in colour and has no marked neck or distinct neck and has a stout long fang.



CATTLE DENTITION

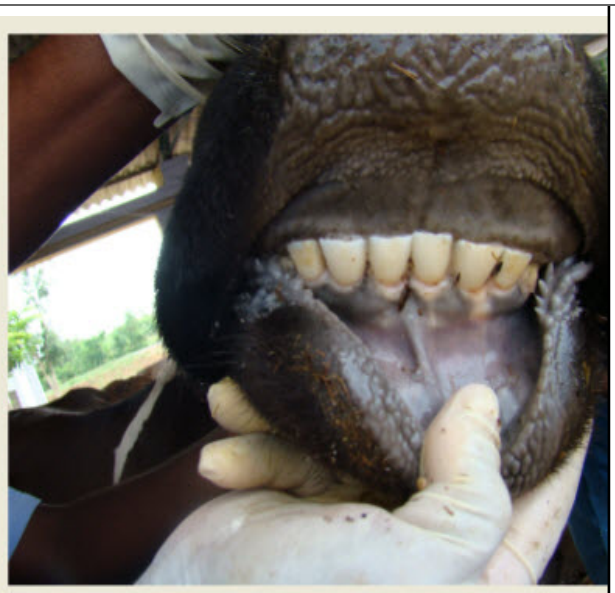
Dental formula

- Temporary dentition: 0/4 0/0 3/3 0/0
- Permanent dentition: 0/4 0/0 3/3 3/3
  - *At birth:* Calves are usually found to have their 8 incisors and 3 pre molars of the temporary dentition easily palpable below the gums.

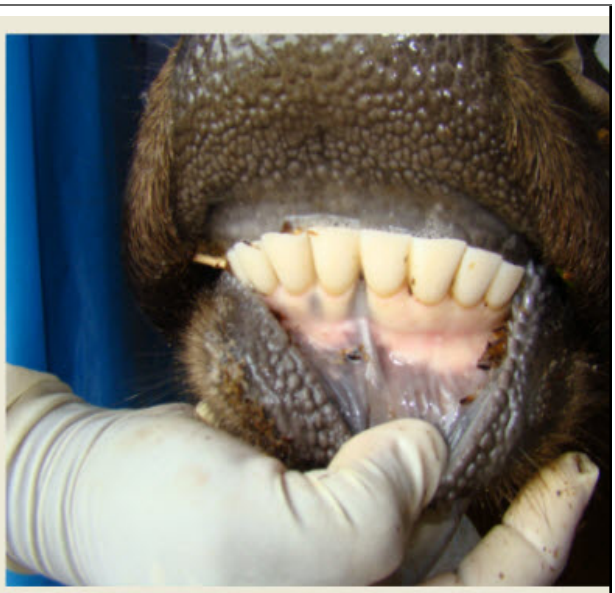
- *At 1 month:* 8 temporary incisors have their crowns free from the gums and the teeth are quite prominent and well defined. The three temporary molars are well up and wearing.
- *At 6 months:* The teeth are well placed in the jaw and are no longer overlapping.
- *At 1 year:* The most marked change between this time and 6 months of age is the wear of the temporary incisors.
- *At 2 years:* The first pair of permanent central incisors replace the corresponding temporaries and the first and second molars push out the temporaries and cut through the gums.
- *At 2 1/2 - 3 years:* The second pair of permanent medial incisors replace the corresponding temporaries.
- *At 3 - 3 1/2 years:* The third pair of permanent lateral incisors replace the corresponding temporaries.
- *At 4 years:* The last pair of permanent corner incisors replace the corresponding temporaries.
- *At 4-5 years:* The teeth are slightly worn along their cutting edges, and they occupy a less crowded position.
- *At about 6 years:* The surface of wear has reached practically half-way across the upper surface of the teeth, and a portion of the root is exposed.
- *At 10 years:* The greater part of the crowns have worn from the teeth and only a little cup-shaped piece of enamel remains.
- *At about 12 to 14 years:* Only the stumps of the teeth remain.
- In horned breeds of cattle a rough estimate of age can usually be made by counting the number of rings round the bases of the horns. The first ring appears at about 2 years and thereafter one ring is added annually.

Milk teeth- cattle

Two teeth animal- Cattle



Six teeth animal - Cattle



Full mouth animal- Cattle

CATTLE DENTITION

Click here

- Temporary – 0/4 0/0 3/3 0/0
- Permanent - 0/4 0/0 3/3 0/0

Age of eruption type of teeth

- 2-2 ½ years - 1st pair central incisors
- 3 years - 2nd pair
- 4 years - 3rd pair
- 4 ½ years - 4th pair

Full mouth in country breed - 4 1/2 years

- 1st pair molars - 2 years
- 2nd pair molars - 2 ½ years
- 3rd pair molars - 3 years
- 4th pair molars - 3 ½ years
- 5th pair molars - 4 years
- 6th pair molars - 4½ years

Milk teeth- cattle

Two teeth animal- Cattle

Six teeth animal - Cattle

Full mouth animal- Cattle

SHEEP AND GOAT DENITION

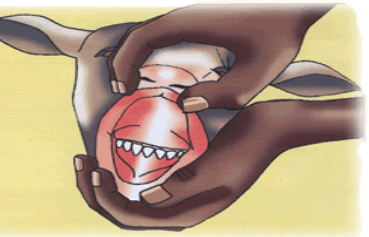
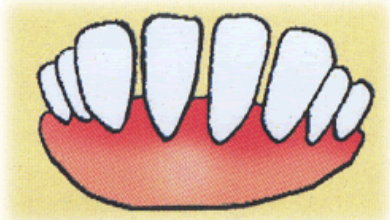
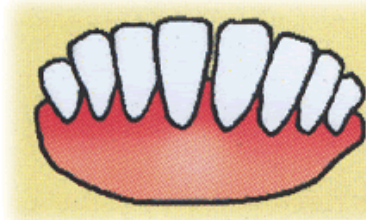
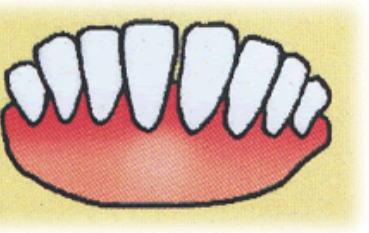
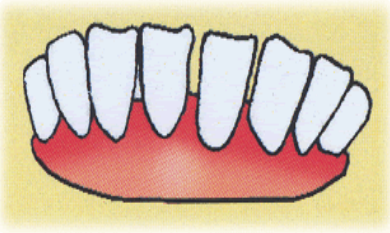
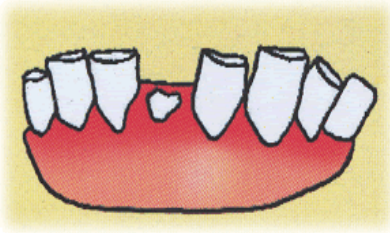
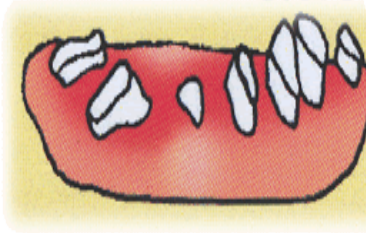
(Click here for a web link)

Dental formula

- Temporary dentition: 0/4 0/0 3/3 0/0
- Permanent dentition: 0/4 0/0 3/3 3/3

- *From birth to 1 year:* The temporary incisors are in use and the mouth of sheep at 1 year shows lamb teeth well worn, while in many cases the first pair of permanent central incisor will be cutting.
- *14-18 months (Two tooth):* The first pair of permanent central incisors replaced the corresponding temporaries.

- *20-24 months (Four tooth):* The second pair of permanent medial incisors replace the corresponding temporaries.
- *26-30 months (Six tooth):* The third pair of permanent lateral incisors replace the corresponding temporaries.
- *32-36 months (Full mouth):* The fourth pair of permanent corner incisors replace the corresponding temporaries.

From birth to 1 year	14-18 months (2 teeth)	20-24 months (4 teeth)	26-30 months(6 teeth)
			
32-36 months (8 teeth)	**Wearing (Above 3 yrs)**	**Broken mouth**	**Gummer (Aged)**
			

Source for illustrations:
Adapted from Vatta et al. (2005) Goatkeepers' Veterinary Manual.
Vatta, A.F., Gumede, S.A., Harrison, L,J,S., Krecek, R.C., Letty, B.A., Mapeyi, N. and Pearson, R.A. (2005). *Goatkeepers' Veterinary Manual*. Onderstepoort Veterinary Institute, Private Bag X05 Onderstepoort 0110, South Africa.

DENTITION OF SHEEP

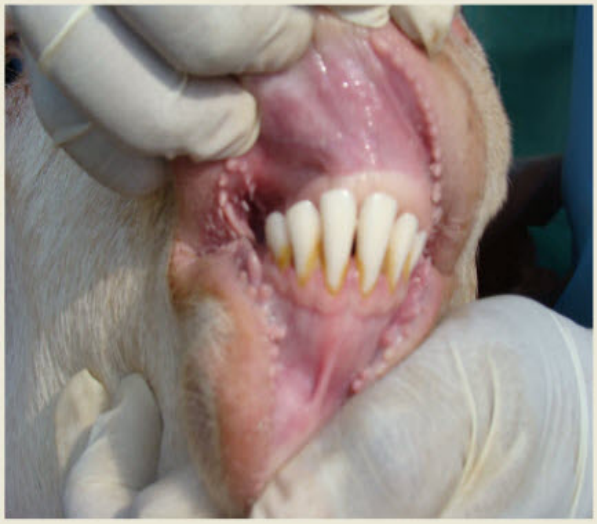
- Temporary - 0/4 0/0 3/3 0/0
- Permanent - 0/4 0/0 3/3 0/0

Eruption of teeth possible age (in months)

- 0-2 pairs of temporary teeth 6 – 10 months at birth all temporary incisors
- Permanent central incisor 16 – 20 months
- Permanent medial incisors 21 – 25 months
- Permanent lateral incisors 26 – 30 months
- Permanent corner incisors 31 – 40 months

Two teeth animal

Four teeth animal



Six teeth animal

Dentition- Full mouth

DEFINITIONS AND COMMON TERMS USED IN DENTITION

- *Alveolus* - It is the bony cavity in which the fang of a tooth is embedded.
- *Buccal surface* - The outer surface of the tooth.
- *Central incisors* - A pair of teeth immediately on each side of the middle line.
- *Lateral incisors* - The second pair of tooth in between the central incisors and corner incisors or the two teeth present on each side of the central incisors.
- *Corner incisor* - The last teeth of the incisor on both side in both the jaws are known as corner incisors or the outer or most lateral pair.
- *Cheek teeth* - Premolars and molars are together called a cheek teeth.
- *Deciduous or Milk teeth or Temporary teeth* - Those which may be present at birth or which may erupt during early life, but which are later pushed out by the growth of the corresponding permanent teeth. This will be milk white in colour and small in size.
- *Crown* - The part of the tooth which appears above the gum.

- *Cutting teeth or Erupting teeth* - The crown of the tooth which has cut through the mucous membrane of the gum.
- *Dental star or Fang hole* - The upper extremity of the pulp cavity is known as dental star and this indicates certain age groups. With advancing age, it becomes round rather than elongated.
- *Root or fang* - The part of the tooth under the gum.
- *Galvaynes groove* - A groove running down the labial surface of the crown of the upper corner incisors of the horses. It normally appears near the gum at 10 years; half way down at 15 years; extends down the whole length of the tooth at 20 years as grown half way out at 25 years and disappears at 30 years.
- *Infundibulum* - A dark depression on the table of the tooth. In incisors it is called as the mark. It is surrounded by prominent layer of enamel.
- *Labial surface* - The surface of the tooth next to the lips.
- *Lingual surface* - The inner surface of the tooth immediately near the tongue.
- *Mandible* - The other name for lower jaw.
- *Maxilla* - Constitutes the upper jaw.
- *Mandibular cheek teeth* - Lower premolars and molars.
- *Maxillary cheek teeth* - Upper premolars and molars.
- *Maxillary sinus* - A cavity in the skull situated in the horse above the last 3 or 4 cheek teeth, into which the root project.
- *Molar teeth* - The last 3 large cheek teeth are called molars. They are permanent teeth and are not represented in the milk dentition.
- *Neck of the tooth* - It joins the crown to the root or fang.
- *Premolars* - The first 3 large cheek teeth on either side are known as premolars.
- *Pulp cavity* - The hollow part of the tooth containing nerves and blood vessels.
- *Shelly* - The newly developed incisor either temporary or permanent is termed as shelly.
- *Table of the tooth or wearing surface* - The part of the tooth which grinds the food and comes in contact with the teeth of the other jaw.
- *Tush* - The canine tooth of the horse. It is characteristically present in stallion or gelding but absent or rudimentary in mares. It is situated nearer the incisors in the lower jaw than in the upper jaw.
- *Tusk* - The canine tooth of a pig.
- *Wolf teeth in horses* - It is a small vestigial tooth in the position of the first premolar.
- *Full Mouth* - It means that all permanent teeth, both molars and incisors have fully erupted and in position but it is customary to consider only the incisors. Full mouth is seen in horse at 4 1/2 - 5 years, in cattle at 3 years and 3 months, in sheep at 2 years and 9 months and in the pig at 17 to 20 months. But a horse is said to be aged when it is over 15 years.
- *Dentine* - It covers the pulp and it is very hard and yellowish white in colour.
- *Enamel* - It is the hardest tissue in the body and covers the dentine of the crown. It is clear and bluish white in colour.
- *Elephant teeth* - Black (devoid of enamel) enamel (hard) and covers the crown portion of the tooth. It is clear and bluish white in colour. Root portion of the dentine is covered by an adhesive substances called cement. It is firmly attached to the alveoli periosteum and supplied with vascular layer and connective tissue.

DENTITION AND AGEING OF CATTLE - AN ANIMATION

Following is the animation showing the age estimation in cattle by dentition

- Look for the permanent and temporary teeth
- Count the number of permanent teeth and say the age

MODULE-9: TRANSPORT OF LIVESTOCK BY RAIL, ROAD, AIR AND ON FOOT

Learning outcomes

- At the completion of this module, the learner will be able to describe about the disinfection of animal dwelling places and select different disinfectants for various needs. Learners are also exposed to practices like quarantine, isolation and different methods available for safe disposal of animal carcasses.

TRANSPORTATION OF ANIMALS

- Norms for transportation of animals by Ministry of Environment and forests
- FAO information

GENERAL RULE FOR TRANSPORT OF LIVESTOCK

- A valid certificate by a qualified veterinary surgeon to the effect that the cattle are in a fit condition to travel by rail or road and are not suffering from any infectious or contagious or parasitic diseases and that they have been vaccinated against rinderpest and any other infectious or contagious or parasitic diseases, shall accompany each consignment.
- In the absence of such a certificate, the carrier shall refuse to accept the consignment for transport.
- The certificate shall be in the form specified in Schedule - E. Veterinary first-aid equipment shall accompany all batches of cattle.
- Each consignment shall bear a label showing in bold red letters the name, address and telephone number (if any) of the consignor and consignee, the number and types of cattle being transported and quantity of rations and food provided.
- The consignee shall be informed about the train or vehicle in which the consignment of cattle is being sent and its arrival time in advance.
- The consignment of cattle shall be booked by the next train or vehicle and shall not be detained after the consignment is accepted for booking.

TRANSPORT OF CATTLE (Click here for a web link)

- It must be accompanied with a valid health certificate indicating fitness of the animals for transport and theirselves being free from any contagious or infections disease and in the absence of this certificate, the carrier shall not accept the consignment; the average space provided per cattle in railway wagon vehicle shall not be less than two square meters; hungry and thirsty cattle should not transported; cattle in advanced pregnancy shall not be mixed with young cattle to avoid stampede during transportation

TRANSPORT OF CATTLE BY TRAIN

- The average space provided per cattle in Railway wagon or vehicle shall not be less than two square metres.
- Suitable rope and platforms should be used for loading cattle from vehicles.
- In case of railway wagon the dropped door of the wagon may be used as a ramp when loading or unloading is done to the platform.
- Cattle shall be loaded after they are properly fed and given water.
- Cattle in advanced stage of pregnancy shall not be mixed with young cattle in order to avoid stampede during transportation.
- Watering arrangements on route shall be made and sufficient quantities of water shall be carried for emergency.
- Sufficient feed and fodder with adequate reserve shall be carried to last during the journey. Adequate ventilation shall be ensured.
- When cattle is to be transported by rail. An ordinary goods wagon shall carry not more than ten adult cattle or fifteen calves on broad gauge, not more than six adult cattle or ten calves on metre gauge, or not more than four adult cattle or six calves on narrow gauge.

- Every wagon carrying cattle shall have at least one attendant. Cattle shall be loaded parallel to the rails, facing each other.
- Rations for padding, such as straw, shall be placed on the floor to avoid injury if a cattle lies down and this shall not be less than 6 cm thick.
- Rations for the journey shall be carried in the middle of the wagon.
- To provide adequate ventilation, upper door of one side of the wagon shall be kept open properly fixed and the upper door of the wagon shall have wire gauge closely welded mesh arrangements to prevent burning cinders from the engines entering the wagon and leading to fire outbreak. Cattle wagons should be attached in the middle of the train.
- Two breast bars shall be provided on each side of the wagon, one at height of 60 to 80 cm and the other at 100 to 110 cm.
- Cattle-in-milk shall be milked at least twice a day and the calves shall be given sufficient quantity of milk to drink.
- As far as possible, cattle may be moved during the nights only. During day time, if possible, they should be unloaded, fed, given water and rested and if in milk, milking shall be carried out.

TRANSPORT OF CATTLE BY ROAD OR TRUCK

- Transport by road or truck has the convenience of loading at the farm and direct transit to the point of market.
- The absence of repeated handling and disturbance associated with it and consequent avoidance of serious weight loss.
- But the poor road condition and longer distance to be traveled cause comparatively higher cost per km than rails.
- When cattle are to be transported by goods vehicle the following precautions are to be taken namely
- Specially fitted goods vehicles with a special type of tail board and padding around the sides should be used.
- Ordinary goods vehicles shall be provided with anti-slipping material, such as coir matting or wooden board on the floor and the superstructure, if low, should be raised.
- No goods vehicle shall carry more than six cattle.
- Each goods vehicle shall be provided with one attendant.
- While transporting, the cattle, the goods vehicle shall not be loaded with any other merchandise and
- To prevent cattle being frightened or injured, they should preferably, face the engine.

SPACE REQUIREMENT FOR TRANSPORT OF CATTLE

- The average space provided per cattle in Railway wagon or vehicle shall be as follows:
  - Space Allowance per Cattle in railway wagon
  - Cattle weighing upto 200 Kg. - 1 Square Meter (Sq.mtr.)
  - Cattle weighing 200-300 Kg - 1.20 Square Meter
  - Cattle weighing 300-400 Kg - 1.40
  - Square Meter Cattle Weighing above 400 Kg - 2.0
- Square Meter Space requirement for Cattle while being transported in commonly sized road vehicles

VEHICLE SIZE (Sq.M)	FLOOR AREA OF THE VEHICLE (Sq.M)	NUMBER OF CATTLE	NUMBER OF CATTLE	NUMBER OF CATTLE	NUMBER OF CATTLE
		Cattle (200Kg)-1.0 sq.M per cattle	Cattle (200-300Kg)-1.2 sq.M per cattle	Cattle (300-400Kg)-1.4 sq.M per cattle	Cattle (Above400Kg)-2.0 sq.M per cattle
6.9 x 2.4	16.56	16	14	12	8
5.6 x 2.3	12.88	12	10	8	6
4.16 x 1.9	7.904	8	6	6	4
2.9 x 1.89	5.481	5	4	4	2

TRANSPORT OF SHEEP AND GOAT (Click here for a web link)

- Sheep and goats shall be transported separately; but if the lots are small special partition shall be provided to separate them.
- Rams and male young stock shall not be mixed with female stock in the same compartment.
- Material for padding, such as straw, shall be placed on the floor to avoid injury if an animal lies down, and this shall be not less than 5 cm. thick.
- The animals shall not be fettered unless there is a risk of their jumping out and their legs shall not be tied down.
  - Must have a valid health certificate indicating their fitness for transport and theirselves being free from any infections or contagious disease and in absence of this certificate the carrier shall refuse the consignment; first – aid equipment shall accompany animals in transit; males and females shall not be mixed in the same compartment.
- The space required for a goat shall be the same as that for a woolled sheep and the approximate space required for a sheep in a goods vehicle or a railway wagon shall be as under,

Space requirement in square metres (approximate weight of animal in kg)

Not more than 20	0.18	0.16
More than 20 but not more than 25	0.20	0.18

More than 25 but not more than 30	0.23	0.22
More than 30	0.28	0.26

Number animals can be transported by train

BROAD GAUGE		METER GAUGE		NARROW GUAGE
Area less than 21.1 m^2	Above 21.1m^2	Area less than 12.5 m^2	Area above 12.5m^2	
70	100	50	60	25

TRANSPORT OF SHEEP AND GOAT BY RAIL AND ROAD

- Only healthy animals in good conditions shall be transported.
- A qualified veterinary officer for freedom from infections and parasitic diseases and their fitness to undertake the journey shall certify these animals.
- It is desirable not to mix sheep and goats in order to avoid stampede during transportation.
- It is desirable not to mix sheep and goats in advance stage of pregnancy with kids and lambs in order to avoid stampede during transportation.
- Prior to the transportation of sheep and goats from endemic areas of zoonotic importance to non-endemic areas, necessary precautions shall be observed.
- Necessary vaccination shall be done, 14 days in advance.
- Male stock shall not be mixed with female stock in the same compartment.
- First-acid equipment shall accompany the animals in transit.
- Sufficient feed and fodder shall be carried to last during the journey. Watering facility shall be provided at regular intervals.
- All vehicles shall be inspected for safety, suitability and cleanliness before loading the animals.
- The floors and walls shall be undamaged and there shall be no nails or sharp obstruction, which might injure the animals
- The vehicle shall be thoroughly sprayed with suitable disinfectant before loading the animals.
- Material for padding, such as straw or other suitable material shall be placed on the floor to avoid injury if an animal lies down. This shall be not less than 5 cm thick.
- The animals shall not be fettered unless there is a risk of their jumping out; typing of legs shall not be permitted.
- Each consignment shall bear a label showing the following particulars. Number and kind of animals loading.
    - Name, address and telephone number if any, of the consignor
    - Name, address and telephone number if any, of the consignee; and
    - Quantity of rations and feed provided.
    - Proper ventilation shall be provided.
- In case the journey is for more than 12 hours, an attendant shall be present at all times and shall ensure that proper conditions are maintained during transport.
- Sheep shall be unloaded and watered every hours and attendant shall not allow any sheep to sit down while truck is moving.

Loading

- While loading, the extreme temperatures of the day and night shall be avoided.
- Suitable ramps shall be provided for loading and unlading animals. The ramp should be at least 0.75 metre in width with raised side at least 0.75 metre high.
- The floor of the ramp shall clear at about 15-cm interval so those animals don’t slip as they climb or descend.

- In case of a railway wagon, when the loading is done on the platform, the dropped door of the wagon may be used as ramp. In such cases bales of bags of hay or bags of bhusa etc., may be placed on either side of the dropped door to prevent the animals from getting their legs between the sides of the wagon and platform.

Space requirement

- The space required per goat shall be the same as that for wooled sheep. The approximate space required per sheep in truck or railway wagon shall as follows,

APPROXIMATE MASS OF THE ANIMALS (Kg)	SPACE REQUIRED (m^2)	
	Wooled	Shorn
Upto 20	0.18	0.16
21 to 25	0.20	0.18
26 to 30	0.23	0.22
Above 30	0.28	0.26

- Overcrowding shall be avoided.
- For journey in hilly areas, suitable partitions shall be provided to avoid tramping of animals.
- Railway wagon shall not accommodate more than the following number of sheep or goats.

BROAD GAUGE AREA OF WAGON		METER GAUGE AREA OF WAGON		NARROW GAUGE AREA OF WAGON
Less than $21.2m^2$ 70	$21.1m^2$and above 100	Less than 12.5 m2 50	12.5 m2 and above 60	25

- In case of large trucks and wagons, partitions every two to three metres across the width may be provided to prevent much of the crowding and trapping of animals.
- In case of ewes, goats, lambs and kids under 6 weeks of age, separate panels may be provided.
- The speed of the truck shall not exceed 40 km per hour and shall avoid jerks and jolts. The truck not lads any other merchandise and shall avoid the unnecessary stops on the road.

GENERAL CONDITION FOR TRANSPORT OF LIVESTOCK

- Healthy animals should be transported and a qualified veterinarian should certify it.
- Young animals should be separated from adult animals and advanced pregnant state animals should be separated from other animals.
- When animals are transported from endemic area, necessary permission should be obtained from concerned authorities for proper health condition.
- 14 days prior to transportation necessary vaccination procedure should be completed for the particular livestock
- During transport all the livestock should be given humane treatment
- Sufficient quantity of feed and fodder should be carried during transport

- The vehicle should be examined for cleanliness, the floor and walls shall be undamaged and should be free from nails and other sharp edges
- The vehicle should be sprayed with disinfectant solution
- Materials for bedding such as straw or hay should be placed on the floor to avoid injury and the bedding should not be less than 5 cm thickness
- Animals during transport should not be tied up at leg.
- Each consignment shall bear a bold red label showing the following particulars
    - Number and kind of animals loaded
    - Name and address and telephone number of the consignor (sender) and consignee (receiver)
    - Quantity of ration to be fed
    - Consignee should be informed about the train or vehicle in which the consignment of cattle is sent and its arrival time in advance
- In case of journey for more than 12 hours an attendant should be present at all the time and should ensure the proper conditions are maintained during transport.
- Cattle, sheep and goat should be unloaded by every 8 hours and should be watered. The attendant should not permit the sheep and goat to sit down during transit.
- Apart from the above general condition some species of livestock require specific conditions for transport and it also depends upon the mode of transport.

TRAIN TRAVEL

- Animals shall be transported by passenger trains only. In areas where such trains are not run, the equines may be transported by goods trains provided that special precautions are taken.
- Ordinary Cattle wagon when used for transportation of horses, ponies, mules and donkeys along with their foals, shall carry not more than 6 of these animals on broad gauge, 4 on meter gauge and 3 on narrow gauge. Attendants shall be allowed to travel along with the animals in each wagon.
- In extreme summer, water shall be sprinkled over the wagons by the railway authorities to bring down temperature; ice cubes in specially made containers may be placed inside the wagon if recommended by veterinarian.
- Every wagon shall have 2 attendants if the animals are more than 2 in number.
- Animal shall be loaded parallel to the rails facing each other.
- Material for padding (Kapok) such as paddy straw shall be placed on the floor to avoid injury if an animal lies down. This shall not be less than 6 cm thick.
- Rations for the journey shall be carried in the middle of the wagon.
- To provide adequate ventilation the upper door of one side of the wagon shall be kept open and properly fixed.
- This door of the wagon shall have wire gauge welded to it to prevent burning cylinders from the engine entering the wagon and leading to the outbreak of fire.
- 2 breast bars shall be provided on each side of the wagon one at a height of 60 to 90 cm and other at 100 to 110 cm.
- Valuable animal like horses and donkey, stallions, race horses and brood mares shall be transported in EH or EHH horse box. These shall be provided by the railways.

TRUCK TRAVEL

- Specially fitted vehicles with a special type of tailboard and padding around the sides shall be used.
- Ordinary lorries shall be provided with anti-slipping material on the floor.
- Bamboo poles of atleast 8 cm in diameter between each animals and 2 stout batons at the back shall be provided to prevent the animal from falling.
- To prevent horses being frightened or injured their heads shall face left to the vehicle away from the passing traffic.
- Each lorry shall carry 4 to 6 animals.
- Each vehicle shall be provided with one attendant.

- The speed of the truck in which equines (horses, Ponies, mules, donkeys) are transported shall not exceed 40 km per hour.
- All starting, stopping and turning shall be done slowly.
- While transporting the animals the truck shall not be loaded with any other merchandise.

SEA TRAVEL

- All ships detailed for conveying animals shall be inspected for fittings by a board consisting of a marine and a veterinary officer.
- The ship may preferably be of shelter deck type and have ample mechanical ventilation, good drainage and arrangements for exercising the animals.
- Horses may normally be accommodated in a single stalls and mules in pens. Each pen holding 4 to 5 mules.
- Providing portholes and permanent air trunks or electric powers on all decks shall ensure more ventilation. Exhaust fans shall be installed to below out foul air.
- The pens shall be mucked out twice day decks scrubbed once every 24 hours. This shall be done when animals are being exercised.
- All standings shall be towards the ship with heads facing inwards.
- Length between breast rail and back lining shall be 2 metres. Breast rails shall be 1.1 m from the platform.
- Passage between 2 rows of pens should be not less than 1.5 metres.
- Parting boards between pens shall be 3 metres.
- To avoid distress especially during hot weather the ship may sail immediately after embarking.
- Entries (stallions) shall not be kept in same decks.
- Colts and fillies shall be kept on the exposed decks.
- A pharmacy and spare stalls for 5% animals shall be made available.

AIR TRAVEL

- In aircrafts animals are either secured in crates of 2 to 3 horses each or kept tied in pens 4 to 5 to each pen.
- The floors of aircrafts are provided protected by a thick layer of wood shavings and covered with polyethylene sheets. Sides of the body are well padded.
- All animals shall be administrated tranquilizers before loading. If an animal becomes considerable within the aircraft it shall be destroyed.
- A horse killer should always be carried for this purpose.
- All aircraft for transporting animals shall be inspected for fitting etc by a board comprising an air force and veterinary officer.
- Entires (stallions) and brood mares shall not be accommodated in same crate.
- Loading shall be effected through ramps or lifts.
- An attendant shall accompany the animal consignment.
- A veterinary first-aid kit with the veterinarian shall always be available in the aircraft.
- Coir matting shall be placed on the floor so that loaded animal does not produce any sound during journey.
- Hay bundles shall be placed in between the hind legs and sides of the aircraft.

MODULE-10: COMMON FARM MANAGEMENT PRACTICES

Learning outcomes

- At the completion of this module the learner will be able to understand the concept of disinfection and disposal of carcasses in the hygienic way

DISINFECTION

Definition

- Disinfection means destruction of pathogenic micro organisms from a place so that the place becomes free from infection.
- Disinfectant, germicide, antiseptic is a substance able to kill organisms and their spores.
- Disinfection can be brought about with the help of physical, chemical and gaseous agents. Most disinfectants are chemical agents.

Types of disinfection

- Physical disinfectant
- Chemical disinfectant
- Gaseous disinfectants

PHYSICAL DISTINFECTANT

- Heat destroys microorganisms by denaturation of their cellular proteins through oxidation.
- Heat can be used in tow forms for sterilization dry and moist.
    - *Dry heat*
        - Dry heat may be applied in the form of flame (300°C) to floors, walls and surface.
    - *Moist heat*
        - Moist heat is far more effective than dry heat. It can be applied in the form of steam.
        - Moist heat is more effective for disinfection of equipment, utensils etc.

Flame gun (double nozzle)

Radiation

- The bactericidal effect of solar radiation due to the presence of ultraviolet rays in sunlight is a good disinfectant.
- Pathogens like brucella are killed in 4-5 hours direct sun light exposure. Artificical UV lambs can also be sued for disinfection.

Filtration

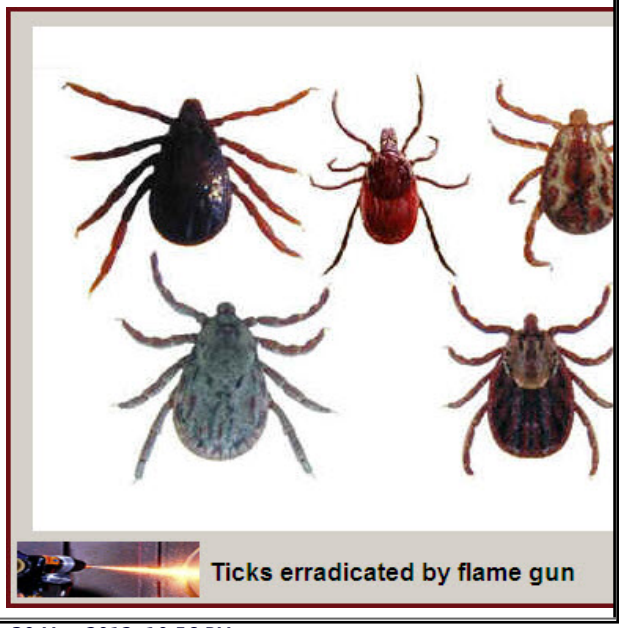
- The technique has been used to control microbial

population in air, water and biological materials.

Desiccation

- This process removes moisture from microorganisms, the drying effect varying with the type of microorganisms.

Disinfection- Flame gun



Ticks erradicated by flame gun

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CHEMICAL DISINFECTANTS

- These are very widely used in veterinary practice, as their aqueous solutions are easy to prepare.
- They are cheap and have a broad spectrum of activity.
- A good disinfectant neither stains nor damages materials.
- It is free of undesirable odours.
- Most of the commonly used disinfectants fall into one of the major categories mentioned below,
    - *Acid and alkali*
        - Eg. Boric acid: 4-6%
        - Sodium hydroxide (1,2 and 5%) is available as lye for disinfection of animal houses
        - Calcium hydroxide (lime water, slaked lime)
    - *Aldehydes*
        - Formaldehyde (5-10%) can be used for washing floor of animal houses
        - Glutaraldehyde 2% aqueous solution is useful for sterilization of instruments
    - *Detergents and Soap*
        - These are used mainly for washing. They remove grease, dirt and Other organic matter, which tend to reduce the efficacy of disinfectants.
        - Eg. Quartenary ammonium compounds; cetavlon; savlon

- *Halogens*
  - This important group of disinfectants finds wide use in veterinary and dairying practices.
  - A process of oxidation following exposure to either chlorine or iodine brings about the destruction of pathogens.
  - Gaseous chlorine, hypochlorites and organic chloramines are commonly used.
  - Bleaching powder (calcium hypochlorite) are commonly used disinfectants.
- *Metallic* compounds
  - Copper sulfate (5mg/lit) can be used
- *Oxidizing* agents
  - Potassium permanganate (1-2mg/lit) can be used
- *Phenols*
  - This group includes cresol(3-5%), lysol(3-5%), thymol, tar acids and hexachlorophene.
  - Phenol 0.5 to 5% can be used in veterinary practice.
- *Sodium carbonate*
  - 2.5-4% can be used for farm building
- *Bleaching powder (chlorinated lime)*
  - It is available in the form of white powder.
  - 1 kg of bleaching powder can be used with 25 litres of water makes a very good deodorant.
- *Sodium hypochlorite*
  - It is similar to bleaching powder.
  - It is a powerful germicide in the absence of organic matter.
- *Quick lime (calcium Oxide)*
  - Fresh lime is a good disinfectant.
  - It is used in the burial pits to dispose the carcass and for land application
- *Calciuim hydroxide (slaked)*
  - Commonly used in white washing of the walls. It act as disinfectant also.
  - While white washing 5% phenol can also be add for more effect.

GASEOUS DISINFECTANTS

Gaseous disinfectant are

- Formalin gas
- Ozone gas
- Cresol gas

QUARANTINE

- Quarantine is the process of segregating apparently healthy animals (especially animal being introduced into a herd or into the country for the first time) which have been exposed to the risk of infection.
- Quarantine period depends on the incubation period of diseases. In practice, a minimum period of 30 to 40 days has been generally accepted as the reasonable period; but incase of diseases like rabies this period is up to 6 months.
- Normally newly purchased animals and animals returned from show should be kept in the quarantine shed.
- The shed should be constructed at the entrance of the farm.
- They should be dipped or sprayed on the 25^{th} / 26^{th} day to remove the ectoparasites.

ISOLATION

- Isolation is the process of segregation of affected and in contact animals from the apparently healthy ones, in the event of outbreak of a contagious disease.

- Such segregated animals should preferably be housed in a separate isolation shed situated far away from the normal animal house.
- If a separate shed is not available the animals for isolation should be tied at one end of the shed as far away from the apparently healthy stock as possible.
- Attendants and equipment for sick animals should be ideally separate.
- If due to practical reasons this is not possible the sick animals should be attended only after the healthy stock.
- The equipment should be thoroughly disinfected after use in the isolation group.
- The attendant should wash his hands, feet and gumboots in antiseptic lotions and change his cloths.
- The isolated animals are brought back to the healthy herd only after they are fully recovered and the chance of passing on infection is removed.

DISPOSAL AND UTILIZATION OF CARCASS

- The primary purpose of safe disposal of carcass is to ensure the check and spread of disease either to other susceptible animals or humans.
- Carcasses of animals may be disposed of by sending them to knackeries or by burial or burning.

BURIAL AND BURNING OF CARCASSES

Burial of carcasses

- Burial a suitable site should be selected. The burial place must be distant from a well or water course and there is a sufficiency of subsoil to allow a depth of 6 feet above the carcass.
- The carcass must be buried in its skin, be covered with a sufficient quantity of quicklime or other disinfectants.
- The dead animals should be arranged upon its back with feet upwards.
- The skin is slashed inside the pit all cases except ;in the case of anthrax.
- As the small of carcass may attract foxes and dogs the area of the burial needs to be disinfect with coal tar which will act as detergent for sufficient length of time.

Incineration/cremation/burning of carcasses

- There are 4 methods of cremation
    - Pit method
    - Surface burning method
    - Flame gun method
    - Incineration in a destructor

PIT METHOD

- Pit method for the carcass of a large cow, dig a pit measuring about 7 feet long, 4 feet wide and 18 inch deep is dug.
- A trench about 9 inches wide and 9 inches deep is next dug right across the bottom of the pit, the ends of this cross trench being the bottom of te pit, and sloped upwards so as to reach ground level about 2.5 feet from the edge of the pit.
- The object of this trench is to provide for draught and to facilitate the lighting of the fire. The fire may be laid in the following sequence.
    - Fill the trench with straw soaked with paraffin to provide lighting points.
    - Place a few piece of heavy timber, iron rails at intervals across the ventilation trench so as to prevent its obstructions.
    - Cover bottom of pit with thin pieces of wood

    - Add large pieces of wood
    - Saturate with paraffin
    - Add coal
- The fire is started by lighting the straw at one or both ends of the lighting points.

SURFACE BURNING METHOD

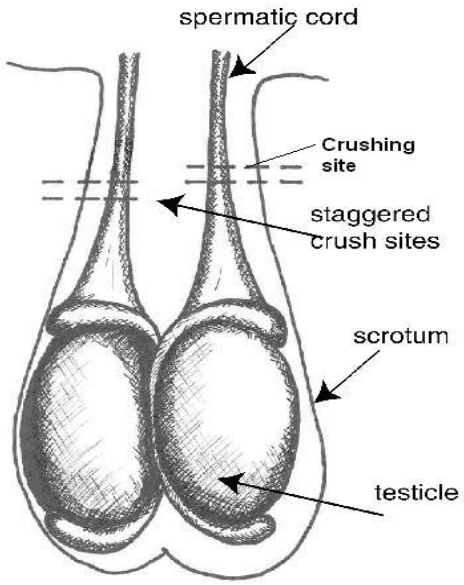
- This method can usefully be adopted when labour is scarce or when the nature of ground is not suitable for construction of pit ie., when the land is water logged.
    - Two parallel trenches about 5 feet long, 9 inches wide and 9 inches deep and 2 feet apart are dug in the direction of the prevailing wind at the site selected for cremation.
    - The carcass is placed over the trenches.
    - Coal is placed on and around the carcass.
    - Wood is soaked with paraffin.
    - A small quantity of paraffin saturated straw is added, the fire is then lit.

FLAME GUN METHOD

- No pit or trench is required in this method. The carcass is placed on ground or corrugated iron sheet and a powerful flame directed towards it, destroy the carcass.
- The time taken depends on the number of flame guns used and the size of the animals.

CASTRATION

- Making the animal unable to reproduce is generally known as castration.
- In India and other South-East Asian countries bullocks are extensively used for agricultural operations.
- Buffalo is particularly valued as a draught animal in rice growing areas.
- Male cattle and buffaloes meant for work should be castrated.



Purpose

- To render the animal docile
- To induce faster gain in body weight and to improve the quality of meat.
- To control indiscriminate breeding.
- To prevent certain genital diseases.
- Castration also results in lean and slender neck which facilitates the correct fitness of yoke especially in work cattle.

Precaution

- Castration should be performed during cold season and strictly avoid rainy season for fear of fly problems.

- Castrated animals should be rested for few days in clean and comfortable pens.

Optimum Age

- *Young animals:* within 3 months (Surgical method and elastrator)
- *Adult animal:* within one year of age (Closed method – Burdizzo castrators)

Methods

Castration of sheep and goats

Castration of young bull

- *Burdizzo method* (see the video)
  - It is also known as bloodless castration. The Burdizzo castrator is used to crush the spermatic cord and thus stopping the blood to the testes.
  - This results in atrophy of the testes and stoppage of spermatozoa production.
  - After casting, secure the animal. Move the spermatic cord to the side of the scrotum and then clamp the Burdizzo at about 3-5 cm above the testicles and it is held for a few seconds.
  - Then repeat this operation on the same cord at a location about 1cm below the first one. This method is safe, quick and less chance of getting infection.

Burdizzo castrator- Large (for cattle)

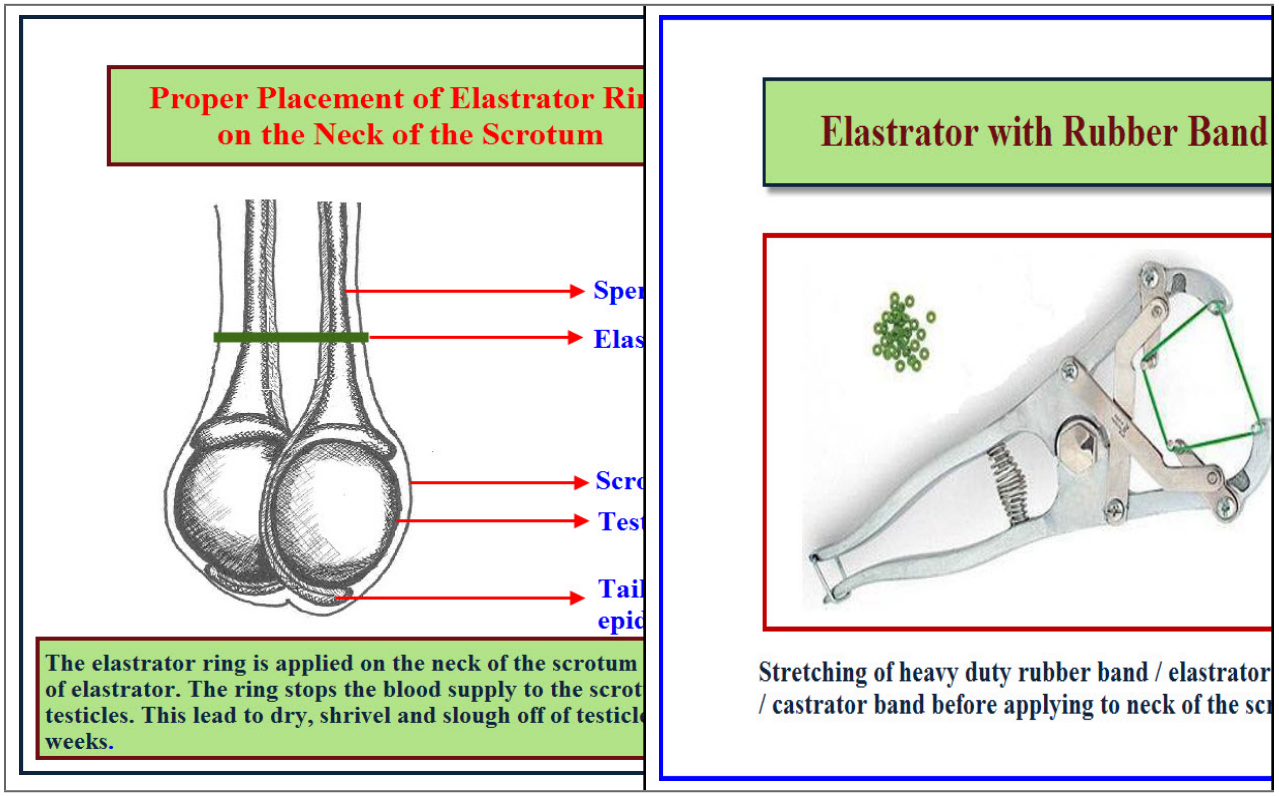
Burdizzo castrator- small (for sheep and goats)

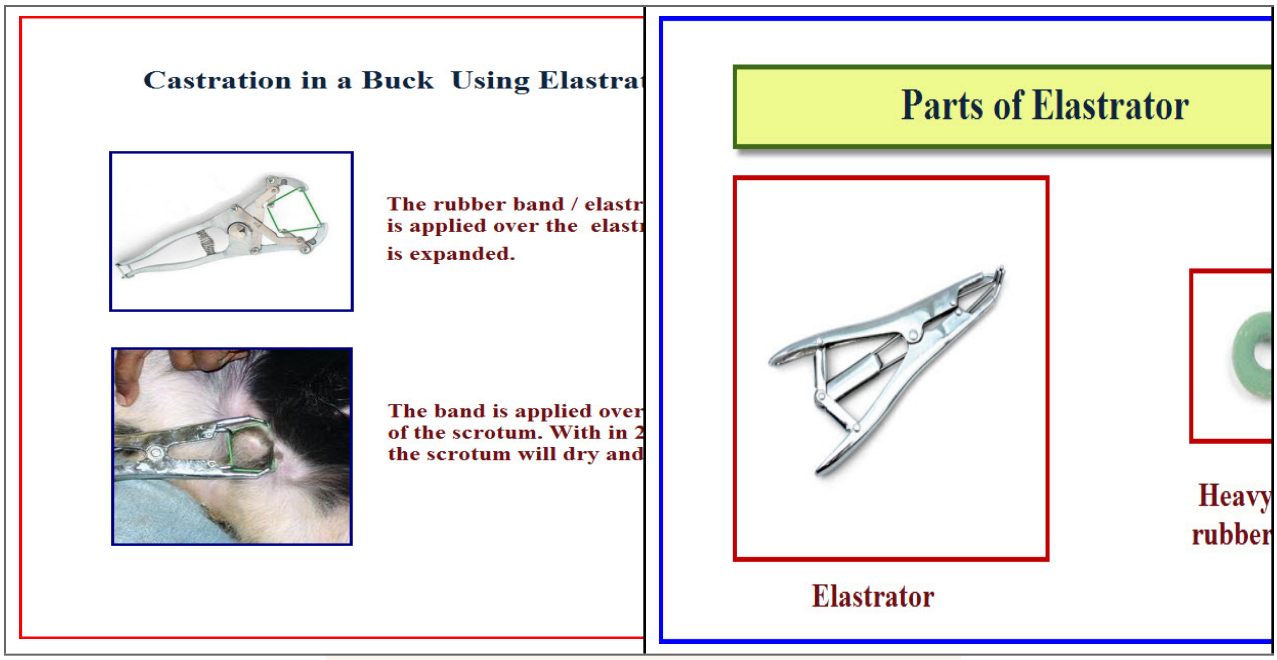
- *Open or surgical method*
  - Scrotum is opened and testicles are removed, aseptically and the wound is treated with antiseptics.
  - In young bulls the cord may be cut as savagely off but in the case of mature bulls the cord should be twisted before severing it.
- *Rubber ring or elastrator method*
  - A strong and tight rubber ring placed around the cord at an early age of calf.

- This creates constant pressure and the testicles are atrophied and absorbed and the ring drops down.
- Elastrator rings are very painful to the animal and so it is not usually recommended. Optimum age: below 3 months.

RUBBER RING / ELASTRATOR METHOD

- A strong and tight rubber ring placed around the cord at an early age of calf.
- This creates constant pressure and the testicles are atrophied and absorbed and the ring drops down.
- Elastrator rings are very painful to the animal and so it is not usually recommended. Optimum age: below 3 months.





DEHORNING

- Dehorning means removal of well grown horns. Disbudding means arresting the horn growth at an early age, when the horn root is in the bud stage.
- Horn serves no useful purpose.

Purpose

- Dehorned animals will need less space in the sheds.
- Cattle with horns inflict bruises on each other that may result in heavy economic losses.
- Horned animals are a danger to the operator.
- Dehorned animals can be handled more easily.
- Prevents the occurrence of horn cancer.

Optimum age**:** 15 to 20 days.

Methods

- *Hot iron method*
  - A specially designed electric dehorner is used for this purpose. This is bloodless method it may be used at any season.
  - The rod heated with electricity has an automatic control that maintain the temperature at about 1000^0 F, applying it to the horn bud for l0 seconds is sufficient to destroy the horn tissue.

Electric dehorner

- *Elastrator*
  - A specially made thick rubber ring applied to the base of the horn.
  - The rubber band shuts off circulation and the horn gradually comes off. Small buds drop off in 3 to 6 weeks and large horns may take even 2 months.
  - It is a painful method and this method is used on cattle when the horn length is about 5-10 cm.
- *Chemical method*
  - Caustic potash or caustic soda is the common chemical used for dehorning.
  - These are available in the form of paste or solution.
  - Clip the hair around the horn buds and surrounding area, a ring of Vaseline to protect the eyes against chemicals.
  - Rub the chemical over the buds until bleeding occurs.
- *Dehorning saw or clippers*
  - When older cattle are to be dehorned a specially designed clippers or saw are used.
  - A considerable amount of bleeding may follow the operations.
  - To prevent the bleeding the main horn artery should be tied off with a cotton or silk thread.
  - This may be done by sliding a sewing needle under the artery to pull the thread in place before tying.
  - It is necessary when sawing or clipping the horns, to take about half an inch of skin in order to get at the horn roots.

EXTRA TEAT REMOVAL

- Normal udder should have four severely placed teats of uniform size. But animals with one and even two extra teats are also seen. Such extra teats may be blind or leaky.
- It should be removed before the calf attains 6 months of age.
- After controlling the calf the region is thoroughly cleaned and disinfected with Tincture iodine and mark extra teats before removal. These teats are clipped off with scissors.

- Some more tincture is applied after finishing the process. In the older heifer, suture is put in order to arrest bleeding.

MODULE-11: INTRODUCTION TO METHODS OF DRUG ADMINISTRATION

Learning outcomes

- On completion of this module, the learner will be able to discuss about the vices of different ruminant animals, different age groups and measures to control them.

INTRODUCTION

- To treat the ailments of animals, various remedial measures are advocated in the form of drugs or in the form of physical agents like moist heat by fomentation.
- Therapeutic agents intended to bring about beneficial effects in sick animals administered through various routes.

METHODS OF ADMINISTRATION OF MEDICINES

- Medicines are administered in two ways
    - Oral administration
    - Parentral administration
- *Oral administration:* It is the administration of medicines through the mouth. By oral method, medicines can be administered in liquid, solid and semi-solid form.
- *Parentral administration:* Any other route of administration other than oral route is called parentral administration.

ORAL ADMINISTRATION

Drenches

- Drenches are medicines given in liquid form.
- Drenches may be given by mouth or through a stomach tube.
- For administration of fluid medicines to horses, the stomach tube is used.
- Stomach tube is better than the use of a drenching bottle and drenching bit.

Cattle

- Metal drencher and stomach tube can be used for administering fluid medicines to cattle.
- The tube can be passed through the nostril as that of horse.
- A stronger stomach tube may be passed by mouth with the aid of a probang gag.
- Careless drenching leads to aspiration pneumonia.

Sheep and Goat

- Stomach tube or drenching cup may be used for the administration of medicines.
- Nostrils are too small for introduction of tube for administering medicine.
- Mouth gag is required to prevent the tube being chewed during introduction of stomach tube through the mouth.

Bolus and Pills

- It is a solid form of medicine.

Horses

- The tongue is held between the upper and lower jaws the operator's hand is protected and the mouth is kept open.
- The bolus held between the first and second fingers of the right hand is inserted into the left side of the horse's mouth, quickly passed along the roof of the mouth as far back as possible and dropped in the throat.
- The right hand is quickly withdrawn and the tongue released.

Cattle

- The mouth should be opened by hand or gag and the bolus, pills and capsule can be deposited on the back of the tongue.
- A balling gun may be necessary for calves and young cattle.

Sheep and goat

- Tablets, pills and small boluses are dropped on the back of the tongue by hand or by a balling gun.

Electuaries

- It is a semi-solid form of medicine. These are thick viscid mixtures prepared with treacle and placed on the back of the tongue.
- Powders are often given by this method.
- It is a common way of giving medicines for respiratory complaints or when swallowing is difficult.

Cattle

- The nostrils are held by an assistant and the operator opens the mouth of the animal.
- The electuaries can be smeared on the tongue.

Sheep and goat

- The sheep/goat is held as for drenching and the electuaries can be smeared on the tongue.

PARENTRAL ADMINISTRATION OF MEDICINES

Hypodermic or subcutaneous injections

- Medicine is injected under the skin with a sterilized hypodermic needle and syringe.
- The rate of absorption is slow as compared to intramuscular and or intravenous routes.

- Site of injection
    - Horse and cattle - neck region
    - Sheep and goat - flank region

Intramuscular injection

- Medicines which are not suitable to administer through subcutaneous route are administered directly into a muscle.
- A longer and stouter needle is desirable.
- Site of injection
    - Horse, cattle, sheep and goat - muscles of breast, Neck, triceps, buttock muscles.

Intravenous injection

- In this method, the medicine is injected directly into the blood stream.
- Site of injection
    - Cattle - jugular vein, mammary vein
    - Sheep and goat - jugular vein

Intraperitoneal injection

- The drug is injected into the peritoneal cavity in large animals by means of trocar and canula inserted into the upper part of the left flank.
- In small animals a hypodermic syringe with long needle is used.

Intratracheal injection

- The drug is injected directly into the trachea with a specially made intratracheal needle or canula in certain condition like parasitic bronchitis in young cattle and sheep.

Intramammary infusions

- A special syringe or teat syphon is used and the infusion is pressed into the teat canal in case of mastitis.
- First the milk in the udder is removed and then appropriate antibiotic is infused.

Intra-uterine irrigation

- Antiseptic solutions are injected into the uterus so as to irrigate the uterine cavity with a two-way catheters.
- Otherwise a specially designed metal catheter for cow; rubber tubing and a pump for mare; and a syringe for bitches and cats may be used.

Intra-ruminal injection

- Medicines are sometimes given directly into the rumen.
- A trocar and canula is introduced into the rumen through the hollow of the left flank.
- Some antiparasitic medicines are given through this route.

OTHER METHODS

Pessaries

- These are solid forms of medicines for insertion into the uterus and vagina of large animals.

Inhalation

- Medicaments are added to boiling water and the resulting vapour is inhaled.
- It is useful for all animals for respiratory diseases.

Enema

- It is given for evacuation of bowel.
- Sometimes nutrient enema may be given to animal which are unable to take nourishment in the ordinary way.

Poultices

- Glycerine and kaolin with turpentine are taken in a semi solid form (paste) and applied on the part of the body.

Fomentation

- This is a first aid treatment for many types of sprains.
- It may be used in the form of either hot or ice cold fomentation.

Baths

- Animal suffering from hoof diseases e.g. foot rot in sheep may be driven through a shallow trough or foot bath containing antiseptics.

ROUTES OF DRUG ADMINISTRATION

- Medicines are administered in animals by the following routes, mainly classified into,
    - Mouth
    - Rectum
    - Vagina
    - Respiratory tract
    - Skin
    - Eye
    - By parentral route (injections)

ORAL MEDICATION

Medicines administrated through mouth in different forms as drench, bolus, electuary and powders.

Drenching

- Liquid medicines given by this method. Near the base of the tongue as a single dose/or divided doses.

Equipment used

- A bottle with a long neck
- Aluminium drencher
- Feeding cup
- Country bamboo
- Drenching bit and
- Stomach tube for horses

Precautions for drenching

- Drenching avoided if animal suffering from respiratory disorders.
- Drenching not advised for unconscious animals
- Avoid wrong drenching (i.e) medicine entering into the respiratory tract by observing as follows:-
    - Head should not be raised too high
    - Give small quantities of medicine at a time
    - Leave tongue absolutely free.
    - If the animal exhibits cough during drenching indicating that small quantities of medicine entered in respiratory tract, immediately suspend drenching.

For drenching sheep

- Funnel and rubber tupe
- Sheep, dosing syringe (Non automatic and automatic type)
- Sayer’s automatic pistolet drenching gun

Bolusing

- Soild mass of medicine (bolus) placing behind base of the tongue (Bolus, Pills, tablets, tabloids and capsules used)
- Eg: Balling Gun used for administration of bolus.

Electuaries

- Semi solid medicines prepared with treacle as excipent.
- It is given for respiratory diseases or when swallowing is difficult.
- They are administered by introducing in-between the molars by rubbing over the tongue or roof of the mouth, given in cattle, sheep, goat, pig, dogs and cats.

Baling gun

Drenching bit(large) for cattle

Feeding cup for small ruminants

Drenching bit for small ruminants

THROUGH RECTUM

Per rectum (or) Enema

- These are fluid preparations given or introduced through rectum.
- There are different types enema based on their actions.
    - Purgative enema
    - Sedative enema
    - Vermifuge enema
    - Nutritive enema

Suppositories

- Solid preparations given through rectum.
- These are small conical bodies of glycerine containing drugs intended for introduction though rectum.

Enema can

THROUGH RESPIRATORY TRACT

Inhalation

- It is a method of applying drugs in a finely divided gaseous state so that beinig inhaled they come into contact with the nasal air passages and lungs.
- Eg. Volatile inhalations (Volatile drugs used)
- Air inhalations (Aerosols)

THROUGH VAGINA

- *Pessaries* are solid conical bodies containing compounds of drugs made up with a base and some antiseptic/antibiotic elements used for introducing into the reproductive tract.

SITES OF INJECTIONS

By injections: Sites of injection

- Are 1 sides of the neck region
- Brisket, axillary space between the thigh, flank and buttock
    - Intramuscular injections
        - sites

        - Side of the neck, Muscles of the buttock and breast, thigh, injected into the major muscle mass.
    - Intravenous injections
        - sites
            - Injected directly into lumen of the blood vessel.
        - Site
            - Jugular vein in cattle, Horse, Sheep and Goat.
            - Dog and Cats – Saphneous vein.
    - Subcutaneous injections
        - Injected inbetween the skin and the muscle layer.
        - Site:- Flank, side of the neck
    - Intradermal injection
        - Injected into between the layers of the skin by using appropriate needle. Mostly diagnostic agents like tuberculin and mullein are introduced.
    - Intra-peritoneal injection.
    - Intra -tracheal injection.
    - Subconjunctival injection
    - Intra-uterine injection
    - Intra-ruminal injection
    - Intra –mammary injections

TOPICAL APPLICATION OF MEDICINES

Skin

- Topical application of medicine into the skin, mucous membrane of eye, nasal passage as ointment aqueous, solution, powders, aerosol, Lotion, Liniment etc

Poultice

- Soft medicated moist warm application used for the surface of the body kept in a muslin cloth to effect emollient, relaxing and softening effects for relieving soreness and inflammation.

Fomentations

- These are applications of warm or hot fluids usually containing some antiseptic soothing agents, pain relieving agents to be used to quicken the ripening of abscess.
- Action and indication similar to that of poultice

Blisters

- These are medicinal subjects used for the purpose of counter irritations i.e. to produce a superficial congestion of the skin and its underlying tissue to relieve inflammation/congestions in some deep seated organ/tissue.
- In chronic localized painful condition blisters are applied. Blisters are divided into 1) Rubifacients and vesicants.

Ointments

- Ther are mixtures of medicated subjects with a base like lard, paraffin or Vaseline, wool fat or lanoline which is intended for application to the surface of the skin or mucous membrane.

Lotions

- Ther are fluid preparations intended to bring into contact with the skin and used for washing a part, Lotion are watery nature and some are alcoholic.

Liniment

- They are preparations intended for external application which are oily/soapy in nature generally applied by rubbing to the skin.
- Eg. Turpentine liniment.

Eye

- Collyrium:- is an eye wash
- Occulentum:- is an eye ointment

Lamellae

- It is a small disc of glycerine jelly containing an active drug for application to the eye.
- It is applied into the eye in lower eyelid. Eg. atropine, cocaine.

MODULE-12: COMMON VICES OF ANIMALS, THEIR PREVENTION AND CARE

Learning outcomes

- On completion of this module, the learner will be able to discuss the various methods available for administration of medicines to ruminants and select the best method for a given animal and situation.

DAIRY ANIMALS

Eye rolling

- The eyes are moved around in the orbit at a time when no visible object is present.
- Normally seen in calves confined in crates and stand immobile for extended period.

Tongue rolling

- The tongue is extruded from the moth and moved by curling and uncurling outside or inside the mouth with no solid material present.
- This condition occurs in all ages and breeds. Brown Swiss breed exhibit it most frequently.
- Factors responsible for this vices may be hereditary, continuous confinement, feeding of low roughages.
- Control method includes insertion of a metal ring through the frenulum of the tongue, dietary inclusion of salt mixture, free movement.

Licking and eating own hair, wool

- Many young calves housed in individual crates, early weaning leads to licking those parts of their bodies which they can reach, this results in ingestion of large quantities of har wick aggregates into hair balls or bezoars in the rumen.
- This vice is more common in calves moved from individual pen to group housing.

Sucking and eating solid objects

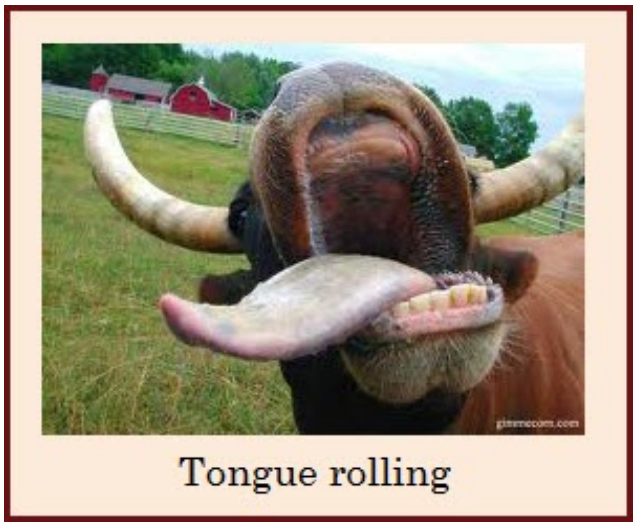
- Recently weaned calves will often suck and lick the walls, bars of their pen.
- This can be controlled by regular creosote paint of wood surface.
- Feeding good quality concentrate and roughage will minimize the incidence.

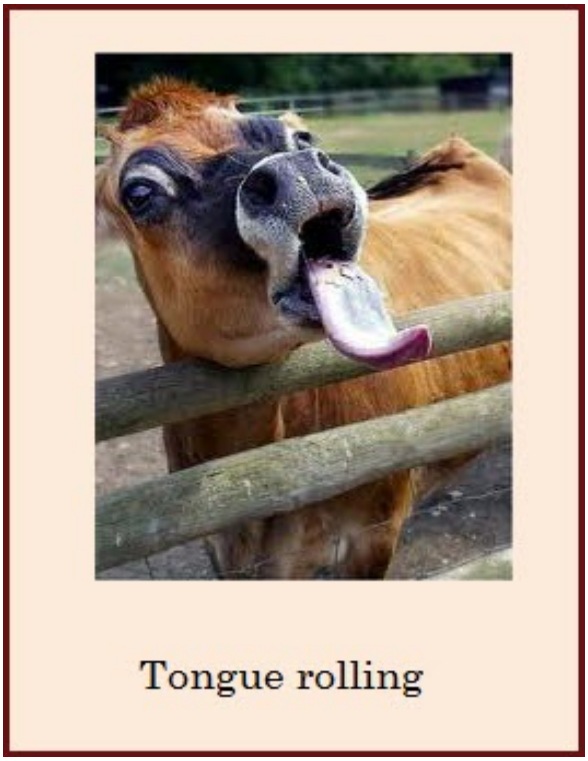
Intersucking by calves

- Calves separated from their mothers suck and lick at their own bodies, at objects in their pens and at parts of the bodies of other calves.
- The commonly suck on the naval, prepuce, scrotum, udder and ears of other animals.

Intersucking or milk sucking by adult animals

- This behaviour involves a cow or bull sucking milk from the udder of a cow. Cattle suck milk from herd mates and choose the same lactating animal.
- This vice may lead to loss of milk yield and damage to teat. Proper feeding management and herd supervision can minimize such incidents.





VICES OF SHEEP AND GOAT

Wool pulling and wool eating

- Wool pulling is a form of abnormal behaviour which occurs in sheep within restrictive enclosure and indoor management systems.
- Over crowding and deficiency of roughage in the diet are the contributing factor for this vice.

Stealing young / lamb stealing

- Pre-parturient ewes, cows and mares often approach, sniff and remain close to the new born young of other members of the group. This leads to reduced maternal support to the young and it become weak.
- In lamb stealing, the foster mother may later reject her own lamb when it is born or may have no colostrum left for it. In these situations lamb may often die. This problem can be controlled by separating the ewe from the group before and very soon after parturition.

YOUNG ANIMALS

Vices are abnormal or bad habits shown by animals.

Eye-rolling

- This is very common in calves confined in the crates / pen for the extended periods.
- Head is motionless and the animal rolls its eyes within the orbits.

Licking

- Licking animal's own body or solid object in the surroundings with the same pattern of movement.
- Due to inadequate quantities of food, no teat from which to suck or insufficient total sensory input.
- Common in calves- salt lick is best remedy.

Sucking

- Common in calves and piglets due to early weaning.

Anal massage

- Young piglets rub their noses on other piglets and ingestion of faeces seen in pigs occurs typically among growing pigs kept in crowded conditions.
- It is more noticeable where tail-docking at an early age is used for the control of tail biting.
- Remedy : Reduce the stocking density in a pen.

Tail-biting

- Seen in growing pigs grouped in pens but it is sporadic in its occurrence.
- Tail-docking distal half of the tail which is comparatively insensitive and not necessary to remove the entire tail.
- Segregation of animals showing this behaviour.

Belly nosing

- Common in piglets and can be controlled by provision of straw bedding in the pen.

Intersucking by calves

- It can be controlled by feeding calves with automatic nursers with teats and prolonging the feeding time.
- Sucking periods lasting approximately 30 min appear to eliminate intersucking.

- Takes place during periods of idling by the herd.

- Remedy : Increased provision of roughage can be made in the diet and such roughage should be offered during periods when idling occurs.

ADULT ANIMALS

Head rubbing

- Cattle which are confined to stalls for extended periods, such as winters, may rub their heads repeatedly against some part of the stall .
- This behaviour is more noticeable in horned breeds and more in bulls than in other breeds. In pigs: sometimes observed when they housed in a narrow single stall.
- Remedy : Application of suitable restraint imposed upon the affected animals.

Sham-chewing

- Jaw movements like chewing food in sows which has no food in its mouth.
- This is common in sows kept singly in stalls in which no litter is provided.
- *Symptoms:* Periodic chewing, mouth gaping and frothing.
- *Remedy:* Sows should be given straw or saw dust to chew and root. A change to group –housing system is the best way to alleviate the adverse effects on sows.

Tongue-rolling

- The tongue is extruded from the mouth and moved by curling and uncurling outside or inside the mouth with no solid material present.
- It occurs most commonly immediately before and after feeding in cattle.
- *Remedy*
    - Wind-sucking straps
    - Insertion of a metal ring through the frenulum of the tongue.
    - Provision of salt lick
    - Provision of freedom of movement
    - Isolation of affected animals
    - Tongue-rolling cattle should not be used for breeding

Bar-biting / tether / crib-biting

- The animal opens and closes its mouth around a bar, tether / stable door engaging the tongue and teeth with the surface and performing chewing movements.
- This is mainly due to restricted movement in stalls.
- *Remedy :* Less confined housing conditions.

Drinker-pressing

- Pressing an automatic drinker repeatedly without ingesting the water. Common in pregnant sows.

Eating solid objects

- Cattle and sheep- Phosphorus deficiency. Injection of phosphorus or supplementation through feed.

Eating of soil, sand or dirt

- Cattle- mineral deficient diet. Supplementation of phosphorus and iron through feed.

Overeating

- Common in horses and occasionally in cattle. Excess intake of grain.
- Feeding hay before grain feeding. Split feeding. Rumenotomy. Not treatable if hypothalamus is involved.

Wool-pulling and wool eating

- In sheep, restricted enclosure and indoor management systems.
- Sometimes deficiency of roughage in the diet. Reducing the stocking density in a pen (50 %).

Stable tricks and vices of horses

- Weaving, Wind sucking, Crib biting, Biting, Tearing the clothing, Kicking in the stable, Gnawing the walls, Eating the dung (coprophagia), Eating the bedding material, Sleeping while standing, Throwing the food out of the manger, Rearing, Shying, Jibbing in harness or backing.

MODULE-13: LIVESTOCK PRODUCTION SYSTEMS OF DIFFERENT AGRO-CLIMATIC ZONES

Learning outcomes

- At the completion of this module the learner will be able to describe the different livestock production systems which are in practice for different ruminant animals

DEFINITIONS (FAO)

Solely livestock production systems (L)

- Livestock systems in which more than 90 percent of dry matter fed to animals comes from rangelands, pastures, annual forages and purchased feeds *and* less than 10 percent of the total value of production comes from non-livestock farming activities.

Landless livestock production systems (LL).

- Subset of the solely livestock production systems in which less than 10 percent of the dry matter fed to animals is farm-produced and in which annual average stocking rates are above ten livestock units (LU) per hectare of agricultural land.

Grassland-based systems (LG).

- Subset of solely livestock production systems in which more than 10 percent of the dry matter fed to animals is farm-produced *and* in which annual average stocking rates are less than ten LU per hectare of agricultural land.

Mixed-farming systems (M)

- Livestock systems in which more than 10 percent of the dry matter fed to animals comes from crop by-products or stubble or more than 10 percent of the total value of production comes from non-livestock farming activities.

Rain-fed mixed-farming systems (MR).

- A subset of the mixed systems in which more than 90 percent of the value of non-livestock farm production comes from rain-fed land use.

Irrigated mixed-farming systems (MI).

- A subset of the mixed systems in which more than 10 percent of the value of non-livestock farm production comes from irrigated land use.

MIXED FARMING SYSTEMS

Introduction

- Mixed farming systems are livestock systems in which more than 10% of the dry matter fed to animals comes from crop by-products such as stubble, or where more than 10% of the total value of production comes from non-livestock farming activities.

Landless LPS

- Landless LPS are a subset of the pure livestock systems in which less than 10% of the dry matter fed to animals is farm produced and in which annual average stocking rates are above ten livestock units per hectare of agricultural land (on average at census unit level).
- Grassland-based systems are defined as systems in which more than 10% of the dry matter fed to animals is farm produced and in which annual average stocking rates are less than ten livestock units per hectare of agricultural land.
- A distinction is made between,
    - temperate zones and tropical highland
    - humid/sub-humid tropics and sub-tropics
    - arid/semi-arid tropics and sub-tropics.

RAIN-FED MIXED FARMING SYSTEMS

Definition

- Rain-fed mixed farming systems are mixed systems in which more than 90% of the value of non-livestock farm production comes from rain-fed land use; these systems can be divided into the same agro-ecological sub-classes.
- Irrigated mixed farming systems are systems in which more than 10% of the value of non-livestock farm production comes from irrigated land use.

Farming systems

- In general, husbandry systems are usually classified as intensive, semi-intensive and extensive, but in the tropics and subtropics these distinctions are sometimes less instructive than those between sedentary, transhumant, and nomadic systems.
- Devendra and Burns (1983) surveyed husbandry systems in southern Asia, and related them to ecological zones.

- He included tethering as a husbandry system of major importance in the humid zones of this area; it may also be regarded as a semi-intensive system practiced by sedentary small farmers, or even as a method of control alternative to fencing or housing.
- *Meat and dual production systems which is common in the tropical countries can be classified as*
    - Extensive (migratory, free range, pasture or range grazing).
    - Semi-intensive (pasture or range grazing, use of supplementary feeding mainly on crop residues and conserved roughage)
    - Intensive (grazing on improved pastures, zero grazing, conserved forage, crop residues and increased use of concentrates).
    - Tethering (small size flocks of 2-10 animals). This is a subsistence family system and the animals live on kitchen remnants crop residues, grazing near inhabited areas and other supplementary feed.
        - In the migratory system sheep and goat farmers make use of the seasonal pastures located in different areas.
        - In the mountainous regions of Asia, Europe and North America climatic conditions limit growth of vegetation in winter and so flocks are moved to lowlands; in summer flocks are moved to highlands where feed is available.
        - In the semi-arid and arid regions land use is seasonal and movement of the animals is dictated by rainfall and availability of grazing.

EXTENSIVE-NOMADIC SYSTEMS

- Extensive - Nomadic systems are the most difficult to improve, because they involve continuous movement, not only of the whole flock, but also of all its owners.
- There is, therefore, no possibility of dividing the flock by age, sex or stage of reproductive cycle, and it is very difficult to provide supplementary feeding.
- Nomadic flockers know where to find the best pasture and browse, as well as drinking water, at different seasons.
- These systems have developed primarily in areas of sparse or seasonal grazing, such as arid regions.

TYPICAL TRANSHUMANT SYSTEM

- Typical transhumant system involves the flock spending part of each year grazing within reach of a permanent village base, and the rest of the year on distant pastures, usually in a different ecological zone.
- The women, children and old people usually stay in the village throughout the year, and may cultivate some crops.
- Pregnant and newly kidded does could be kept at the village and fed on crop wastes, tree leaves, etc., being controlled either by tethering or housing.
- Bucks could be similarly controlled, making selective breeding and control of kidding dates possible.

SEDENTARY SYSTEMS

- Nomadic and transhumant systems are essentially extensive for at least part of the year, but sedentary farmers have a wide choice of systems, from fully extensive to zero-grazing.
- Extensive systems are most appropriate where large areas of pasture land can provide grazing and browse for goats with a minimum of labour or capital investment.

Tethering

- Semi- intensive - Tethering of goats. Goats are usually tethered singly. Where tethering is used, care must be taken that there is no possibility of strangulation by entanglement with vegetation, etc., or with other goats. Shade must be always available, and drinking water and shelter from rain must be provided when required.

- It is essential to change the place of tethering every day for obtaining fresh herbage and a variety of different feed plants by the animal. Tethering is an excellent and cheap method.
- A more sophisticated method is the running wire in which the tether is attached by a sliding metal ring to a long wire tightly stretched between two short posts.

INTENSIVE PRODUCTION SYSTEMS

- Intensive production systems involve either grazing on crops or cultivated pastures at a very high stocking density or zero-grazing.
- Large number of animals or birds are placed in a comparatively lesser area and the production is intensified.
- All the activities are carried out in a smaller area to achieve the production potentials of the animal.
- In contrast, in a large area the control of animals by fencing is both difficult and expensive.
- Fences need to be at least 1.5m high and made of strong wire netting, closely placed wires, or wooden rails.

MODULE-14: LIVESTOCK RESOURCES AND RESOURCES MANAGEMENT

Learning outcomes

- On completion of this module the learner will be able to understand the livestock resources in the country and their management for the use of mankind.

INTRODUCTION

- India has vast animal genetic resources with a wide variety of indigenous farm animals including cattle. The cattle breeds have evolved over generations to adapt to the agro-climatic and socio-economic needs of the people.
- A number of these breeds are now subjected to fast genetic degradation and dilution because of unplanned breeding and introduction of exotic germplasm. Since last two decades, the emphasis on draftability of cattle has reduced due to mechanization of agriculture and transport.
- Crossbreeding of native cattle for increased milk production has been advocated as a breeding policy across the country. As a result, some indigenous breeds are getting endangered at an alarming rate while others are in the process of replacement by certain high producing strains. If this trend continues, the invaluable native germplasm would grossly be depleted or even lost for ever.
- Thus conservation of domestic cattle breeds of cattle is essential due to their potentiality for production or draught capability or high resistance to diseases and heat tolerance ability. Constraint analysis including strength, weakness, opportunities and threats (SWOT) of different production system in necessary for developing strategies for conservation and management of livestock genetic resources.
- (Source: NBAGR, ICAR, Govt.of India)

CURRENT STATUS

- Animal production contributes about 40% of the total value to agriculture globally.
- Two billion people depend at least in part, directly upon livestock for their lively hood.
- The wide variety of livestock genetic resources provide varieties of meats, milk and eggs, together with a broad range of other goods and services such as draught, fibre, hides, skin manure etc., Judicious utilization and enhancement of the quality of these resources is important to ensure their sustainability to meet future demand.
- Human population growth, progressive urbanization and large purchasing power of people will increase the demand for livestock products.

- The projected growth in total consumption of meat and milk is 2.9 and 4.3% per year respectively for India.
- Two major considerations that will guide future activities are
    - The conservation of livestock genetic resources and maintenance of diversity.
    - Substantial increase in rate and efficiency of livestock production.
- The future increase is how to efficiency generate increase output per unit of input from livestock sector while preventing major loss in genetic diversity and environmental degradation.
- The Indian sub-continent is a hot spot amongst the 12 mega biodiversity resource centers in the world.
- In domesticated livestock and birds a large number of breeds/ types of cattle, buffaloes, sheep's, goats, pigs, horses, camels, mithun, yak, dogs, cats, poultry, ducks, gees, turkeys, guinea fowls and pheasants have evolved over time through natural, selection and some human effort.
- In India, 27 cattle breeds, 10 buffalo breeds, 44 sheep breeds, 20 goat breeds, 4 horse breeds and 2 camel breeds were recognized by NBAGR of ICAR.
- With appropriate management, livestock enable sustainable use of lands for food production transforming unusable fibrous material into high quality protein, the milk and meat for human beings.
- When poorly managed especially in fragile eco-systems, livestock species becomes one of the causes of environment pollution, environment degradation and desertification.

CONSERVATION

Introduction

- India has vast animal genetic resources with a wide variety of indigenous farm animals including cattle.
- The cattle breeds have evolved over generations to adapt to the agro-climatic and socio-economic needs of the people.
- A number of these breeds are now subjected to fast genetic degradation and dilution because of unplanned breeding and introduction of exotic germplasm . Since last two decades, the emphasis on draftability of cattle has reduced due to mechanization of agriculture and transport.
- Crossbreeding of native cattle for increased milk production has been advocated as a breeding policy across the country. As a result, some indigenous breeds are getting endangered at an alarming rate while others are in the process of replacement by certain high producing strains. If this trend continues, the invaluable native germplasm would grossly be depleted or even lost for ever. Thus conservation of domestic cattle breeds of cattle is essential due to their potentiality for production or draught capability or high resistance to diseases and heat tolerance ability.

Mechanism of conserving cattle genetic resources

- Once genetic resources have been identified and characterized, two basic conservation activities can be followed, i.e., in situ conservation and ex situ conservation

IN SITU CONSERVATION

- It requires establishment of live animal breeding farms and their maintenance. The generation and loss of alleles is a dynamic process that should be maintained at close equilibrium through sound management.
- In situ conservation strategies emphasize wise use of indigenous cattle genetic resources by establishing and implementing breeding goals and strategies for animal sustainable production systems.
- Information for animal recording and breeding is well established in developed countries through breeding associations which zealously protect the interest of breeds including rare ones. Infrastructure appropriate to systems in developing countries remains scarce.

Advantages of in-situ conservation

- Live animals can be evaluated and improved over the years.
  Genetic defects can be detected and eliminated.
  Live animals are always available for immediate use.
  The animals are gene banks for future use.
  The herd may have some economic advantages (heat tolerance, disease resistance) which can be exploited and so render the enterprise economically viable.
- The produce from live animals partly compensates the expenditure, if not entirely.
- From aesthetic point of view, the live animals are, visible, a pleasure to look at, the people are delighted to see variety of animals and have some cultural value.

Limitations

- The major limitation of live animal conservation is the number of animals that could be maintained. While fixing the number for preservation of a breed, the cost of maintenance, availability of animals and rate of inbreeding should be taken into consideration.
- With small population size, the effective population size decreases and the genetic structure of the population is affected due to inbreeding and random drift.
- Many models are now available which reduce inbreeding to a minimum, but random drift over long periods may lead to a population very different in genetic composition from the initial one. Gene X environment interactions is another disadvantage.
- In situ conservation involves a large infrastructure of land, buildings, feed and fodder resources, water supply, labour , technical and supervisory man-power, etc.
- Therefore, new establishments for in-situ conservation of farm cattle genetic resources are quite costly and even the maintenance of existing ones is cumbersome. The costs need to be estimated for each ecosystem

New technologies

- Major changes in livestock production have occurred during the past few decades due to the introduction of several new technologies.
- *Examples:* Eradication of Rinderpest, artificial incubation, embryo transfer and associated technologies (genomics, cloning and Tran genesis).
- It is therefore necessary that research in newer biotechnologies are intensified, so that traditional genetic improvement methods like progeny testing and sire/dam evaluation schemes are by- passed in future.

EX-SITU CONSERVATION

- Ex-situ conservation includes cryogenic preservation. It is the storage of genetic resources, which the farmers are currently not interested in using.
- Ex situ conservation is based on the use of live animals populations wherever practicable, supported by cryopreservation where technology exists or can be developed, combining within-country gene banks with global repositories.
- Interested governments, non- governmental organizations, research institutions and private enterprises should be encouraged to maintain in vivo samples of breeds at risk, with national inventories being established and kept up to date so that the genetic resources are readily available for use and study.
- Because of random drift and possible gene by environment interactions, ex situ methods are generally preferred over in situ. Ex situ conservation is comparatively more convenient, economical and easy with the application of modern reproductive technologies.

Advantages

- If the preservation is to maintain populations without genetic change, it can be best done by cryogenic storage as it is difficult to breed many generations of animals without any change in the genetic structure.
- The resources requirement for in situ preservation is quite large as compared to cryogenic methods.

Limitations

- Ex situ preservation using frozen semen delays the restoration of a breed as it can be restored in the future only by upgrading. But this could be overcome through preservation of embryos.
- Another important factor is the danger faced by a breed restored from cryogenic preservation from important changes in the environment like germs, climate, etc., that have taken place over the years.
- Variability in cryogenic storage of germplasm , accessibility to their physical location, ownership, behaviour of animal, response of germplasm to freezing and thawing techniques, and poor conception rate.

Ex situ/Cryogenic preservation includes

- Preservation of frozen semen
- Preservation of oocytes
- Preservation of embryos
- Preservation of ovaries
- Use of embryonic stem cells or blastomeres
- Production of chimeras
- Production of embryos in vitro
- Embryo splitting
- Transgenesis
- DNA libraries

STRATEGIES FOR CONSERVATION OF LIVESTOCK BIODIVERSITY

- A number of methods have been used for conservation of livestock genetic resources.
- These include in-situ conservation of the breeds/population and cryo-preservation of semen, ova, embryos, skin, blood, DNA, Fragments etc.
- These methods are important especially when the breed is rate or near extinction.
- In India, as the situation is not so acute, large scale ex-situ conservation efforts are being taken up.

UTILIZATION OF GENETIC RESOURCES

- Sound genetic resource utilization policy relevant to different farm animal species based on livestock population, breeding structure, disease problems, availability of feed resources, change in social structure, sustainability of population system in terms of marked demand of products and prices is the need of the hour for efficient and sustainable livestock resource management.

MODULE-15: LIVESTOCK PRODUCE AND PRODUCTS

Learning outcomes

- At the completion of this module the learner will be able to know the contribution of various species of animals and their products to the national income and role in rural/urban health and economy.

CONTRIBUTION TO GROSS DOMESTIC PRODUCT

- The livestock and fisheries sector contributed over 4.07 per cent to the total GDP during 2008-09 and about 29.7 per cent to the value of output from total agricultural and allied activities.
- The Eleventh Five Year Plan envisages an overall growth of 6-7 per cent per annum for the sector. In 2009-10, this sector produced 112.5 million tonnes of milk, 59.8 billion eggs, 43.2 million kg wool, and 4.0 million tonnes of meat.
- The result of the 18th Livestock Census (2007), derived from village-level count, has placed the total livestock population at 529.7 million and poultry birds at 648.8 million. India ranks first in world milk production,increasing its production from 17 million tonnes in 1950-51 to about 112.5 million tonnes in 2009-10 .
- The per capita availability of milk has also increased from 112 grams per day in 1968-69 to 263 gram per day in 2009-10. It is however still low compared to the world average of 279.4 grams/day, as per FAOSTAT (Food and Agriculture Organization Statistical Database) 2009 data.
- ***Source:*** Union Budget 2010-2011, Ministry of Finance, Govt. of India

LIVESTOCK PRODUCE AND PRODUCTS

- All the products that we obtain from animal can be divided into the nine categories, out of which the food items are the main ones.
- It should not be forgotten that traditionally animal facilitate crop production by providing the much needed draft power and fertilizers.
- Thus livestock contribute all the basic need of man-food (directly or indirectly via agriculture), clothing and recreation.

Sl.NO	ITEM GROUPS	MAIN CATEGORIES PRODUCTS
1	Food	Meat and offal, blood, milk and dairy products, eggs, fish, shellfish, honey
2	Fibre	Wool, hair, silk, feathers
3	Hides	Skins(leather), pelt (fur)
4	Fuel	Faeces
5	Fertilizer	Faeces, urine, blood, bone, hoof and horns
6	Breeding stock	Live animal, semen, ova, embryo
7	Power	Draught/pact animals
8	Sport/recreation	Equestrian sports, bull/ram/cock fight
9	Other items	Pearls, shells, horns, hooves

- In developing countries like India, work/draft should be considered as a very important animal product though its production cannot be expressed in units or money.
- A huge number of cattle in India is zebu non-descript type used for various agricultural operations and rural transport.

- The present day worth of power produced by all our draught animals would be around Rs. 15,000 millions.
- Hence, a relative importance of difference species of livestock and different types of livestock products for India as a whole cannot be neglected.
- The per capita availability of milk and total production in India are as follows:

MILK PRODUCTION IN INDIA		
Year	Production (Million Tonnes)	Per Capita Availability (gms/day)
1991-1992	55.7	178
1992-1993	58.0	182
1993-1994	60.6	187
1994-1995	63.8	194
1995-1996	66.2	197
1996-1997	69.1	202
1997-1998	72.1	207
1998-1999	75.4	213
1999-2000	78.3	217
2000-2001	80.6	220
2001-202	84.4	225
2002-2003	86.2	230
2003-2004	88.1	231
2004-2005	92.5	233
2005-2006	97.1	241
2006-2007	100.9	246
Source: *Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, GoI*		

VALUE OF OUT PUT FROM LIVESTOCK SECTOR (Rupees in crores)							
Item	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
1. Milk Group	88092	94551	100454	104347	110447	115931	124520
2. Meat Group	21905	22980	24983	26547	27337	28123	30051
2.1 Meat	18521	19571	21231	22571	23223	23944	2558

							8
2.1.1 Beef	2060	2311	2292	2510	2630	2822	3599
2.1.2 Mutton	6696	7036	7899	8789	9179	8594	9247
2.1.3 Pork	997	1089	1187	1430	1405	1501	1726
2.1.4 Poultry Meat	8768	9134	9853	9842	10010	11025	11017
2.2 Meat Products	720	744	841	905	951	939	1125
2.3 By-Products	2665	2665	2912	3071	3162	3240	3338
2.3.1 Hides	991	977	1046	1097	1107	1154	1129
2.3.2 Skins	1070	1065	1194	1257	1285	1324	1312
2.3.3 Other By Products	604	623	672	716	770	762	897
3. Eggs	4398	4669	4879	5049	5186	5570	5791
4. Wool & hair	281	317	308	329	343	371	366
4.1 Wool	209	230	227	241	252	279	274
4.2 Hair and Bristles	73	88	80	88	91	92	92
5. Dung	10533	11484	10790	12021	12868	13658	15803
5.1 Dung Fuel	4295	4652	4473	5346	5561	5416	6311
5.2 Dung Mature	6238	6832	6317	6675	7307	8242	9492
6. Silk Worm Cocoons and Honey	1384	1526	1922	1560	1837	1697	2065
7. Increment in Stock	2937	3446	3762	4202	4903	5462	6570
Value of Output from Livestock Sector	129531	138973	147097	154056	162921	170812	185166
Source: Central Statistical Organization, Dept. of Statistics, GOI (2007)							

LIVESTOCK FOR RURAL DEVELOPMENT

- The role of livestock in the lives of small farmers and village poor is many fold as shown below
  - It buffers the risks due to crop failure, unemployment and underemployment
  - Enhances family nutrition status, allows some domestic consumption of essential nutrients
  - Provides regular cash income
  - Render services-draft, manure and fuel
  - Helps enhance socio-economic status
- But the small farmer faces several constrains in developing his livestock enterprise. Some such constraints are listed below.

- They possess meager resources
- They have limited access to resources, services, technology and market duet o their low socio-economic status
- There is a subsistence farming/livelihood
- They are poorly organized
- They are distributed over a wide area, with no/poor transport and communication facilities
- They are generally tradition/taboo/apathy bound to allow big changes in technology towards the better.

PRODUCTION OF LIVESTOCK PRODUCTS IN INDIA

ANIMAL PROUCTS					
Commodity	**Production, million tonnes**			**% Annual growth**	
	1990-1992	**2001-2003**	**2008**	**1980 -1990**	**1990-2003**
Milk	55.9	86.2	105.0	5.2	4.0
Cow	23.7	36.7	44.1	5.2	4.1
Buffalo	29.7	47.9	60.9	5.0	4.7
Goat	2.5	1.6	4.0	6.8	0.2
Meat	3.88	5.65	-	4.9	3.5
Beef and Veal	1.28	1.47	0.89	1.2	1.6
Buffalo Meat	1.19	1.45	1.40	2.5	2.3
Goat Meat	0.43	0.47	0.47	0.9	0.6
Mutton and Lamb	0.19	0.23	0.23	2.9	3.2
Pig meat	0.43	0.61	-	3.4	4.7
Poultry Meat	0.37	1.42	0.64	5.5	12.3
Egg, Million number	22.0	39.7	55.6	7.8	5.2
Wool, million kg	40.5	49.5	46.4	2.7	2.0

Source: *1. Basic Animal Husbandry Statistics, DAHandD, GoI*
2. FAOSTATS for Meat production.

- Indian export of animal products has increased from Rs. 5129 crores in 207-08 to Rs. 6913 crores in 2008-09. (Source: APEDA, Govt. of India)
- Export oddairy products reaced 70146.77 MT with the value of Rs. 980.86 crores in 2008-09 as against Rs. 866.56 crores in 2007-08. (Source: APEDA, Govt. of India)

VALUE OF OUTPUT FROM LIVESTOCK SECTOR IN INDIA

VALUE OF OUTPUT FROM LIVESTOCK SECTOR IN INDIA

Commodity	Value, Rs. in Billions at 1993-94 prices			Annual growth rate, %	
	1980-82	1990-92	2001-03	1980-90	1990-2003
Food based products	305.6	519.7	806.2	5.46	3.94
Milk Group	241.2	399.7	615.7	5.22	3.94
Meat	51.7	96.2	150.6	6.26	3.77
Beef and Buffalo meat	7.7	12.5	14.6	4.82	1.45
Goat meat/ Mutton	21.1	38.2	46.8	5.11	1.42
Pork	2.7	5.5	10.4	7.83	5.97
Poultry Meat	20.2	40.0	78.8	7.61	5.81
Meat Products	2.4	3.4	4.5	1.96	2.27
Eggs	10.3	20.4	35.3	7.35	4.80
Non-food based products	82.3	92.5	123.4	1.52	2.41
Livestock, Total	387.9	612.3	929.6	4.72	3.72

Source: *National Account Statistics (various issues), CSO, Ministry of Statistics and Program Implementation , GOI.*

SELECTION OF SUITABLE LIVESTOCK ENTERPRISE

- Every farmer at every locality of the country cannot effectively use all type of livestock enterprises.
- The scope of different livestock enterprises for different regions of the country can be as follows,

CATTLE	Milk-milk shed areas, near towns and cities
	Female calf rearing-milk shed areas, near town and cities
BUFFALO	Milk-milk shed areas, near towns and cities
	Female calf rearing-milk shed areas, near town and cities
	Male calf rearing-around slaughter houses
WORK ANIMALS	Bullocks for hiring any where
	Camels for hiring in north western region
	Donkeys for hiring, any where
SHEEP	Wool-Himalayan and north western regions

	Meat – any dry area
GOATS	Milk – any area
	Meat – any area
Pigs	Pork – near cities (for specific area and people)
POULTRY	Eggs- poultry shed areas near cities and towns
	Meat – any area
	Meat – any area
	Fun-hilly area
MITHUN	Milk and meat in north eastern region
ALLIED ACTIVITIES	Feed and fodder production / collection any where
	Processing – crop bypro9ducts, in any area
	Hatcheries – for custom hatching in selected area
	Cold stores for egg and meat storage I selected areas
	Feed mills for improving quality of straws any where

- Normally livestock are used for alleviation of poverty in rural areas via certain specifically designated schemes or programmes, e.g. Integrated Rural Development programme with livestock components.

CONTRIBUTION TO NATIONAL INCOME

- Demand for livestock products is increasing fast due to population and income growth, urbanization and change in tastes and preferences. Livestock products also have a higher income elasticity of demand compared to cereals, pulses and fruits and vegetables.
- The impressive growth in the livestock sector was largely due to increase in numbers (except milk and poultry to some extent). Future growth in livestock output would have to come from technological breakthroughs in yields.
- Productivity of the livestock sector in India is low compared to world average. For cattle the average milk yield per animal per year is 48% of world average; beef 52% and pork 44%.
- The contribution of various products to the total value of output of livestock sector in 1987-88 (i.e. Rs.277,300 million) was

Milk and milk products	66.45
Eggs	3.39
Wool	0.43

Hair and Bristle	0.10
Dung fuel	5.33
Dung manure	4.73
Increment in stock	2.76
Beef	1.62
Mutton and meat	4.95
Pork	0.79
Poultry meat	5.36
Meat products	0.68
By-products	1.73
Hides	0.79
Skins	0.63
Others	0.31

- The annual value of work by draft animals comes to Rs.125, 000 millions. The Indian Institute of Management, Bangalore has estimated the value of work and dung produced in 1986 to be Rs.160, 000 million based on their energy value

MILK PRODUCTION AND MILK PRODUCTS

- There are great differences between various regions in both quantity of milk produced and its composition.
- In 1989-90, out of the 51.4 million MT of milk produced in the country, 40.01% was cow milk, 56.56% was buffalo milk and the rest of 3.43% was goat milk.
- In 2009, the total milk production in India reached 100 million tonnes.
- The major milk-shed areas of the country are concentrated in the western and central parts of the Indo-Gangetic Plains and the central and east coast parts of peninsular India.
- The most developed dairy states are Gujarat (3.35 million MT), Haryana (3.15 million MT)and Punjab (4.97 million MT) through area-wise much bigger states may produce as much eg: Andhra Pradesh (3.03 million MT). Madhya Pradesh (4.52 million MT), Maharashtra (3.26 million MT) and Uttar Pradesh (9.14 million MT).
- Rajasthan should also be considered a dairy-wise developed state as it produced 4.21 million MT despite the fact that major area of it is arid.
- The highest per capita availability of milk per day is in Punjab (624 g) and Haryana (455 g), while the lowest was in the N-E states (36-73g) and Orissa (39 g).

Dairy products

- In India, in 2009 export of dairy products reached 70146.77 MT. The income from export of dairy products increased from Rs.866.56 crores in 2007-08 to Rs. 980.86 crores in 2008-09.

MEAT PRODUCTION

- Production of buffalo meat is increasing at a phenomenal rate of 20% per annum.
- Unlike in cattle, buffalo slaughter is more free, especially slaughter of male calves of milch buffaloes.
- Also there is an ever growing export market to the Gulf countries for buffalo meat. While goat meat production is moderate to high in all region mutton production is high in Plateau and Hill and GPH region and insignificant in all other regions.
- Sheep and goat meat production was 9,50,000 tons each, in the year 2009. India ranked 7th in mutton production and 2nd in chevon production in the world.
- Export of mutton and chevon together was to the tune of Rs.493.31 crores in the year 2008-09.
- In 2008-09, export of buffalo meat was to the tune of Rs. 4839 crores.
- Even more localised is pork production; a high in ET and T in WCPH regions per thousand rural inhabitants and insignificant values in other regions.
- Pork production is meagre even in high pig density LGP and MGP region as the pigs are non-descript.
- Distribution of scale of production of hides, skins and other slaughter products among different agro-climatic regions follows similar trends as meat production, as slaughter of animals, as the prerequisite for all the above products.

HIDE, SKIN AND OTHER BY PRODUCTS

Indian Leather Industry Overview

- The leather industry occupies a place of prominence in the Indian economy in view of its massive potential for employment, growth and exports.
- There has been an increasing emphasis on its planned development, aimed at optimum utilisation of available raw materials for maximising the returns, particularly from exports.
- The exports of leather and leather products gained momentum during the past two decades. There has been a phenomenal growth in exports from Rs.320 million in the year 1965-66 to Rs.69,558 million in 1996-97.
- Indian leather industry today has attained well merited recognition in international markets besides occupying a prominent place among the top seven foreign exchange earners of the country.

Major production centers

- The major production centres for leather and leather products are located at Chennai, Ambur, Ranipet, Vaniyambadi, Trichi, Dindigul in Tamil Nadu, Calcutta in West Bengal, Kanpur in Uttar Pradesh, Jalandhar in Punjab, Bangalore in Karnataka, Delhi and Hyderabad in Andhra Pradesh.

Leather availability in India

- There exists a large raw material base.
- This is on account of population of 194 million cattle, 70 million buffaloes, 95 million goats.
- According to the latest census, India ranks first among the major livestock holding countries in the world.
- In respect of sheep with 48 million sheeps, it claims the sixth position. These four species provide the basic raw material for the leather industry.
- The annual availability of 166 million pieces of hides and skins is the main strength of the industry. This availability grows and may reach to 218 million pieces in 2000.
- According to FAO statistics, in the year 2008, the following quantities of hides were produced in India.
- Cattle hide - 3.86 lakh tonnes
- Buffalo hide - 5.31 lakh tonnes
- Sheep skin - 0.58 lakh tonne
- Goat skin - 1.30 lakh tonnes
- Some of the goat/calf/sheep skins available in India are regarded as speciality products commanding a good market.
- Abundance of traditional skills in training, finishing and manufacturing downstream products and relatively low wage rates are the two other factors of comparative advantage for India.

WOOL, HAIR AND OTHER FIBRES

- The wool production in the country increased from 32.0 million kg in 1980-81 to 42.7 million kg in 1990-91 at an annual growth rate 3.3%.
- The major wool producing states are Rajasthan (38.64%), Karnataka (10.30%), Jammu and Kashmir (9.37%) and Tamil Nadu (8.78%).
- The two main wool regions are the WH region (0.7 MT/1000 rural inhabitants) and WD region (0.55 MT/100 rural inhabitants) whereas the TGP and GPH regions produce 0.2 MT/1000 rural inhabitants.
- In Rajasthan the most arid 11 north-western districts are most important in wool production.
- It may be noted that even through bulk of the sheep population is in the plateau and Hills regions (especially, CPH, WPH and SPH), wool production in these regions is not much, as sheep are generally reared here for meat.

DRAUGHT ANIMAL POWER

- Draft animal power is the backbone of cultivation in most parts of India and the principal reason for maintaining bovines (especially cattle) as their use for land preparation is imperative for all farmers in all regions.
- The number of working bovines per hectare of net sown area was 0.64 for the country as a whole in 1984 as against 0.63 in 1972.

Year	Provinces with highest draft animal density		Provinces with lowest draft animaldensity	
	State	Density	State	Density
1972	Assam	1.18	Rajasthan	0.26
	Bihar	0.99	Kerala	0.20
	West Bengal	0.90	Gujarat	0.33
	Uttar Pradesh	0.87	Punjab/Haryana	0.35
1982	Himachal Pradesh	1.50	Rajasthan	0.25
	Bihar	1.02	Haryana	0.25

	Jammu & Kashmir	1.00	Gujarat	0.32
	West Bengal	0.99	Punjab	0.34
Note : Density = Draft animals / ha net sown area				

MARKETING ANIMALS AND THEIR PRODUCTS

- Generally the producers used to sell the perishable products (milk, eggs, meat) themselves directly to producers in the village or in the weakly market.
- Middlemen used to be the conduits in marketing meat animals and even other classes of animals.
- In most parts of the country the middleman is the inevitable person in the livestock trade even now.
- Over the decades many changes have come to take place in this sphere apart from general development of transport, market yards and other necessary infrastructure.
- Enactment of laws by states to regularise markets, development of cooperatives, increasing role of local government agencies etc. are some of the developments.

Milk

- The cooperatives are most active in procurement, processing marketing of milk.
- For other commodities are rather rare, the exception being the pig cooperatives in the north-eastern states and sheep cooperatives in western himalayan region.
- The areas where dairy cooperatives have most developed (mostly under Operation Flood programme and also outside this) are in the areas where milk production is high.
- Dairy cooperatives could not yet take firm ground in central, eastern, north eastern and mid-southern parts of the country, mostly due to lack of robust milk production tradition.
- In the beginning the cooperatives used to fix the milk price based on fat content.
- Two axis pricing based on fat as well as not-fat solids is generally in vogue currently. Introduction of modern milk testing gadgets enabled this.
- There is also a considerable private trade in milk. There are few big and many (> 800 lpd) small private dairy companies in the market.

Erode Cattle Shandy

MEAT AND MEAT ANIMALS

- Trade in meat animals and meat is not well organised in the country. The middlemen have a big role in this trade.
- Though animals are slaughtered in considerable numbers illegally outside recognised slaughter houses, the big and small slaughterhouses located in cities and towns ate the main centres of the meat trade.
- Big wholesaler-contractor operates at the slaughter houses. His sub-contractors or agents procure animals for slaughter from villages either directly or through middlemen strategically located in villages or groups of villages. Animals may be procured from regular livestock fairs and markets.
- The price of animals is fixed by bargaining haphazardly. Some rough judgement of the animals, weight may be made. The prices are invariably low.
- While small ruminants may be of slaughterable age, the bovines so purchased are invariably old, emaciated and may be infirm.
- Then large animals are invariably old, ematiated and may be infirm.
- Then large animals are invariably driven to slaughter houses on foot for days on end in spite of the distances involved.
- Small animals may be taken in trucks if the distance involved is more than 20-25 km.
- The animals lose 15-25% of the body weight during this transit due to feed and water deprivation and water loss.
- The slaughter houses are licenced by the local government agencies (Municipal corporations, Municipalities, panchayat Boards etc) and are manned by registered butchers on payment of a per animal basis tax.
- There is virtually no grading nor sale of meat as per ‘cuts’ as is done in the west.
- Government, in view of big sheep and goat meat trade, farmed rules to ensure fair dealing and protecting market areas from arbitrary changes.
- Market committees responsible for implementing these rules include representatives of farmers and butchers.

WOOL AND HAIR

- Wool marketing in India is better organised. All the wool states like Jammu & Kashmir, Himachal Pradesh, Rajasthan, Gujarat, Karnataka etc. have their own Wool Marketing Boards or corporations/sheep and wool Departments or Wings.
- Bikaner in Rajasthan is the biggest central market in India, where wool comes from all parts of the country.
- Wool is generally collected from shepherds, flocks by shearers/middlemen/agents of contractors through whom it reaches the local markets (mandis).
- Though no grading is done while paying the shepherds for wool (on bargain basis). Wool may be graded to a degree before it reaches central markets from the local ones.
- The prevailing system of wool marketing provided very little for shepherds and the main share of profits goes to the middlemen.
- The producer himself takes wool to the market rarely. A Substantial wool is purchased by the local traders and/or outside traders at ridiculously low prices.
- After shearing wool is brought to the market in small lots by petty agents where it is sold by commission agents. Some local or outside carpet manufactures also may buy wool there.
- The proportion of wool sold to local traders, outside traders and carpet weavers varies from region to region.

LIVE ANIMALS

- Live animals are sold at various levels – within village, between villages at livestock fairs / markets / shows and even exported to other regions and countries.
- Milch buffaloes and work bullocks are the main animals traded. There are several large and small livestock markets throughout the length and breadth of the country.
- They operate mostly on a particular day of the length and breadth of the country. They operate mostly on a particular day of the week.
- Regions in which one finds large number of weekly cattle markets are upper gangetic plains(UGP), western plateau and hills (WPH), southern plateau and hills (SPH) and central plateau and hills (CPH) and lower in islands, western himalayan (WH) , Gujarat plains and hills (GPH) and western dry (WD) .
- Maintenance of the markets is the responsibility of the local governments, which is done via the selected/elected members of market committees.
- They levy a tax for every animal brought to the market and in return provide amenities like water, shelter, feed and veterinary care at the market and in return provide amenities like water, shelter, feed and veterinary care at the market premises.
- In state like Haryana, by virtue of a cattle Fair Act, specially appointed Cattle Fair Officers regulate the cattle markets.
- In Tamil Nadu, Erode weekly dairy cattle shandy runs on Thursdays. This is an exclusive shandy for pregnant animals. Few buffaloes are also marketed here.

DAIRY CATTLE SHANDY - ERODE	LOADING AND UNLOADING OF ANIMALS

PRICE NEGOTIATION

ANIMALS ARE SOLD IN PAIRS

GOSHALS / GAUSHALA

- “Gaushala” means a charitable institution established for the purpose of keeping, breeding, rearing and maintaining cattle or for the purpose of reception , protection and treatment of infirm, aged or diseased cattle and includes a Pinjarpole or a Gosadan where such cattle are kept.
- Goshalas are protective shelters in India for (cows) that have been neglected. Goshalas focus on treating cows in accordance with Hinduism philosophy.
- Generally Goshalas have been established by the public trusts for maintaining old, infirm, unproductive cows and its progeny. The central government as well as state government is also assisting these Goshalas for cattle development.

- In many states (Uttar Pradesh, Haryana, Rajasthan) more number of Goshalas are exist and they play vital role in protecting native cattle. Under National Bull Production Programme these Goshalas has been used to produce good quality indigenous bulls and preservation & conservation of indigenous breeds.

MODULE-16: ORGANIC LIVESTOCK PRODUCTION

Learning outcomes

- On completion of this module the learner will be able to understand the concept of organic livestock production and the advantages and disadvantages of the concept in our country's perspective.

DEFINITION

Click here for a web link

- *Organic farming* is the form of agriculture that relies on techniques such as crop rotation, green manure, compost and biological pest control to maintain soil productivity and control pests on a farm.
- Organic farming excludes or strictly limits the use of manufactured fertilizers, pesticides (which include herbicides, insecticides and fungicides), plant growth regulators such as hormones, livestock antibiotics, food additives, and genetically modified organisms.
- "Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved."
- International Federation of Organic Agriculture Movements

ORGANIC GRASSLAND

- Organic grassland is the foundation stone of organic livestock farming.
- In organic farming, the components of the whole farm system interact closely and grassland plays the central role in this intricate web, including the arable cropping phase.
- Grassland is important particularly in relation to nitrogen supply via its influence on N-fixation, soil organic matter, structure and biological activity and it also has a major role to play in restricting the build-up of arable weeds and soil-borne crop diseases in arable rotations.
- Ruminant livestock share this central role with grassland on most successful organic farms, and the success of the livestock enterprise is intimately tied up with the management and productivity of the grassland.

CONSIDERATIONS FOR ORGANIC LIVESTOCK PRODUCTION

Origin of Livestock

- Livestock and products from the livestock that are sold, labeled, or advertised as organic must be from livestock that originate from animals that were managed under continuous organic management from the last third of gestation or at hatching.

Livestock Feed

- Livestock that are produced under organic management must have their total ration that is comprised of agricultural products including pasture, forage, and crops that are organically produced and handled organically.
- There are certain nonsynthetic and synthetic substances that can be used as feed additives and supplements.

- Dairy cattle under 9 months of age are allowed 20% of their feed come from nonorganic sources.
- Plastic pellets, urea, manure, mammalian or poultry slaughter by-products are not allowed.

Living Conditions

- An organic livestock producer must create and maintain living conditions that accommodate natural behavior and health of the animal.
- The living conditions must include access to outdoors, shade, shelter, fresh air, direct sunlight suitable to the species, and access to pasture for ruminants.

Waste Management

- Organic livestock producers are mandated to manage manure so that is does not contribute to the contamination of crops, soil, or water and optimizes recycling of nutrients.

Health Care

- Organic livestock production practices require the producer to establish preventive health care practices.
- The health care practices include selecting the appropriate species and type of livestock, providing adequate feed, create an appropriate environment that minimizes stress, disease, parasites, administration of vaccines and veterinary biologicals, animal husbandry practices to promote animal well being in a manner that minimizes pain and stress.
- Producers can not provide preventative antibiotics. Producers are encouraged to treat animals with appropriate treatment, including antibiotics and other conventional medicines when needed but treated animals can not be sold or labeled as organic. Producers can not administer hormones or other drugs for growth promotion.

Record Keeping/Audit Trail

- Organic livestock operations need to maintain records for a number of reasons.
- Certainly, records are important for financial management of the organic livestock enterprise.
- Likewise, records are important for the verification of organic status of animals, production, harvesting, and handling practices associated with the organic products and animals.
- Records are mandated to be maintained for 5 years, and must demonstrate compliance with the Organic Food Production Act.

RECORDS TO BE MAINTAINED

- Records of the following must be maintained
    - Medications administered (dates, doses, and sources).
    - Feed bought or raised and fed (receipts, sources, organic certificates, labels).
    - Feed supplements (receipts, labels, sources, dates and quantity administered).
    - The weight of slaughter animals at slaughter or hanging carcass weight.
    - Purchase and sales records for livestock and livestock products (dates, weights, quantities, description).
    - All materials used in the on-site production of crops for feed (receipts, source, dates and quantity applied).
    - Records of finished product sales.

CHANGING LIVESTOCK TO ORGANIC

Dairy One-Year Herd Conversion

- *Feed:* Must be fed 100% organic feed for one year.
- *Antibiotics:* Prohibited for 1 year prior to milking. After conversion, they are prohibited.
- *Hormones:* Except for oxytocin, they are prohibited for 1 year prior to milking and after certification.
- *Vaccines:* May use approved vaccines and biologics as needed.
- *Pasture:* Must have access to pasture.

Poultry (Meat and Eggs)

- *Feed:* Must be fed 100% organic feed from the second day of life.
- *Antibiotics:* Prohibited.
- *Hormones:* Prohibited.
- *Vaccines:* May use approved vaccines and biologics as needed.
- *Living Conditions:* Must have access to the outdoors.

Slaughter Stock (Beef, Dairy, Hogs, Sheep, etc.)

- *Feed:* Must be fed 100% organic feed from the last third of gestation.
- *Antibiotics:* Prohibited.
- *Hormones:* Prohibited except for oxytocin
- *Vaccines:* May use approved vaccines and biologics as needed.
- *Pasture Requirements:* Must have access to the outdoors. Organic pasture is required for ruminant livestock.

MODULE-17: DESIGN AND CONSTRUCTION OF LIVESTOCK BUILDINGS

Learning outcomes

- At the completion of this module the learner will be able to understand the general principles in design and construction of livestock buildings, selection of site and preparation of housing plan etc.

LAYOUT OF THE FARM

- Proper planning, designing and arrangement of various building in a farm is necessary for a successful enterprise.
- Layout is essential to increase the profit, decrease the production cost, and to increase the efficiency of operations in the farm.
- The farm buildings can be grouped into three categories:
    - Farm houses or homestead
    - Farm buildings or farmstead
    - Farm store

FARM HOUSES OR HOMESTEAD

- Farm houses are the residential building meant for the person working in the farm.
- The farm house should never be placed to the leeward side of the farm building.
- Attention to this point tends to prevent flies and smell from the manure heap being blown towards the dwelling houses.
- Farm house should be located at windward side. The farm office should be located in the prominent place most probably at the center of the farm.
- The manager’s house should be located at the entrance. This facilitates efficient supervision.

- All the buildings in the farm should be grouped together for efficient operation. The related enterprises must be grouped.
- The major enterprise which need more attention should be located nearer the farm office.
- In mixed farming the piggery unit can be located away from the dairy unit as well as manager's office.

FARM BUILDING OR FARMSTEAD

- These are meant for housing the livestock.
- The farm buildings should be kept well away from the farm house and worker's cottages.
- But consideration must be given to the distances being not too great, otherwise stockmen or other animal attendants might be reluctant to turn out at night or in bad weather to give the animals the required attention.

FARM STORE

- Farm store is meant for storage of feed materials as well as other farm products.

QUARANTINE SHED

- Quarantine shed is meant for isolation of apparently healthy animals, which are newly purchased from out side market.
- It should be at the entrance so that new animals purchased may be kept and if they are found to be free from diseases, it can be included in the farm.

SELECTION OF SITE FOR FARM BUILDING

Soil

- Soil must be suitable for strong foundation. Marshy, clay, sandy, rock soils are not suitable.
- Loamy and gravely soils are best suited for building construction.

Availability of land

- There should be vast area to construct all building and should give way to future expansion of farm.
- Atleast 2-3 acre land is required for 200 cows.
- For 2 cows 1-acre land is essential for fodder production. Similarly 1-acre land is essential for 30-40 sheep or goat.

Drainage system

- Proper drainage of rain and subsoil water should be provided to keep healthy environment and to protect the building from dampness.

Availability of water

- Plenty of water is needed for farm operations like washing, fodder cultivation, processing of milk and byproducts and for drinking.
- Hence a water source which provides water constantly is essential.

Electricity

- It should be available at the site. It is needed for operating various machines used in the farm and is the light source to the animals.

Protection from wind and solar radiation

- If the farm building in open or exposed area, the wind breaks in the farm of tall quick growing trees should be grown near the building.
- This will reduce the wind velocity and solar radiation.

Protection from noise and other disturbance

- The farm site should be away from noise producing factory/chemical industry, sewage disposing area.
- The industrial effluents in the form of gaseous or liquid may pollute surrounding resources.
- Noise is also found to affect the animal production. Hence the farm should be away from city.

Availability of market facility

- The farm should be away from the city but at the same time it should be nearer to city thereby the products produced from the farm could be marketed easily.

Transport facility

- The farm buildings should be provided with good road and also have the accessibility to reach the market.
- This will reduce the transport cost and avoid spoilage of products.

PREPARATION OF HOUSING PLAN

- Plan preparation is essential for construction of animal houses.
- First a rough plan which consist of following should be prepared.

Orientation

- The farm house can be constructed facing road, other buildings may be turned at an angle to road or reversed to take advantage of the prevailing wind and sunlight.
- In general animal sheds are located with long axis east to west the paddock side facing the north to get direct sun light during winter.

Direction of wind

- The farm house should be located on the windward side of farm buildings considering the direction of summer and winter winds.

Site plan

- Site plan is used to locate the site where the buildings are to be located.
- It should contain the details of various building arrangement, road formation, space between buildings etc.

Floor plan

- Floor plan is the aerial view of the different structures to be erected within a farm building.

- It should contain detail like dimensions of the building, location of ventilators, doorways and layout allays etc.

Elevation

- The appearance and view of the whole building will be shown in the elevation.

Master Plan

- After preparing the rough plans and found satisfactory, a master plan should be prepared.
- The master plans are prepared in semi-transparent paper with black ink as per scale.
- From this master plan mass production of plan will be made by subsequent process like blue printing.

Van-Dyke Prints

- These are negatives of the original drawing.
- Black or blue lines are provided on the white background in the negative.

Blue print

- Mass production of plans are made from negative by exposing them to sensitive blue print paper, developed in water and fixed in Potassium chromate.
- It is used to estimate the cost and to carry out the construction work.

FACTORS TO BE CONSIDERED WHILE DESIGNING A LIVESTOCK FARM

- Different types of enterprises such as dairy, piggery, sheep and goat units need different building design. So the design should be prepared to meet the need of a particular enterprise.
- Each enterprise may adapt different systems of production and management. The design may be influenced by enterprise also.

Designing for unit

- It is desirable to design the accommodation for a workable unit.
- It will give opportunity to study the need of smaller group with regard to floor space, feeding space required for different kinds of animals.

Structural form

- Shape and design of building should meet the needs of all classes of livestock.
- Uniformity in the appearance should be maintained. We have to decide the number of animals to be housed in the building and number of buildings to be constructed.

Designing for flexibility

- Animal building has to be designed to meet the requirement of changing enterprises.
- This will increase the utility of buildings. Spacious building without pillars can be easily be adopted for different enterprises with little modifications in the building.
- For example large intensive dairy buildings can be used for rearing pig or sheep and goat with little modification.

Shape of the roof

- It is designed to suit the local climatic conditions. Gable with roof ventilators are necessary for hot condition.
- Monitor roof is suitable for building with smaller width.

Standard width of buildings

- Single row cow shed - 3. 80 to 4.25 metre
- Double row cow shed - 7. 90 to 8.70 metre
- Poultry and others - 20 to 30 feet.

Standard height of the building

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

Length of building

- The standard length of building may be of any. It may vary depends upon the number of animals housed.
- Length can be determined based on the total stock to be housed within the building.
- Example: In case of dairy 15-20 animals in single row system and 20-50 animals in double row system and above 50 animals a separate shed should be provided.

DESIGNING THE ANIMAL BUILDING FOR PRODUCTION AND PRODUCT CONTROL

- Animal house is so designed to have control over production of product and quality of product.
    - *Environmental controlled house*
        - Recent trend in animal house is to control the bad effect of environmental factors to provide comfort condition to the animals.
        - In tropical building, choice of building material and method should be employed to prevent heat radiation from sun in to the building through roof, wall and surrounding ground. Non- conducting material with sufficient insulation will prevent various kinds of heat radiation.
        - Comfortable air velocity, optimum humidity should be maintained in the building.
        - These entire factors will have effect on production, fertility, fecundity and prolificacy.
    - *Quality of products*
        - High quality milk and egg can be produced only in certain type of houses, which are specially designed for it.
        - For example certified high quality eggs are produced only in cages with roll away floor arrangement or in slatted floor arrangement.
        - Certified high quality milk with low bacterial counts can be produced only in the parlour system of milking.
    - *Labour control*
        - One of the major expenses in a farm is the cost of labour.
        - Labour cost can be reduced and designing the animal house properly and labour efficency can be improved by double row arrangement of animals and animal building facilitates circular travel and two-way job. Construction of alleys/passages like feed alley, milk alleys, egg collection alleys animal weightment yard are designed to reduce the labour cost.
    - *Disease control*
        - Animal house should be designed properly to effect disease control.

        - Provision of washable and easily drained floor, washable walls will control spread of diseases.
        - Designing of suitable drainage system for quick and hygienic disposal of wastes is required for preventing disease.
        - External loose box accommodation is necessary for isolation of sick animal.
        - Dampness resistant surface will reduce the high humidity, which is the predisposing cause for respiratory disease in pigs and young animals.
- Standard height of the building
    - The height of the building may differ according to the roofing material and agroclimatic condition.
- Length of the building
    - The building may be of any length. In case of dairy 15-20 animals in single row system and 20 – 50 animals in double row system and above 50 animals a separate shed should be provided.
    - The length can be determined based on the total stock to be housed with the building.

GENERAL PRINCIPLES OF PLANNING

- The following points should be considered before planning and designing animal houses.
    - It should be of attractive appearance
    - It should minimize labour cost
    - Efficiency of the operation should be increased
    - It should have resale value
- Plan preparation is essential for construction of animal houses. First a rough plan which consists of following should be prepared.
    - Site plan
        - It is used to locate the site where the buildings are to be erected.
        - It should contain details of various building arrangement, road formation and space between buildings etc will be located.
    - Floor plan
        - It is the aerial view of the different structures to be erected within a farm building.
        - It should contain details like dimensions of the building, location of ventilators, and doorways will be marked in the floor plan.
    - Elevation
        - The appearance and view of the whole building will be shown in the elevation.
    - Cross section
        - It gives details of building foundation, type of flooring, walls and roof of the building.
        - The internal fittings, partition, feeding and securing devices should be clearly shown
    - Master plan
        - After preparing the rough plans and found satisfactory a master plan should be prepared.
        - The master plans are prepared in semi-transparent paper with black ink as per scale.
        - From this mass production of plans will be made by subsequent process like blue printing.
    - Van – Dyke print
        - These are negatives of the original drawing. Black (or) blue lines are provided on the white back ground in the negative.
    - Blue print
        - Mass production of plans are made from negatives by exposing them to sensitive blue print paper developed in water and fixed in potassium dichromate.
        - It is used to estimate the cost and to carryout the construction work.
    - Orientation
        - The farm housing can be constructed facing road, other buildings may be turned at an angle to road or reversed to take advantage of the prevailing wind and sunlight.

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

ROOF PATTERN

- Different patterns of roofs are used for animal building to suit for the climatic condition and type of roof ventilation.

Lean to type roof

- These are simple roof with single slope adopted for shed type of buildings Roof ventilation cannot be provided in this pattern.
- In this type of roof one wall is higher than the another one to give necessary slope for roof. It is suitable for maximum span of 2-4 meter.

Gable roof

- These are coupled roof with two slopes, roof ventilation can be provided in this pattern the form of continuous ridge opening protected by louvre board

Monitor roof

- The roof has two slopes, but one overlaps other at the ridge of the roof with a ventilation gap of one feet.
- In this roof ventilation can be provided in between two slopes.
- This also suitable for tropical buildings and it serves the purposes of ventilating and lighting the building.
- Poultry sheds are constructed by this pattern.

Semi monitor roof

- Roof has 2 slopes but one overlap the other at the ridge of roof with ventilating gap of 1 feet.

Gothic arch

- This is an arched roof providing greater roof space used for store houses. Used for storage of feed and also for pig shed.

DEFINITION

- *Eaves* - lower edges of the roof which is resting on the supporting wall.
- *Gable* - The triangular upper part of a wall formed at the end of roof.
- *Purlins* – The wooden pieces which are placed horizontally on principal rafters to carry the common rafters.
- *Rafters* – These are the pieces of timber, which extend from eaves to the ridge.
- *Ridge* – The highest part of the building is ridge where the two slopes of the roof joints.
- *Span* – The horizontal distance between the internal faces of walls or supports.
- *Pitch of a roof*
    - It is the degree of slope to the side of the roof. Steep pitches are necessary for thatched and tiled roof.
    - The low pitch is suitable with aluminum asbestos and other metal sheets. It can be calculated from the formula
    - Rise is the vertical height between the eave to ridge.

- Run is half of the span.
- The pitch of 1/8 to 1/10 is sufficient for roof with metal sheet, a pitch of
- 1/4 is required for thatched and tiled roof

ROOFING MATERIALS

- Different materials are used as roof covering. Careful selection of material is essential in tropical building to prevent the solar radiation.
- It is preferable to have material with low conductivity of heat. The commonly used roof materials are.
- Various materials are available for construction of roof

Tiles

- They are cheap and easily available in most of the places. It conducts heat rapidly. Hence it is suitable for hot climate.
- Wind or accident easily damages them. It has to be renewed periodically. There are two types of tiles.
  - *Pan tiles or Mangalore tiles*
    - These are rectangular tiles with grooves on outer surface and two nibs on the inner surface. They are lied one at the side of the other to cover the roof.
  - *Country tiles*
    - These are semi-circular tiles of different shape and dimensions. They are used by keeping one over other in layers forming numerous air pockets, they conduct less heat.

Asbestos sheet

- These are commonly used in animal buildings. Asbestos sheets are prepared by mixing cement mixture with varying quantities of vegetable fibres.
- The are available as sheets of different dimensions with corrugated surfaces.
- Sheets are easily fixed to roof trusses and more durable than tiles. But the houses under this roof will be hotter during summer.

Aluminum Sheets

- Corrugated aluminum sheets of different thickness and dimensions are available in the market as roof coverings.
- They are 2 ½ feet width and varying length from 8 to 12 feet. They are very light and can be easily fixed.
- The bright and polished surface of new sheets provides a reflective insulation and keeps the animal houses cool during summer.
- They are expensive but have a greater resale value. They are rust proof and therefore they are more durable.

Galvanized iron sheets

- These are iron sheets, which are galvanized on the surface and provided with corrugation. They are available in standard dimension of 6feet x 3feet.
- Galvanized sheets are commonly used in animal houses but this sheet keep the house very hot during summer.
- It is suggested that sheet should be painted white on outer side to avoid absorption of heat. They are strong and may be rusted after long use.

Thatched Roof

- This roof is made of either coconut or Palmyra leaves. Sometimes hay and straw are used as roof coverings. They are cheap and poor conductors of heat.

- They keep the house cool in summer. They are non-durable and has to be removed yearly or once in two year. They are very prone for fire accident.

Light roofing

- These are also poor conductor of heat. But it need close truss work otherwise spacing of roof covering may occur leading to entry of rain water into the building.

Roof lining

- Wooden board and synthetic vegetable boards can be used as roof lining for tiled and roof with galvanized iron sheets to give better insulation.

CONSTRUCTION OF FLOOR

- Floor is the important part of the building. Floor is the one, which is frequently used by animals for various purposes as resting, movement, feeding and milking etc.
- So the floor must have all the qualities, which are required to meet the purpose.
- It must be strong as durable to withstand the weight to hard roof of the building and movement of hard hoof of the animals. Durability is also required for economical point of view.
- Flooring must facilitate hygienic feeding and effective removal of waste product both liquid and solid.
- The floor should be laid on solid and compact foundation. It should have a gradient of 1/60 from manger to the rear dung channel.
- Non slippery quality is needed to avoid accident slipping especially in case of large animals. Grooves and roughened surface should be provided.
- Construction details
    - For any type of animal house flooring, the primary thing required is provision of good 'bottom'.
    - It is as important as that of foundation wall. The bottom is called some times are hard core for the floor.

FLOOR MATERIALS

- Different materials are used for animal house flooring. The choice depends on availability, cost and other quality required for the animal houses.
    - Cement concrete floor
    - Vitrified paving bricks
    - Stones
    - Wood
    - Building bricks
    - Gravel

Cement concrete floor

- This is a common material used in animal house. It is cheap and durable floor if properly constructed.
- In tropical condition, it provides the required cool condition for the animals.
- Groove and rough surface are to be provided for preventing accident.

Vitrified paving bricks

- These are hard impervious bricks with grooves on the surface.
- It is an ideal flooring for animals because of durability and damp proof condition.
- The bricks are set over the bottom and a cushion of sand. The joints are coated with cement mortar.

Stones

- Granite stones are used in place where they are easily available. They are made into a block.
- The floor surface is roughened and laid over a cushion of sand. It is durable and strong and cheap.

Wood

- Wooden floors sometimes used for animals house. It keeps the floor warm and comfortable in cold condition.
- In hill station where timber is cheap, wooden floor is preferable. The planks may be used as solid floor or slatted floor.
- The Slatted floors are preferable and they are used for hygienic reasons of breaking contact of animal with excreta.
- In tropical building it will be useful to provide desirable floor ventilation which facilitates maximum cooling of animals in hot condition.
- Slatted floor is a common fitting in poultry and rabbit houses.

Building bricks

- They are sometimes used as a flooring material. They are not good floor materials. They absorb water and are easily worn out.
- They are set on edges closely and packed with good quality of cement.

Gravel

- Fine quality of gravel can be used as cheap quality flooring materials. It absorbs water and worn out quickly.
- Periodical repair and maintenance is required. During disease outbreak disinfection is not possible with this type of flooring.
- Lime dressing and smearing of cow dung mixture will help in proper maintenance of floor. This floor will be sufficient for sheep and goat.

SYNTHETIC FLOORING

Composition brick

- It provides a non-conducting warmth floor, which is necessary in houses of young animals in cold countries.
- This is a good floor for piggery and calf houses. It provides a soft and comfortable surface, which is necessary in houses of young animals in cold countries.

Rubber floor

- Rubber is used as blocks set on cement blocks or as thick mat with grooves and ridges on the surface.
- It is costly and fixing is difficult. In western countries this rubber is used as flooring in dairies and calving boxes to provide a clean, soft and comfortable surface.

DESIGN OF FLOOR

Solid floor

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

Slatted floor

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

Wire floor

- Animal house floor are at present manufactured in the form of thick gauge wire meshes.
- They can be fixed in frame and used, as flooring such wire mesh should be welded type with good galvanized coating.
- It has same advantage as slatted floor and is easy for fixing as floor in poultry houses, rabbit and houses for calf.

Deep litter floor

- It is made of bedding material as dried layers.
- Straw, paddy husk, saw dust groundnut hulls, dried leaves are spread on the floor used as litter materials.
- It can be spread as layer of 4-6 inches thickness and can be allowed to accumulate over a period of a month to 1 year.
- The litter get mixed with excreta and decomposed.
- The dried litter materials absorb the moisture. Hence bacterial activity is controlled.
- The litter material with decomposed excreta may supply B complex vitamin to birds.
- The B complex vitamins especially B12 increases the hatchability.
- Excessive bacterial action in the deep litter is kept controlled by addition of lime.

WALL MATERIALS

Bricks

- *Building bricks*
  - They are made out of brick earth, which are 50 per cent clay and 50 per cent sand.
  - Rectangular blocks are prepared by molds and cut by machines.
  - Then they are heated in the Kiln at proper temperature.
  - Well made machine bricks will have standard dimensions of 9" x 4½ " x 3".
  - They will have uniform shape, colour and texture and will be sharp on angles.
  - They produce clear ringing sound when struck with hard objects.

- *Virtified paving bricks*
  - These are hard, impervious and durable bricks paving more than 10 per cent of iron oxide.
  - They are heated at very high temperature to the point of vitification.
  - They are grooved on the outer surface and have a strong and hard finish. They are damp proof.
  - They are special bricks made for use as flooring in animal houses.
- *Glazed bricks*
  - These are small bricks made of china clay and finished with glaze or enamel on the outer surface.
  - They are used for providing sanitary finishes on walls and the places where hygienic condition and washable surfaces are necessary. They are very costly bricks.

Stones

- Different kinds of stones are used for building construction. They may be dressed in to rectangular or square blocks and used in original shapes to give a rubble finish.
  - *Granite*
    - These are hard and natural stones. They may be black in colour or light Grey.
    - They are durable and weather resistance and are commonly used for the construction of walls and floors in animal buildings.
    - The surface should be of roughened periodically by chipping.
  - *Whin stones*
    - They are also hard rocks but not so durable and weather resistant as granites.
    - They are used for wall constructions and broken stones are uses as a common ingredient of cement concrete.
  - *Sand stones*
    - These are immature rocks of recent formation. They are not strong and durable and not used in heavy constructions.
    - They are capable of being dressed into different shapes and patterns. Hence, they are used for architectural works.

MODULE-18: ARRANGEMENTS OF THE BUILDINGS

Learning outcomes

- On completion of this module the learner will be able to know the different types of arrangement of buildings in a livestock farm and select the best type for our Indian conditions.

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ARRANGEMENT OF FARM BUILDINGS

- Proper planning, designing and arrangement of various buildings in a farm is necessary for a successful enterprise.
- The farm buildings can be grouped into three categories.
  - Farm house (or) homestead
  - Farm buildings (or) farmstead
  - Farm store

Farm house (or) homestead

- Farmhouses are residential building meant for the person working in the farm.

- The farmhouse should never be placed to the leeward side of the farm building and it should be located to the windward side.
- Attention to this point tends to prevent flies and smell from the manure heap being blown towards the dwelling houses.

Farm building (or) farmstead

- These are meant for housing the livestock. The farm buildings should be kept well away from the farm house and worker's cottages.
- But consideration must be given to the distances being not too great, otherwise stockmen or other animal attendants might be reluctant to turn out at night or in bad weather to give required attention to the animals.

Farm store

- Farm store is meant for storage of feed materials as well as other farm products.
- Farmhouse should always be located at windward side. The farm office should be located in the prominent place most probably at the centre of the farm.
- The farm manager's house should be located at the entrance of the farm.
- This facilities gives efficient supervision. All the buildings in the farm should be grouped together for efficient operation.
- The related enterprises must be grouped. The major enterprise which need more attention should be located nearer the farm office.
- In mixed farming the piggery unit can be located away from the dairy unit.

Quarantine shed

- Quarantine shed should be located at the entrance of the farm.
- So that new animals purchased from outside may be kept and if they are found to be free from diseases, it can be included in the farm.

Isolation shed

- It should be located away from the healthy animal shed.

TWO TYPES OF ARRANGEMENT OF FARM BUILDINGS

- Central courtyard system.
- Parallel arrangement with the road.

Central courtyard system

- There is a wide driveway at the entrance of the farm leading to spacious courtyard. The driveway should be as wide as 20-25 feet.
- Farm house should be located at the entrance of driveway will have good control of farm buildings activities and efficient supervision is possible.
- The different farm buildings are located all around the courtyard at different distance from the courtyard.

- The major enterprises will be near the farm house than other enterprises.

Parallel arrangement with the road

- The entrance driveway leads to a number of farm roads with sufficient space in between them.
- The different farm buildings are located on either side of the road in a parallel arrangement.
- Different rows can be set for different kinds of buildings.
- One for dairy unit, another for feed and another for storing the farm implements.
- This type of farm arrangement helps for easy and quick transport.
- It is mostly followed in commercial farms where the resources are obtained from outside market and the products are sold to outside.
- This is ideal for large farm with different enterprises.
- For smaller farms with single enterprise or limited activities the buildings may be arranged in the shape of the English alphabet letters ‘ L’, ‘ U’, ‘ T’, ‘ E’ and ‘M’.

CENTRAL COURTYARD SYSTEM AND PARALLEL ARRANGEMENT

Central courtyard system

- In this system, there is a wide way at the entrance, leading to a courtyard.
- Farm houses are located at the entrance of the way and different farm buildings are located around the courtyard.

Parallel arrangement with the road

- The entrance drive way leads to a number of farm roads with sufficient space in between them.
- The different farm buildings are located on either side of the road. This is ideal for quick and easy transport.
- It is mostly followed in commercial farms where the resources are obtained from outside maret and the products are sold to outside.
- In smaller farms the building may be arranged in the shape of the letters **‘L’ ‘U’ ‘T’** or **‘E’** with a road round the outside.

MODULE-19: BUILDING MATERIALS

Learning outcomes

- At the completion of this module the learner will be able to understand the construction principles of animal buildings for foundation, floor, wall and roof and different materials used for construction, their merits and demerits etc.

SITE SELECTION

- The site or location of the building bears a relation with the useful life of the building.
- It is mainly affected by the climate, soil type, topography and the available basic facilities.
- A proper site may be selected by considering the points.

Site selection for economic animal habitation

FACILITIES	CHARACTERISTICS	REQUIRED FOR

Size and shape	Enough and regular	Ease of planning and operations
Topography	Elevated (high and leveled)	Low cost of construction
Soil type	Firm	Durability of buildings
Water supply	Easy and regular	Low cost of construction
Drainage	Good drainage system	Durability of buildings
Roads	Away, but not for away	Ease for transport of materials
Electricity	Regular	For easy operations
Erosion control	Good vegetation coverage	Protection to soil and buildings

CONSTRUCTION PRINCIPLES OF FARM BUILDINGS

Farm buildings are constructed to provide complete comfort conditions to the animals and birds and also to provide facilities to the work men for easy operation. The structures important to a building are as follows:

- Foundation
- Wall
- Roof

FOUNDATION

- Foundation is the basic structure to be put up in any construction work. It consists of two parts namely
  - Footing and
  - Foundation wall.

Footing

- Footing is the broad base of the foundation wall designed to carry the load without settlement.

DIMENSION	HEAVY	LIGHT
Width	24”	12”
Depth	12”	8”

Foundation wall

- The height of the foundation wall required for farm buildings depends on the soil condition of the site.
- Deeper foundation is necessary in loose soil and shallow in firm rocky soil.
- Generally the height for light farm building will vary from 18” to 30”. The thickness will vary from 9” to 12”

Material used

- Foundation footing can be made of cement concrete or brick and cement mortar.
- Concrete foundation is stronger and is called monolythick foundation.

- Brick foundation is provided with stepped up increase in width towards the base. It is not so strong as concrete.

Method of putting foundation

- Trenches of suitable size are put up to receive foundation. The base is hardened, made smooth and level.
- Then the footing and foundation wall is put up to ground level.
- The surface is smoothened and levelled again.
- At this place, a 4% layer of damp proof course of asphalt or other material is introduced to prevent absorption of moisture.

WALL

- Walls are the supporting structures built above the foundation to enclose the buildings.
- They may be constructed with materials like brick, stones or concrete with thickness of 9", 12" and 6" respectively.
- Non-weight bearing walls of brick need not be thicker than 4 ½".
- The height of the wall depends upon the type of animals to be housed under the building.
- Principles followed for finishing the walls in animal houses are as follows,
    - The height up to 4 feet from floor should be finished smoother with hard cement plaster and made washable for reasons of hygiene.
    - Corners should be filled and rounded to prevent accumulation of dust.
    - The sharp edges and angles should be rounded to prevent accident.

ROOF

- Roof is provided for the purpose of protecting animals from hot sun and rain. It also protects the internal structures.
- It should be of simple type. Cheap materials have to be used for animal buildings.
- One of the essential qualities required for roof material in tropical condition is to have high insulation value.
- In the absence of this, the roof has to be insulated.
- Principles used in construction can be discussed under different headings.
    - Roof truss work
    - Trusses

ROOF TRUSS WORK

- These are framed structures used on the roof for fixing roof covering.
- It consists of parts as purlins on which trusses are fitted at sufficient intervals of 10-12 feet.
- Rafters are spared parallel to the trusses at closer interval depending upon type of roof coverings.
- Reapers are wooden planks fitted over the trusses and rafters in horizontal direction at required intervals.
- All these are called as members of the roof truss work which are necessary for supporting and fitting roof covering.

PITCH OF A ROOF

- It is the degree of slope to the side of the roof. Steep pitches are necessary for thatched and tiled roof.
- Low pitch is suitable for roof with aluminium, asbestos and other metal sheets.
- It can be calculated from the formula:

Pitch = rise
2 x run

Rise

- It is the vertical height between the eave to ridge and run is half of the span
- The pitch of 1/8 – 1/10 is sufficient for roof with metal sheet, a pitch of ¼ is required for thatched and tiled roof.
- The slope can be expressed as its pitch angle (between slope and tie). The 35° for thatched roof, 25°-30° for tiled roof and 12°-18° for sheet roof.

ROOF PATTERN

Different patterns of roof are used for animal buildings to suit for the climatic condition and type of roof ventilation

- Couple closed roof and collar beam trusses
  - These type of trusses used for the buildings with a span (span is the distance between two walls) of 3-4.2 meter.
- Lean to type roof
  - These are simple roofs with single slope adopted for shed type of buildings.
  - Roof ventilation cannot be provided in this pattern.
  - In this type of roof one wall is carried up sufficiently higher than other wall or support to give necessary slope to the roof. It is suitable for a maximum span of 2.4 meters.
- Gable roof
  - These are coupled roofs with 2 slopes, roof ventilation can be provided in this pattern in the form of continuos ridge opening protected by louvre board.
- Monitor roof
  - The roof has 2 slopes, but one overlaps other at the ridge of the roof with a ventilating gap of 1 feet.
  - This also suitable for tropical buildings and it serves the purposes of ventilating and lighting the building.
- Gothic arch
  - This is an arched roof providing greater roof space. It is suitable for storehouses and barns to store fodder.

ROOF COVERING OR ROOFING MATERIALS

- Different materials are used as roof covering. Careful selection of material is essential in tropical building to prevent the solar radiation.
- It is preferable to have material with low conductivity of heat. The commonly used roof materials are.

Tiles

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- Wind or accident easily damages them. It has to be renewed periodically. There are two type of tiles.
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- But the houses under this roof will be hotter during summer.

Aluminium sheets

- Corrugated aluminium sheets of different thickness and dimensions are available in the market as roof coverings.
- They are 2 ½ feet width and varying length from 8 to 12 feet. They are very light and can be easily fixed.
- The bright and polished surface of new sheets provides a reflective insulation and keeps the animal houses cool during summer.
- They are expensive but have a greater resale value. They are rust proof and therefore they are more durable.

Galvanized iron sheets

- These are iron sheets, which are galvanized on the surface and provided with corrugation.
- They are available in standard dimension of 6 feet x 3 feet.
- Galvanized sheets are commonly used in animal houses but this sheet keep the house very hot during summer.
- It is suggested that sheet should be painted white on outer side to avoid absorption of heat.
- They are strong and may be rusted after long use.

Thatched roof

- This roof is made of either coconut or palmyra leaves. Sometimes hay and straw are used as roof coverings.
- They are cheap and poor conductors of heat. They keep the house cool in summer.
- They are non-durable and has be removed yearly or once in two year. They are very prone for fire accident.

Light roofing

- These are also poor conductor of heat. But it need close truss work otherwise spacing of roof covering may occur leading to entry of rain water into the building.

Roof lining

- Wooden board and synthetic vegetable boards can be used as roof lining for tiled and roof with galvanized iron sheets to give better insulation.

CONSTRUCTION OF FLOOR

- Floor is the important part of the building. Floor is the one, which is frequently used by animals for various purposes as resting, movement, feeding and milking etc.
- So the floor must have all the qualities, which are required to meet the purpose.
- It must be strong and durable to withstand the weight of hard roof of the building and movement of hard hoof of the animals. Durability is also required for economical point of view.
- Flooring must facilitate hygienic feeding and effective removal of waste product both liquid and solid.
- The floor should be laid on solid and compact foundation.
- It should have a gradient of 1/60 from manger to the rear dung channel.
- Non slippery quality is needed to avoid accident slipping especially in case of large animals. Grooves and roughened surface should be provided.

- Smooth and damp surface is conducive for accident. The floor should provide maximum comfort to animals.
- A warm floor with insulation is suitable for cold climate and cool floor in hot climate.
- The cost should be considered in the construction of floor but is should not be at the expense of durability.

Construction details

- For any type of animal house flooring, the primary thing required is provision of good ‘bottom’.
- It is as important as that of foundation wall. The bottom is called some times as hard core for the floor.

FLOORING MATERIALS

- Different materials are used for animal house flooring.
- The choice depends on availability, cost and other quality required for the animal houses.

Cement concrete floor

- This is a common material used in animal house. It is cheap and durable floor if properly constructed.
- In tropical condition, it provides the required cool condition for the animals. Groove and rough surface are to be provided for preventing accident.

Vitrified paving bricks

- These are hard impervious bricks with grooves on the surface.
- It is an ideal flooring for animals because of durability and damp proof condition.
- The bricks are set over the bottom and a cushion of sand. The joints are coated with cement mortar.

Stones

- Granite stones are used in place where they are easily available. They are made into a block.
- The floor surface is roughened and laid over a cushion of sand. It is durable and strong and cheap.

Wood

- Wooden floors sometimes used for animal house. It keeps the floor warm and comfortable in cold condition.
- In hill station where timber is cheap, wooden floor is preferable. The planks may be used as solid floor or Slatted floor.
- The Slatted floors are preferable and they are also used for hygienic reasons of breaking contact of animal with excreta.
- In tropical building it will be useful to provide desirable floor ventilation which facilitates maximum cooling of animals in hot condition.
- Slatted floor is a common fitting in poultry and rabbit houses.

Building bricks

- They are sometimes used as a flooring material. They are not good floor materials.
- They absorb water and are easily worn out. They are set on edges closely and packed with good quality of cement.

Gravel

- Fine quality of gravel can be used as cheap quality flooring materials. It absorbs water and worn out quickly.
- Periodical repair and maintenance is required.
- During disease outbreak disinfection is not possible with this type of flooring.
- Lime dressing and smearing cow dung mixture will help in proper maintenance of floor. This floor will be sufficient for sheep and goat.

SYNTHETIC FLOORING

- Composition brick
  - It provides a non-conducting warmth floor, which is necessary in houses of young animals in cold countries.
  - This is a good floor for piggery and calf houses.
  - It provides a soft and resilient surface, which is necessary in houses of young animals in cold countries.
- Rubber floor
  - Rubber is used as blocks set on cement blocks or as thick mat with grooves and ridges on the surface. It is costly and fixing is difficult.
  - In Western countries this rubber is used as flooring in dairies and calving boxes to provide a clean, soft and comfortable surface.

DESIGN OF FLOOR

Solid floor

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

Slatted floor

- Floor set with wood and reinforced concrete bars provide a required gab between them and are used in house for intensive animal production.
- It has the great advantage of controlling disease by breaking the contact between animals and excreta.
- The excreta, both liquid and solid passes downward from the wooden floor immediately after it is voided through the gap provided.
- The excreta collected underneath the floor are suitably disposed by mechanical means. The slatted floor is ideal for raising animals in germ free condition.

Wire floor

- Animal house floors are at present manufactured in the form of thick gauge wire meshes.
- They can be fixed in frame and used, as flooring such wire mesh should be welded type with good galvanized coating.
- It has same advantage as slatted floor and is easy for fixing as floor in poultry houses, rabbit and houses for calf.

Deep litter floor

- It is made of bedding materials as dried layers. Straw, paddy husk, saw dust, groundnut hulls, dried leaves are spread on the floor used as litter materials.
- It can be spread as layer of 4 - 6 inch thickness and can be allowed to accumulate over a period of a month to 1 year.
- The litter get mixed with excreta and decomposed. The dried litter materials absorb the moisture. Hence bacterial activity is controlled.
- The litter material with decomposed excreta may supply B complex vitamin to birds. The B complex vitamins especially B12 increases the hatchability.
- Excessive bacterial action in the deep litter is kept controlled by addition of Lime.

BUILDING MATERIALS

- Various building materials are used for the construction of animal buildings.
- The material selected must have the following common qualities. They should be strong, durable, weather resistant, cheap and locally available.
- The conductivity of heat must be as low as possible under the local climatic conditions.
- The common materials used are.
    - Bricks
    - Stones
    - Binding materials
    - Timber

BRICKS

Building bricks

- They are made out of brick earth, which are 50 per cent clay and 50 per cent sand.
- Rectangular blocks are prepared by molds and cut by machines. Then they are heated in the Kiln at proper temperature.
- Well made machine bricks will have standard dimensions of 9” X 4 ½” X 3”.
- They will have uniform shape, colour and texture and will be sharp on angles.
- They produce clear ringing sound when struck with hard objects.

Virtified paving bricks

- These are hard, impervious and durable bricks paving more than 10 per cent of iron oxide.
- They are heated at very high temperature to the point vitification.
- They are grooved on the outer surface and have a strong and hard finish.
- They are damp proof. They are special bricks made for use as flooring in animal houses.

Glazed bricks

- These are small bricks made of china clay and finished with glaze or enamel on the outer surface.
- They are used for providing sanitary finishes on walls and the places where hygienic condition and washable surfaces are necessary.

- They are very costly bricks.

STONES

- Different kinds of stones are used for building construction.
- They may be dressed in to rectangular or square blocks and used in original shapes to give a rubble finish.

Granite

- These are hard and natural stones. They may be black in colour or light Grey.
- They are durable and weather resistance and are commonly used for the construction of walls and floors in animal buildings.
- They surface should be roughened periodically by chipping.

Whinstones

- These are also hard rocks but not so durable and weather resistant as granites.
- They are used for wall construction and broken stones are used as a common ingredient of cement concrete.

Sand stones

- These are immature rocks of recent formation. They are not strong and durable and not used in heavy constructions.
- They are capable of being dressed into different shapes and patterns. Hence, they are used for architectural works.

BINDING MATERIALS

Lime

- It is prepared form limestone, which are heated and slacked with water. The white power that is produced is called lime.

Lime mortar

- It is prepared by mixing one part of lime with three parts of pure sand adding sufficient quantity of water.

Cement

- It is prepared from 70% chalk and 30% clay, which is mixed with water to form a creamy fluid.
- It is allowed to settle and then the sediment is collected dried and roasted over kiln and ground into fine powder.
- It is greyish and bluish Grey in colour. It is an efficient binding material used for building bricks, stones and other materials.

Cement mortar

- Cement and sand in 1:3 ratio.

Cement concrete mixture

CONTENTS	QUANTITY
Broken granite stones	4 parts
Sand	2 parts
Cement	1 part
Water	QS

TIMBER

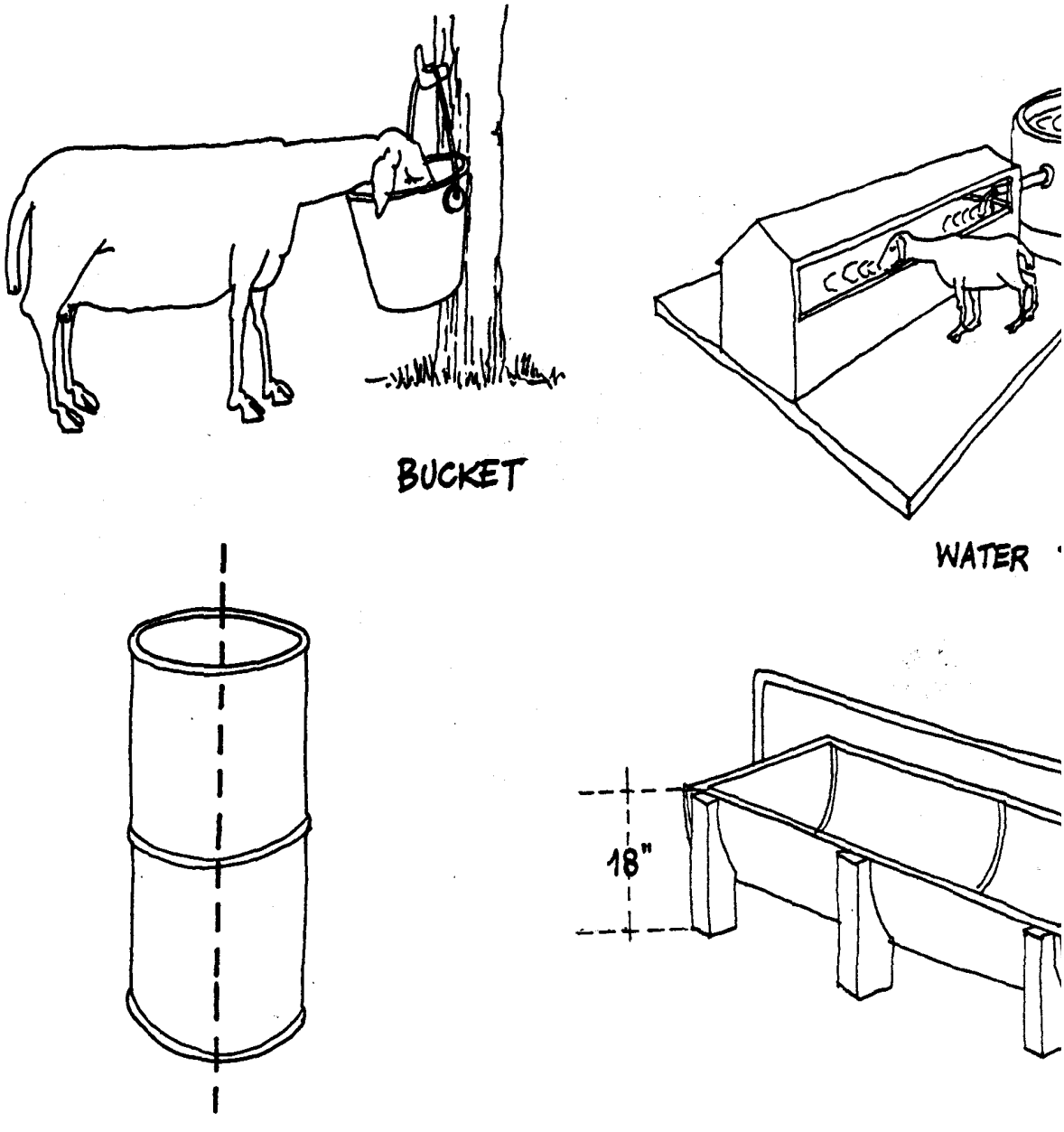
- Wooden posts and planks are used for constructing roof trusses, animal house partitions, yard fences and feeding devises.
- Good quality timber should be selected for this purpose.
- These will be hard and durable. The grains will be dark in colour and closed packed.
- Annual rings will be closely set. Timber should have more of hard wood.
- The cut surface must be smooth and not spongy in appearance. Fresh smell should be produced.
- It should give a ringing sound. Timber should be free from defects as
    - *Shake:* These are cracks produced in timber due to improper seasoning.
    - *Knots:* These are the cross sections of the branches left of the timber. Timber is weak at these spots.
    - *Sap wood:* It is the spongy, weak, immature portions of timber it is undesirable.
    - *Rots:* The fungus disease affecting timber is called as rots. It reduces the timber to powder and weakens it. It spreads from timber to timber rapidly.

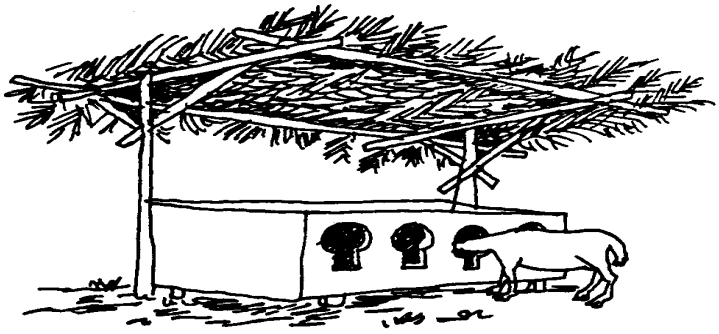
BUILDING MATERIALS

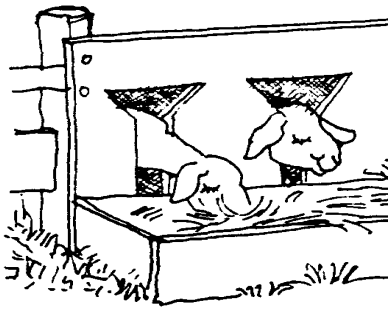
- Soil types and topography vary across the country. Accordingly, the building materials also differ from region to region.
- These materials are usually substances that remain unaffected (or reasonably slowly affected) by the stress of climatic variables.
- These include clay, pebbles, stones brick, a variety of grass (thatch), bamboo products, coconut products, wood rocks-slate tiles, tin, iron, cement etc.
- It is noted that certain materials are predominantly available in particular areas (e.g. coconut and bamboo in coastal areas).
- One should be liberal in using locally available materials to cut down on cost of their procurement. Such materials also resist the weather conditions of the region and are eco-friendly.
- The roof is an important component of any house. Normally a roof is permanent of fixed structure.
- It gets the maximum effects of climatic variable (rain, show, hail) and of unwanted elements (monkeys, fallen twings, pebbles/stone etc.) Therefore one has to decide on the type of roof and roofing system for the particular locality and animals housed within.
- The roofing materials should preferably be lighter and weather proof. Corrugated iron roofs are suitable for open cattle courts, manure pits, cart sheds etc.
- Asbestos cement roof covering are non-corrosive, comparatively light, insulating and require little attention.
- Asbestos protected metal sheets consist of corrugated iron sheeting, covered with asbestos fabric with bitumen finish. It is long lasting with practically no maintenance cost.
- Tile/slates are also the materials of choice for the roof. They are to be given adequate slope for draining rain and need strong support underneath as well as frequent maintenance.

- All the above materials may require insulation materials (wooden boards, layer of paddy straw, gunny bags).
- Thatch, locally available grass material, is generally used in rural areas for covering the animal houses.
- It requires to be replaced frequently, gets damaged in heavy storms and catches for easily. It does not require any insulation material. The shape of the roof may be flat or gabled.

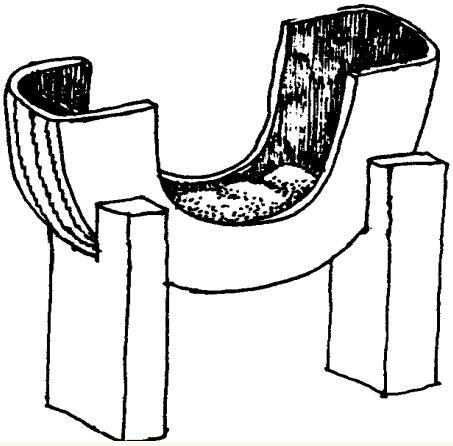
LOW COST FEEDING AND WATERING ARRANGEMENT

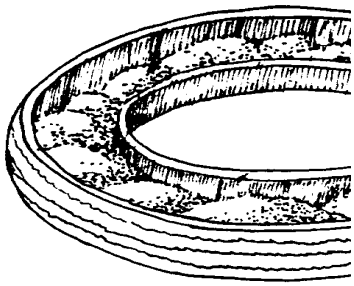






KEY HOLE FEEDER





SALT AND MINERAL TROU
MADE FROM OLD TIRES

MODULE-20: PROBLEMS AND PROSPECTS OF DAIRY FARMING

Learning outcomes

- After reading this module, the learner will understand the problems, strength, opportunities and weakness of dairy farming and dairy industry

SWOT ANALYSIS OF INDIAN DAIRY INDUSTRY

(Strength, weakness, opportunity and threats)

(Source of information : http://www.indiadairy.com/**)**

Strengths

- *Demand profile:* Absolutely optimistic.
- *Margins:* Quite reasonable, even on packed liquid milk.
- *Flexibility of product mix:* Tremendous. With balancing equipment, you can keep on adding to your product line.
- *Availability of raw material:* Abundant. Presently, more than 80 per cent of milk produced is flowing into the unorganized sector, which requires proper channelization.

- *Technical manpower:* Professionally-trained, technical human resource pool, built over last 30 years.

Weaknesses

- *Perishability:* Pasteurization has overcome this weakness partially. UHT gives milk long life. Surely, many new processes will follow to improve milk quality and extend its shelf life.
- *Lack of control over yield:* Theoretically, there is little control over milk yield. However, increased awareness of developments like embryo transplant, artificial insemination and properly managed animal husbandry practices, coupled with higher income to rural milk producers should automatically lead to improvement in milk yields.
- *Logistics of procurement:* Woes of bad roads and inadequate transportation facility make milk procurement problematic. But with the overall economic improvement in India, these problems would also get solved.
- *Problematic distribution:* Yes, all is not well with distribution. But then if ice creams can be sold virtually at every nook and corner, why can't we sell other dairy products too? Moreover, it is only a matter of time before we see the emergence of a cold chain linking the producer to the refrigerator at the consumer's home!
- *Competition:* With so many newcomers entering this industry, competition is becoming tougher day by day. But then competition has to be faced as a ground reality. The market is large enough for many to carve out their niche.

Opportunities

"Failure is never final, and success never ending". Dr Kurien bears out this statement perfectly. He entered the industry when there were only threats. He met failure head-on, and now he clearly is an example of 'never ending success'! If dairy entrepreneurs are looking for opportunities in India, the following areas must be tapped.

- *Value addition:* There is a phenomenal scope for innovations in product development, packaging and presentation. Given below are potential areas of value addition:
- Steps should be taken to introduce value-added products like *shrikhand* , ice creams, *paneer*, *khoa* , flavored milk, dairy sweets, etc. This will lead to a greater presence and flexibility in the market place along with opportunities in the field of brand building.
- Addition of cultured products like yoghurt and cheese lend further strength - both in terms of utilization of resources and presence in the market place.
- A lateral view opens up opportunities in milk proteins through casein, caseinates and other dietary proteins, further opening up export opportunities.
- Yet another aspect can be the addition of infant foods, geriatric foods and nutritionals.
- *Export potential:* Efforts to exploit export potential are already on. Amul is exporting to Bangladesh, Sri Lanka, Nigeria, and the Middle East. Following the new GATT treaty, opportunities will increase tremendously for the export of agri-products in general and dairy products in particular.

Threats

- *Milk vendors, the un-organized sector:* Today milk vendors are occupying the pride of place in the industry. Organized dissemination of information about the harm that they are doing to producers and consumers should see a steady decline in their importance.
- The study of this **SWOT** analysis shows that the 'strengths' and 'opportunities' far outweigh 'weaknesses' and 'threats'. Strengths and opportunities are fundamental and weaknesses and threats are transitory. Any investment idea can do well only when you have three essential ingredients: entrepreneurship (the ability to take risks), innovative approach (in product lines and marketing) and values (of quality/ethics).
- The Indian dairy industry, following its delicensing, has been attracting a large number of entrepreneurs. Their success in dairying depends on factors such as an efficient yet economical procurement network, hygienic and cost-effective processing facilities and innovativeness in the market place. All that needs to be done is: to innovate, convert products into commercially exploitable ideas.

PROBLEMS CONFRONTING DAIRY PRODUCTION

- There is wide variation in
    - agro-climatic condition,
    - biodiversity and ecology,
    - socio economic and cultural background of people,
    - types/breeds of dairy cattle reared.
- It is therefore necessary to plan for dairy development specific to each micro level, viz., a block, a village, a taluk and a district. This planning not only would result in optimum utilisation of local resources, but will also ensure better viability of the programmes and higher cost benefits ratio.
- Before embarking on planning and formulation of dairy development programmes, it is necessary to consider environmental impact (water bodies pollution, over grazing of grasslands, degradation of watersheds, deforestation).
- Nowadays, environmental aspect is very much stressed by the private parties and multinational agencies while funding the animal husbandry projects.
- Notwithstanding above consideration, it is essential to adopt the following tips for efficient identification and formulation of animal husbandry and veterinary projects.
    - Need for identifying such technologies, which demand less capital, less time and minimum operations.
    - Exploring the possibilities of providing loans at the lowest interest rates with subsidies for dairy development activities.
    - Gradual improvement of existing indigenous breeds of animals.
    - Gradual removal of useless stock and replacement with high yielding superior quality animals.
    - Gradual manipulation in husbandry practice for improving animal productivity and adoption of biotechnological interventions in feed and fodder, reproduction and growth aspects.
    - Need for Government role in improving the supply of inputs and service to dairy farmers / beneficiaries at their doorsteps with minimum cost.
    - Contribution from various nongovernmental agencies/organisation to ease the problems of farmers in association with the governmental agencies.
    - Need for developing viable farmer’s cooperatives societies / federations like, milk producers cooperative societies at village and district levels, federations, boards and corporations.
    - Need for simultaneous development of cold chain storage and marketing facilities especially for milk and milk products.
    - Need for extensions services from the Government, Agriculture Universities, R&D institutions, federations and corporation, besides mobilization of various input services from various agencies**.**

PROBLEMS AND POSSIBLE SOLUTIONS OF DAIRYING IN INDIA

- We have a large population of cattle and buffalo and their average production is very much lower than the animals in other developed countries.
- The average milk production of our animal is 1.5 liter per day and it should be doubled so as to attain present level of production with only half the present strength of livestock.
- It can be achieved only be giving better care, balanced feeding, scientific health management and should be bred with pedigreed or progeny tested bulls or quality of animal breeding service should be improved.
- There is ample scope to increase the yield or to reduce the production cost by utilizing crop residues and agricultural byproducts.
- Low cost technologies like enrichment of straw, urea molasses mineral blocks should be popularized in rural areas.
- National commission on Agriculture and FAO stipulated that 8% of the cultivable land must be earmarked for growing fodder and the productive animal strength should be restricted to 70 per cent of present

number. High yielding fodder varieties like hybrid Napier (Co-3, Co-4), fodder sorghum (CoFS 27), fodder maize, guinea grass, paragrass should be popularized among farmers.

- High yielding legume fodders like lucerne, hedge lucerne, and fodder cow pea should be fed to animals to reduce the production cost.
- Regional imbalance in the availability of feed and fodder need much more attention.
- Shortage can be reduced to densification and transportation of straw ad hay from surplus regions to deficient regions.
- Ignorance of the farmers about the importance of mineral mixture in cattle feed is another problem.
- The mineral mixture is utmost essential for productive reproductive efficiency.
- Non availability of standard mineral mixture at reasonable cost at field level should be attended first.
- Similarly area specific mineral mixture should be advised for the farmers to meet the requirements.
- 16 million inseminations are carried out per year, majority of the local non-descript cows bred naturally and indiscriminately and hence genetic progress was very slow.
- 99 per cent of AI is directed towards crossbred cows, whose population is only about 5-7 per cent of the total cattle population.
- Only 10 per cent of the total bovine population is covered by AI. It is much worse in buffaloes, where the animals are bred naturally and indiscriminately under village condition.
- Intensive and periodic training to be give to the personnels handing semen and to the inseminators.
- Farmers are in general ignorant and they should be educated about heat detection, regular breeding and importance of postpartum care.
- Systematic studies revealed that exotic inheritance at 50 per cent level is optimum to exploit the production, reproduction and disease resistance potential of animal.
- It essential to produce large numbers of progeny tested bulls, genetically superior bulls and semen from such bulls should be made available.
- To encourage AI, it should be subsidized 100 per cent, all other equipment related to AI, liquid nitrogen should be made available to all the artificial inseminator on subsidized price.
- Elite cows should be identified at farmers level and more subsidies should be given to the farmers who is maintaining elite cows/high yields.
- Encouragements should be given to such farmers to rear calves scientifically so that improvements can be made in the population of high yielder .

MODULE-21: CATTLE BREEDS AND DESCRIPTORS OF IMPORTANTS BREEDS

Learning outcomes

- On completion of this module the learner will be able to describe different breeds of cattle utility wise and origin wise.

CATTLE AND BUFFALO BREEDS

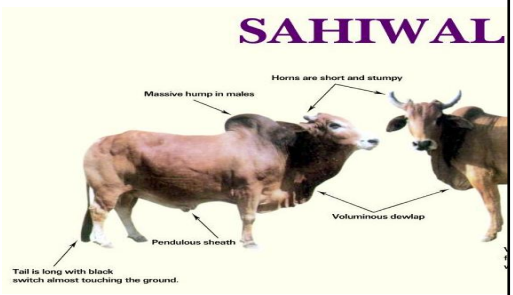
- Indian Cattle Breeds
  - Milch breeds
  - Milch and draught breeds (Dual Breed)
  - Draught breeds
- Exotic dairy breeds
- Breeds of Buffalo

Indian Cattle Breeds

Milch breeds

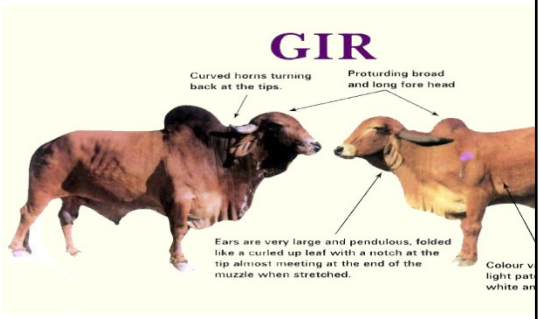
Sahiwal

- Mainly found in Punjab, Haryana, U.P, Delhi, Bihar and M.P.
- Milk yield – Under village condition :1350 kgs
  – Under commercial farms: 2100 kgs
- Age at first calving -32-36 months
- Calving interval – 15 month



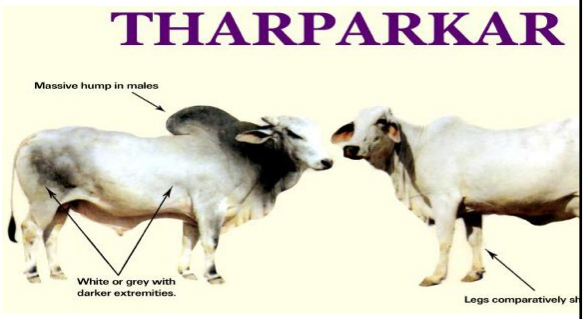
Gir

- Mainly found in Gir forest areas of South Kathiawar
- Milk yield – Under village condition : 900 kgs
  – Under commercial farms: 1600 kgs



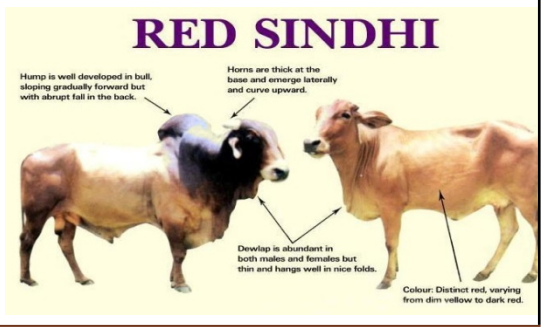
Tharparkar

- Mainly found in Jodhpur, Kutch and Jaisalmer
- Milk yield – Under village condition :1660 kgs
  – Under commercial farms: 2500 kgs



Red Sindhi

- Mainly available in Punjab, Haryana, Karnataka, Tamil Nadu, Kerala and Orissa.
- Milk yield – Under village condition :1100 kgs
  – Under commercial farms: 1900 kgs



TOP

Milch and Draught breeds (Duel breed)

Ongole • Mainly found in Nellore, Krishna, Godavari and Guntur district of A.P. • Milk yield –1500 kgs • Bullocks are powerful for cart work and heavy ploughing.	*Hariana* • Mainly found in Karnal, Hisar and Gurgaon district of Haryana, Delhi and western M.P • Milk yield –1140 -4500 kgs • Bullocks are powerful for road transport and rapid ploughing
Kankrej • Mainly found in Guajrat • Milk yield – Under village condition :1300 kgs – Under commercial farms : 3600 kgs • Age at first calving -36 to 42 months • Calving interval – 15 to 16 months • Bullocks are fast, active and strong. Good for plough and cart purpose	*Deoni* • Mainly found in North western and western parts of A.P. • Cows are good milk producers and bullocks are good for work

TOP

Draught Breeds

Amritmahal • Mainly found in Karnataka. • Best suitable for ploughing and	*Hallikar* • Mainly found in Tumkur, Hassan and Mysore districts of Karnataka

transport	
Khillar	*Kangayam* • Mainly found in Coimbatore, Erode, Namakkal, Karur and Dindigul districts of Tamil Nadu. • Best suited for ploughing and transport. Withstands hardy conditions.

TOP

Exotic dairy breeds

Jersey • Age at first calving : 26-30 months • Intercalving – 13-14 months • Milk yield – 5000-8000 kgs • Dairy milk yield is found to be 20 lts whereas cross bred jersey, cow gives 8-10 lts per day. • In India this breed has acclimatized well especially in the hot and humid areas	*Holstein Friesian* • This breed is from Holland • Milk yield - 7200-9000 kgs • This is by far the best diary breed among exotic cattle regarding milk yield. On an average it gives 25 litres of milk per day, whereas a cross breed H.F. cow gives 10 - 15 lts per day. • It can perform well in coastal and delta areas

TOP

Breeds of Buffalo

Murrah • Mainly found in Haryana, Delhi and Punjab • Milk yield – 1560 kgs • On an average the daily milk yield is found to be 8-10 lts, whereas a cross breed murrah buffalo gives 6-8 lts per day. • It performs well in coastal and slightly cold climatic areas.	*Surti* • Gujarat • 1700-2500 kgs
Jaffarabadi • Kathiawar district of Gujarat • 1800-2700 kgs	*Nagpuri* • Nagpur, Wardha, Akola, Amravathi and Yeotmal in Maharastra. • Milk yield – 1030-1500 kgs

UTILITYWISE CLASSIFICATION

- The Indian breeds of cattle and buffaloes are classified as
  - Milch breeds,
  - Draught breeds
  - Dual (General utility) breeds
  - Cross breed
  - buffalo breeds
- They are as follows,

S.NO	TYPE OF BREED	BREEDS	SALIENT CHARACTERS

I	Milch breeds	• Gir • Red Sindhi • Sahiwal • Deoni	Ponderous in build, pendulous dewlap and sheath have lateral or curved horns, predominantly red with varying colour pattern.
II	Draught breeds	• Nagori • Bachur	Short horned white or light grey colour, with long coffin shaped skull and slightly convex profile.
		• Kenketha • Malvi • Kerigarth	Lyre horned grey with wide forehead, prominent orbital arches, flat dished profile.
		• Hallikar • Amirthamahal • Khillari • Kangeyam • Bargur	Mysore type – prominent fore head with long pointed horn raises closer at poll, coffin shaped skull. Grey colour.
		• Ponwar • Siri	Short horned or slightly lyre horned small black, red, dun colour.
III	Dual (General utility) breeds	• Gaoloa • Krishna valley	Short horned white or light grey colour, with long coffin shaped skull, convex profile.
		• Tharparkar • Kankrej	Lyre horned grey with wide forehead prominent orbital arches, flat or dished profile.
IV	Exotic breeds used to produce cross breed of cattle in India are	• Short horns • Ayrshire • Jersey • Brown Swiss • Red Dane • Guernsey • Holstein– Friesian	
V	Buffalo Breeds	• Murrah • Bhadawari • Jaffarabadi • Surti • Mehsana • Nagpuri or	

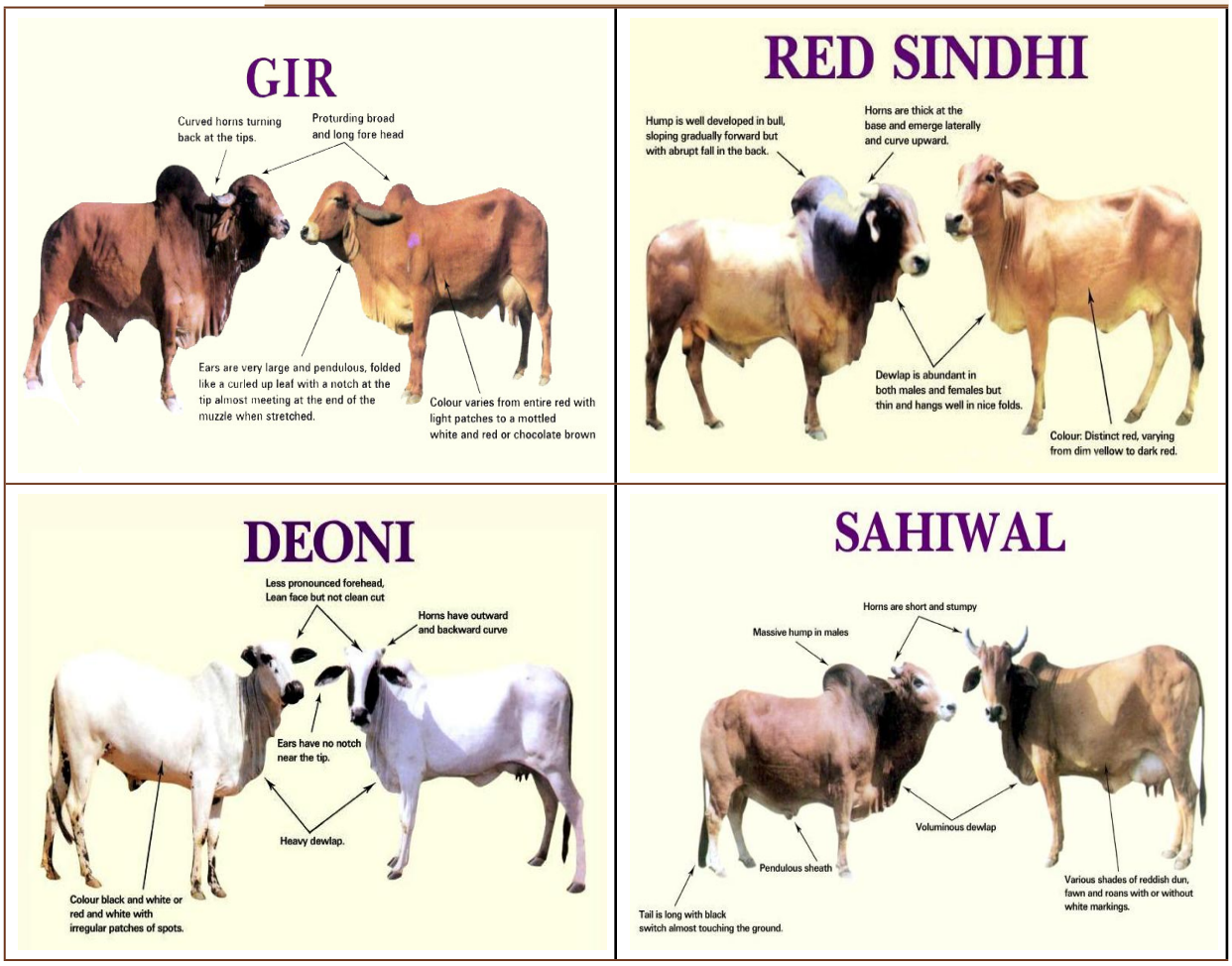
		Ellichpuri • Nili – Ravi	

CLASSIFICATION OF DIFFERENT BREEDS

TYPE OF BREED	BREEDS
Milch breeds	• Gir • Red Sindhi • Sahiwal • Deoni
Draught breeds	• Nagori • Bachur • Kenketha • Malvi • Kerigarth • Hallikar • Amirthamahal • Khillari • Kangeyam • Bargur • Ponwar • Siri
Dual Purpose breed	• Gaoloa • Krishna valley • Tharparkar • Kankrej
Exotic breeds	• Short horns • Ayrshires • Jersey • Brown Swiss • Red Dane • Guernsey • Holstein– Friesian
Buffalo breeds	• Murrah • Bhadawari • Jaffarabadi • Mehsana • Nagpuri or Ellichpuri

	• Nili – Ravi

INDIGENOUS MILCH BREEDS



(Click over the image to view the label)

GIR

(View the cattle)

Synonyms: Desan, Gujarati, Kathiawari, Sorthi, Surati

Origin: Gir forests of South Kathiawar in Gujarat.

Typical characteristics of Gir breed

- Basic colours of skin are white with dark red or chocolate-brown patches or sometimes black. Most of the Gir animals seen today are purely red.
- Broad convex forehead like a bony shield.
- Long and pendulous ears are folded like a leaf with a notch at the tip.
- Their inside faces forward and always remains hanging from the base.
- Horns are peculiarly curved, it take a downward and backward curve and again incline a

little upward ad forward taking a spiral inward sweep giving a ‘half moon’ appearance.
- Tail is long and whip like.

Performance parameters

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

Other details

- Gir breed has been exported to other parts of the world. In Brazil large herds are found and it is known as Gyr. Brazil has also evolved a strain called Indubrasil which is a cross between Gir and Kankrej. Gir has also been exported to USA especially to Texas, Florida and Louisiana states.

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RED SINDHI

(View the cattle)

Synonyms: Red Karachi and Sindhi

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

Typical characteristics

- Head is well proportioned with a occasional bulge on the forehead.
- Horns are thick at the base and emerge laterally and curve upward.
- Hump is well developed in males.
- Dewlap and sheath are pendulous.
- Udder is capacious and pendulous.
- Compact frame and dropping quarters.
- Colour is red with shades varying from dark red to light, strips of white colour also sometime seen on dewlap and on forehead.

Performance parameters

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

Other details

- Owning to their small size, adaptability to varying climatic condition and capacity to resist common disease this breed is widely used in crossbreeding programmes.
- They are also great demand in Korea, Malaya, Brazil, Cuba, Burma, Ceylon, Japan and Philippine.

SAHIWAL

(View the cattle)

Origin: Montgomery district in present Pakistan.

Synonyms: Lola (loose skin), Lambi Bar, Montgomery, Multani, Teli

Typical characteristics

- The colour is reddish dun or pale red, sometimes flashed with white patches.
- The Sahiwal is a heavy bred with symmetrical body and loose skin.
- Animals are long, deep, fleshy and comparatively lethargic.
- Horns are short and stumpy.
- Dewlap is large and heavy. Hump in males is massive and frequently falls on one side.
- Naval flap is loose and hanging. Sheath in males is also pendulous.
- Tail is long and fine with a black switch reaching almost to the ground.
- The distinguishing feature between Sahiwal and Red Sindhi is the muzzle.
- Red Sindhi has dark colour muzzle whereas Sahiwal has lighter colour muzzle. Sahiwal has also whitish ring along the eye. Muzzle and eye-lashes are of lighter colour.

Other details

- The average milk yield of this breed is between 2,725 and 3,175 kg in lactation period of 300 days and certain cows normally give as high as 4,535 kg. of milk.
- The bullocks of this breed are lethargic but useful for slow work.
- This breed involved in development of new cattle breed Jamaica Hope.
- The Jamaica Hope cattle breed constitutes about 70 to 75 per cent of Jersey and about 20 per cent of Sahiwal and small fraction of Criollo cattle.
- Other breeds like Australian-Friesian Sahiwal (AFS), Australian Milking zebu (AMZ) and Mpwapwa (Indo-African zebu cattle breed) also has Sahiwal.

DEONI

(View the cattle)

Synonyms: Dongerpati, Dongari, Wannera, Waghyd, Balankya, Shevera.

Origin: Marathwada region of Maharashtra state and adjoining part of Karnataka and western Andhra Pradesh states.

Typical characteristics

- Body colour is usually spotted black and white. Ears are grey-white or complete white with black pinna. This breed has three strains, viz.
    - Complete white animal without any spot on the body
    - Complete white animal wit partial black face
    - Black and white sported animals.
- Ears are drooping like in Gir and forehead is prominent and slightly bulged similar to that of Gir.
- Horns emerge from the sides of the poll behind and above the eyes.
- Hump is massive and well developed
- Skin is thick, loosely attached with the body. Udder is moderately developed.
- Teats are black, cylindrical with rounded tips and are squarely placed.
- Age at first calving ranges from 894 to 1540 days with an average of 1391 days.
- Milk yield ranges from 636 to 1230 kg with an average of 940 days. Caving interval averages 447 days.

EXOTIC BREEDS

- In order to improve the milk yielding capacity of the indigenous cows, exotic cattle breeds have been extensively used in India.
- Military farms were the first to introduce some of the well-known European breeds such as Shorthorn, Ayrsires, and Holstein – Friesians about 50-60 years ago.
- Since then a number of other exotic breeds with different levels of exotic inheritance have also been produced in India.
- Important exotic breeds of cattle used in India are
    - Jersey
    - Brown Swiss
    - Guernsey
    - Red Dane
    - Holstein – Friesians
    - Ayrsire
    - German Fleckvieh (spoltted mountain cattle)
- Jersey breed has been increasingly in demand. Military farms have 3500 herds of such cross breed cattle.
- The maximum milk yield of crossbred cattle during one lactation at the military farms is 6000 kg and the average yield being 2600 kg.
  The maximum daily yield of one of the cow has been recorded to be upto 46 kg.

INTRODUCTION

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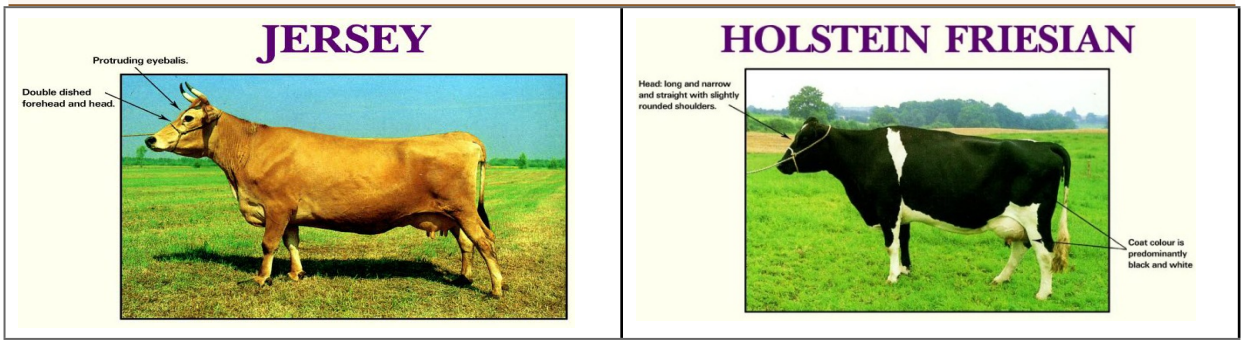
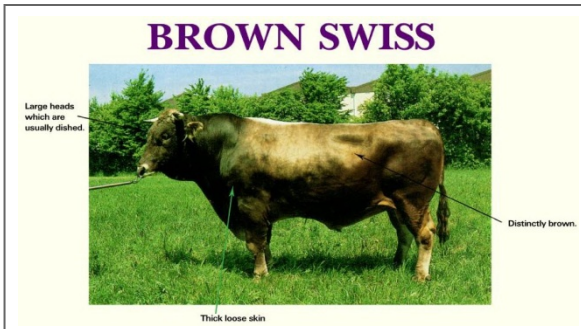
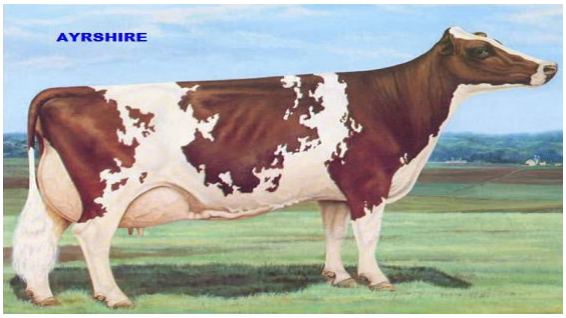
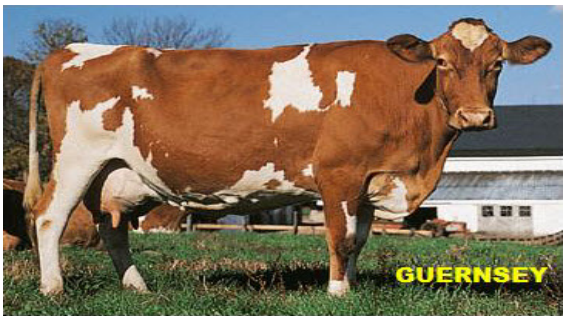
EXOTIC MILCH BREEDS



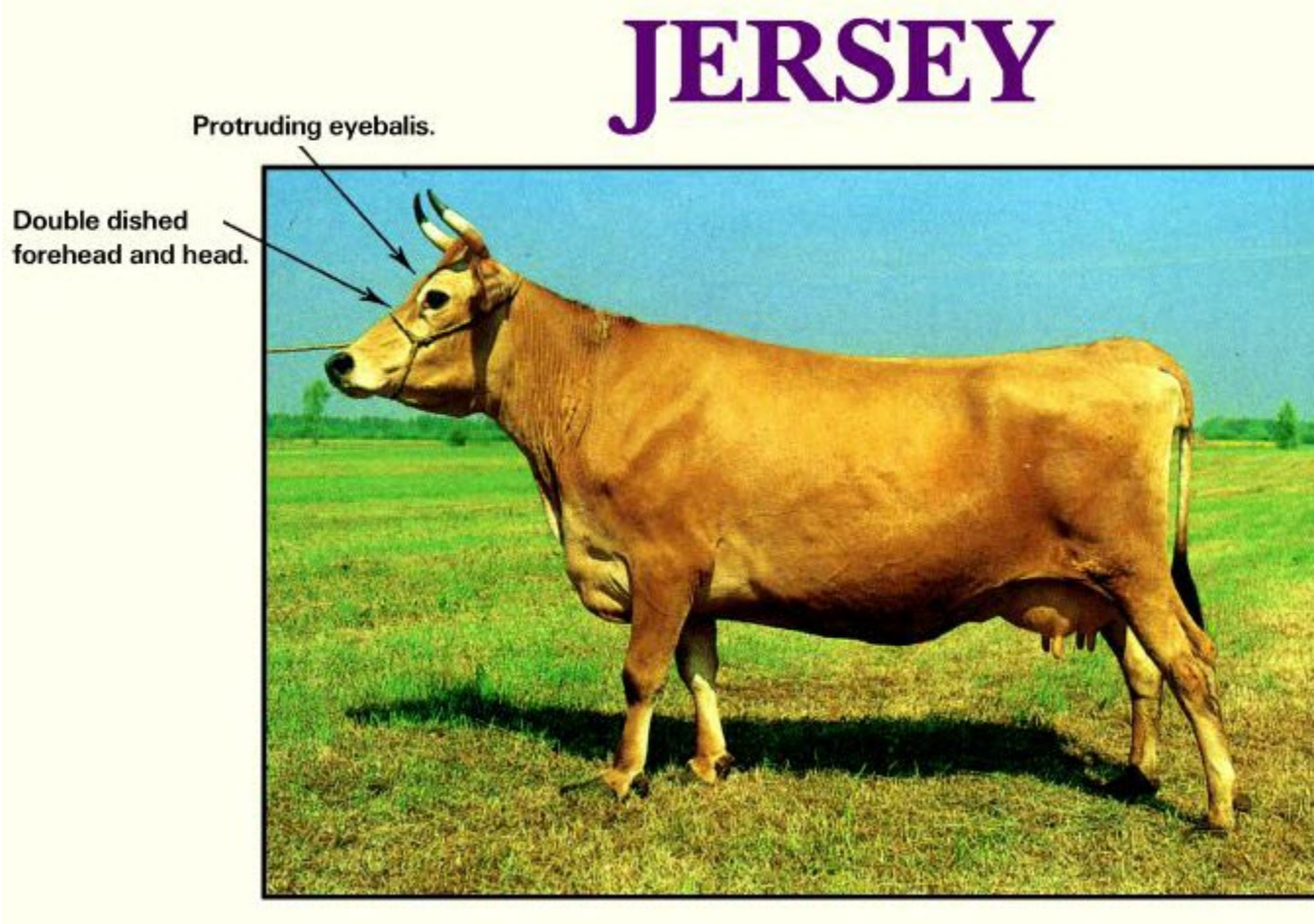






JERSEY

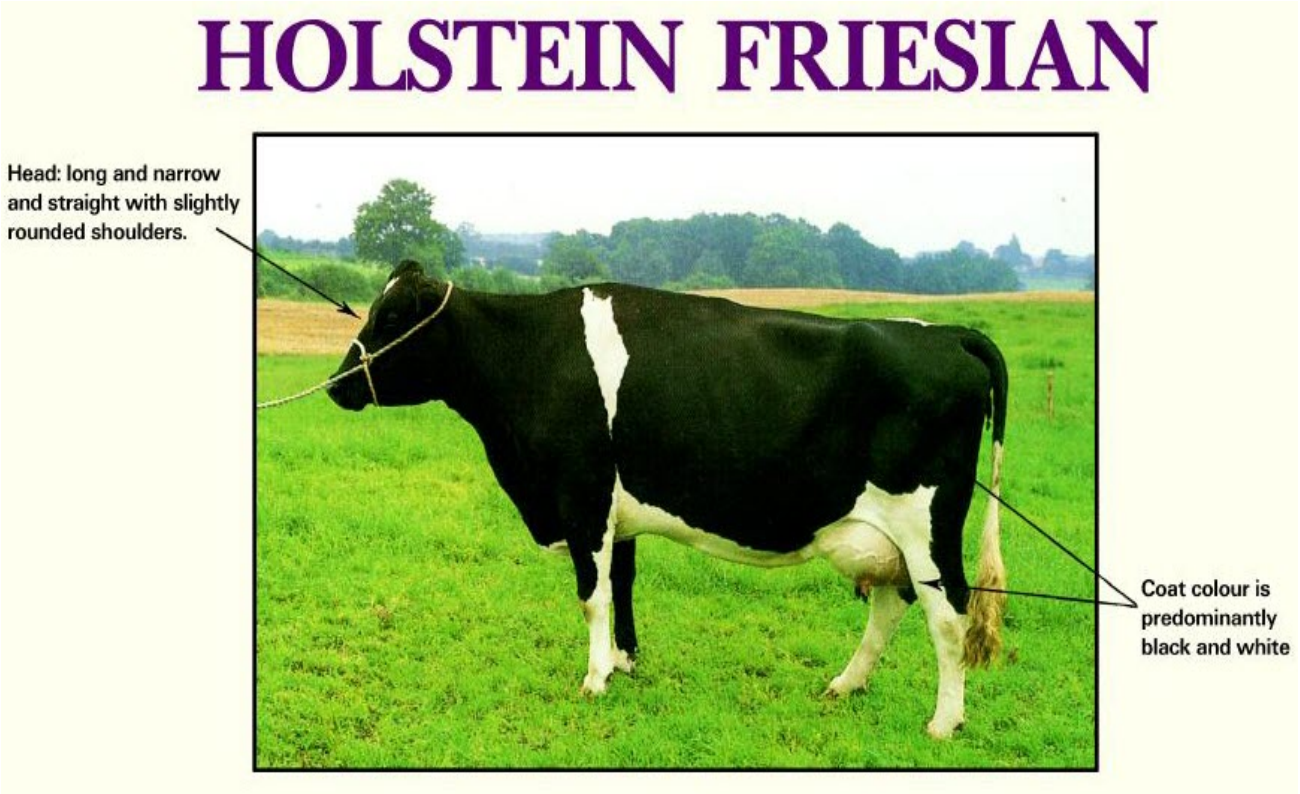
- It is the smallest of the dairy types of cattle developed on island of Jersey, U.K.
- In India this breed has acclimatized well and is widely used in cross breeding with indigenous cows.
- Because of their small and compact size they are more suitable for cross-breeding with zebu cattle.
- The typical colour of Jersey cattle is reddish fawn.
- Dished fore head and compact and angular body.
- These are economical producers of milk with 5.3% fat and 15% SNF.
- The highest record of milk yield was 11381 kg and fat 544 kg in a lactation period of 365 days.
- In India this breed has acclimatized well and has brought about increased production of milk (2.5 times or 50 in the first generation progeny).
- The age of maturity and inter calving period in the progeny have been considerably reduced.



HOLSTEIN FRIESIAN

- This breed was developed in the northern parts of Netherlands, especially in the province of Friesland.
- They are ruggedly built and they possess large udder.
- They are the largest dairy breed and mature cows weigh as much as 700kg.
- They have typical marking of black and white that make them easily distinguishable.
- This is by far the best dairy breed.
- The average production of cow is 6000 to 7000 kg per lactation. However, the fat content in their milk is rather low (3.45 per cent).

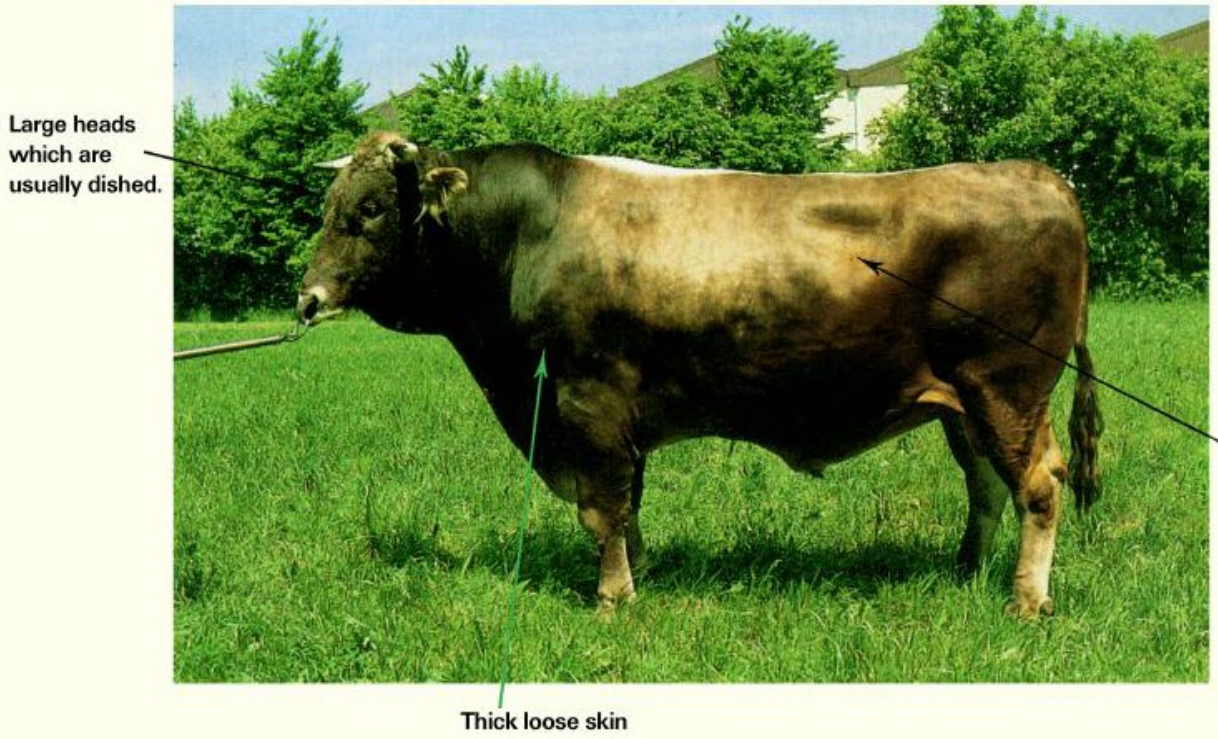
HOLSTEIN FRIESIAN



BROWN SWISS

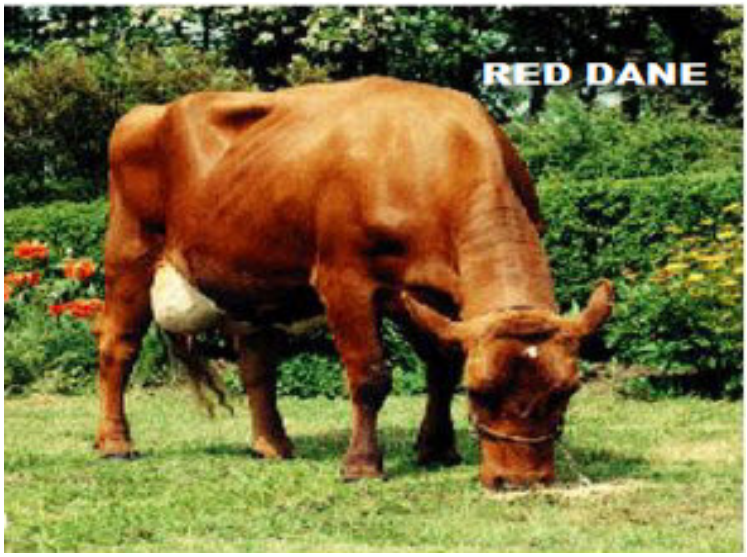
- It is rather les refined than other dairy breeds, but is famous in its home tract for its rugged nature and good milk production.
- In spite of its ruggedness the anima is quite docile and easily manageable.
- In India excellent crossbred cattle have been obtained by crossing this breed with recognized Indian breeds of cattle; the Karan swiss cattle of National Dairy Research Institute, Karnal.
- The mountainous region of Switzerland is the place of origin of Brown Swiss breed.

BROWN SWISS



RED DANE

- The typical body colour of this Danish breed is red, reddish brown or even dark brown.
- It is also a heavy breed; mature males weighing up to 950 kg and mature female weigh 600 kg.
- The lactation yield of Red Dane cattle varies from 3000 to 4000 kg with a fat content of 4 per cent and above.

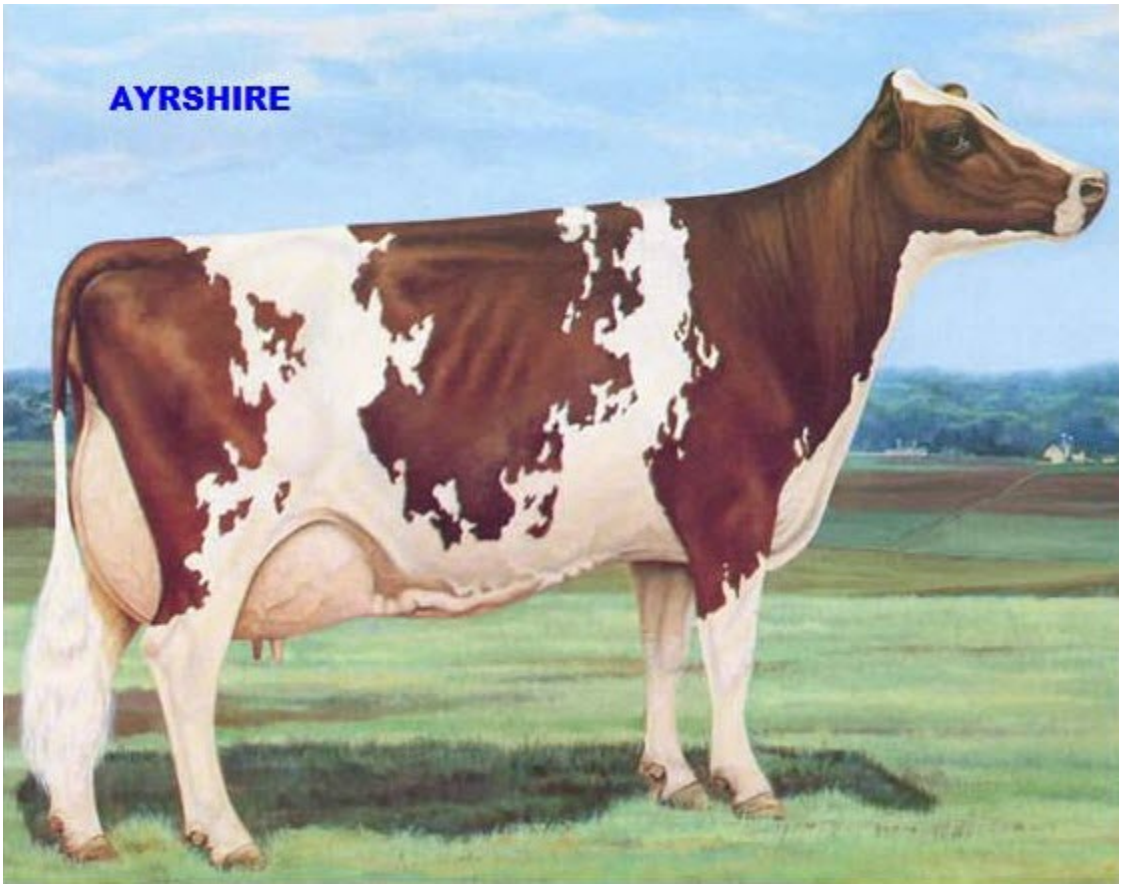


AYRSHIRE

- Origin in Scotland is considered as most beautiful dairy breed. These are very active animals but hard to manage.
- They do not produce as much milk or butter fat (only 4%) as some of the other dairy breeds.
- The Ayrshire cattle is a breed of dairy cattle originated from Ayrshire in Scotland.
- The average mature Ayrshire cow weighs 1000-1300 pounds. Ayrshires have red markings.
- The red can be an orange to a dark brown, with or without colored legs.
- They are known for low somatic cell counts, ability to convert grass into milk efficiently, and hardiness.
- The breed's strongpoints are the now desired traits of easy calving and longevity.
- They also have a very "spirited" nature, which may or may not be desirable.
- The breed was also known as Dunlop cattle (see Dunlop) or Cunninghame cattle (see Cunninghame).
- They were exported to all parts of the world and extensive cattle docks used to exist at Cunninghamhead station for loading and export purposes.
- The Dunlops of that ilk are credited with breeding this line, with animals being brought in from Holland.
- Ayrshires (especially the ones from Finland) are also crossed with Holstein cattle in order to improve the Holstein's hardiness and fertility.

Typical Characteristics

- Ayrshires are medium-sized cattle weighing over 1200 pounds at maturity.
- They are strong, rugged cattle that adapt to all management systems including group handling on dairy farms with free stalls and milking parlors.
- Ayrshires excel in udder conformation and are not subject to excessive foot and leg problems.
- These traits make Ayrshires outstanding commercial dairy cattle.
- Other traits that make Ayrshires attractive to the commercial dairyman include the vigor of Ayrshire calves.
- They are strong and easy to raise.
- The Ayrshire is a moderate butterfat breed and relatively high protein breed.
- The actual average of all Ayrshires on official ABA programs in 2002 is 17,230 pounds of milk with 665 pounds of fat and 542 pounds of protein.



GUERNSEY

Origin

- Small island of Guernsey (France).
- As its name implies, the Guernsey was bred on the British Channel Island of Guernsey.
- It is believed to be descended from two breeds brought over from nearby France; Isigny cattle from Normandy and the Froment du Léon from Brittany.

- The Guernsey was first recorded as a separate breed around 1700.
- In 1789, imports of foreign cattle into Guernsey were forbidden by law to maintain the purity of the breed although some cattle evacuated from Alderney during World War II were merged into the breed.
- Exports of cattle and semen were for a while an important economic resource for the island and in the early 20th century a large number of Guernsey cattle were exported to the United States.
- Today the breed is well-established in Great Britain, the United States, Canada, South Africa and elsewhere.

Production performance

- The unique qualities of the milk produced by the Guernsey cow have made the breed world famous.
- The milk has a golden colour due to an exceptionally high content of beta carotene which may help to reduce the risks of certain cancers.
- The milk also has a high butterfat content of 5% and a high protein content of 3.7%.Guernsey cows produce around 6000 litres per cow per annum.

Specifications

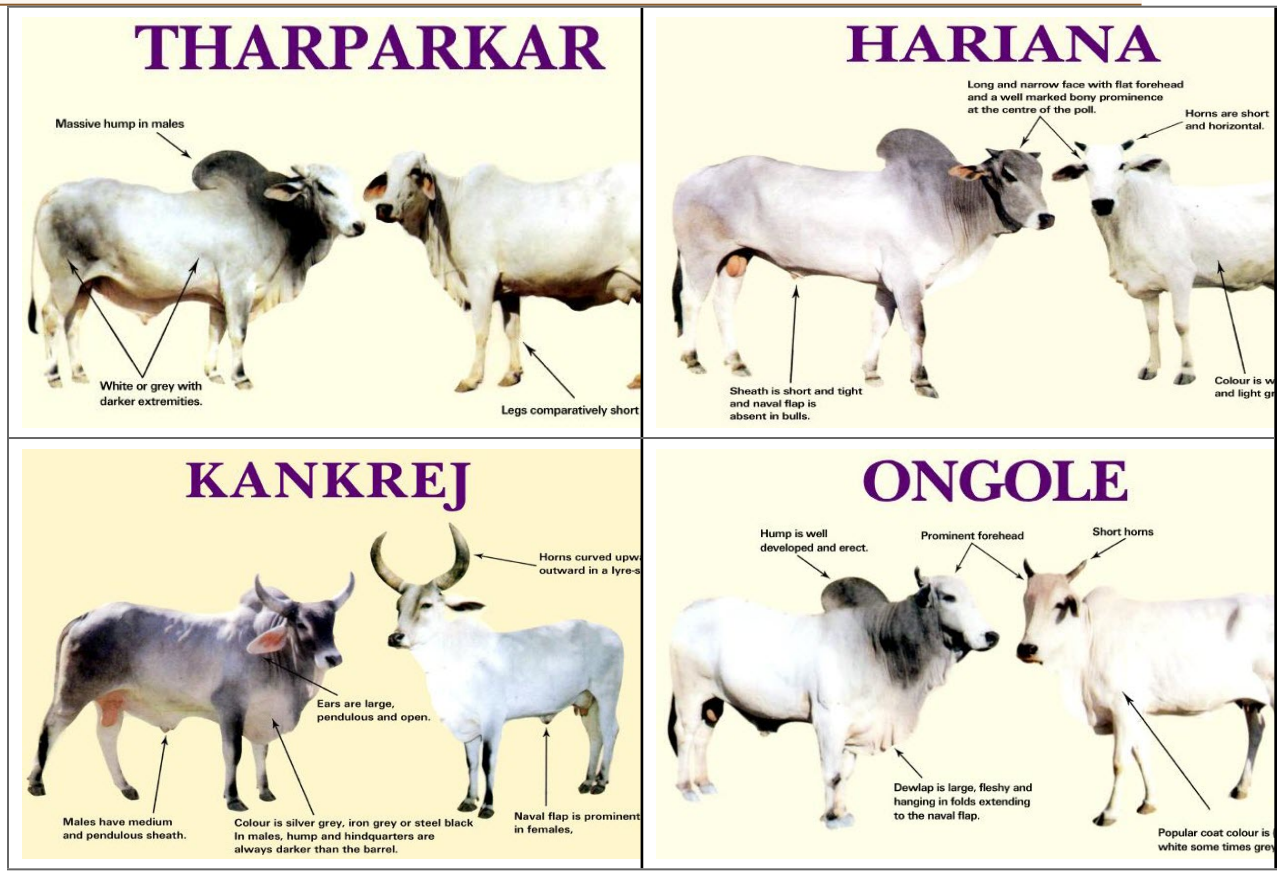
- Guernsey is a breed of cattle used in dairy farming.
- It is fawn and white in color, and is particularly renowned for the rich flavour of its milk, as well as its hardiness and docile disposition.
- The cow weighs 450 to 500 kg, slightly more than the average weight of the Jersey cow which is around 450 kg (1000 pounds).
- The bull weighs 600 to 700 kg which is small by standards of domestic cattle, and they can be surprisingly aggressive.
- The Guernsey cow has many notable advantages for the dairy farmer over other breeds.
- These include high efficiency of milk production, low incidence of calving difficulty and longevity.

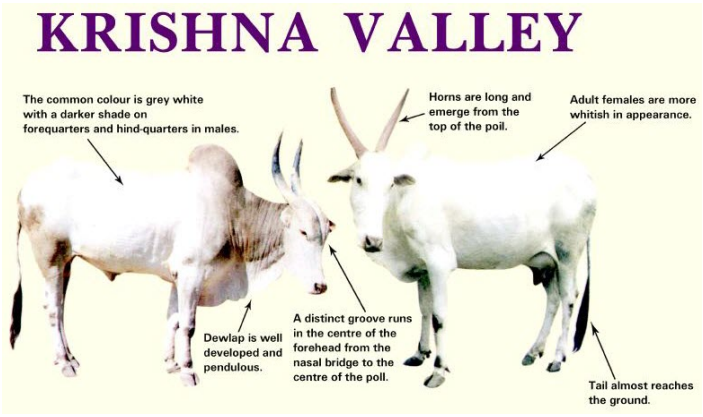
NEW CROSSBRED STRAINS OF CATTLE DEVELOPED IN INDIA BY CROSSING THE EXOTIC BULLS ON INDIAN CATTLE

BREED	CHARACTERISTICS
Taylor breed	• Evolved near Patna • Crosses of *taurus* bulls (Ayrshire bulls from UK) with local cows by Dr. Taylor.
Jersind	• Cross between Red Sindhi 3/8 and Jersey 5/8. • Small body size and better adaptability is characteristic feature.
Brown-sind	• 3/8-5/8 Brown Swiss x Red Sindhi.
Karan Swiss	• It has been evolved by crossing American Brown Swiss bulls with Sahiwal and Red Sindhi cows at NDRI, Karnal. • Brown Swiss inheritance is around 50%. • The colour of the breed is red dun. • It resembles Sahiwal in its body size and general appearance, and is pendulous as in Sahiwal. • The average age at first calving is 32 months and first lactation yield was 3,564 kg

	with 4.2-4.4 % fat.
Karan Fries	• Cross between Tharparkar and Holstein Friesian at NDRI, Karnal. • The breed has 50% Friesian inheritance. • The breed carries black patches and sometimes is completely dark with white patches on the forehead and switch. • Average yield 3700 kg with 3.8 to 4.0% fat.
Sunandini	• Under Indo-Swiss project in Kerala, local non-descript cows were crossed with Brown Swiss bulls. • The crosses with 62.5% brown-Swiss inheritance were mated intense followed by selection to synthesize a new breed named Sunandini. • Average lactation yield 4351 kg in 305 days.
Frieswal	• Friesian x Sahiwal crossbreds with Friesian inheritance between 3/8 and 5/8 at military farms are being intebred with semen of 5/8 Friesian crossbred bulls into a breed formation programme. • Average yield 2729 kg.

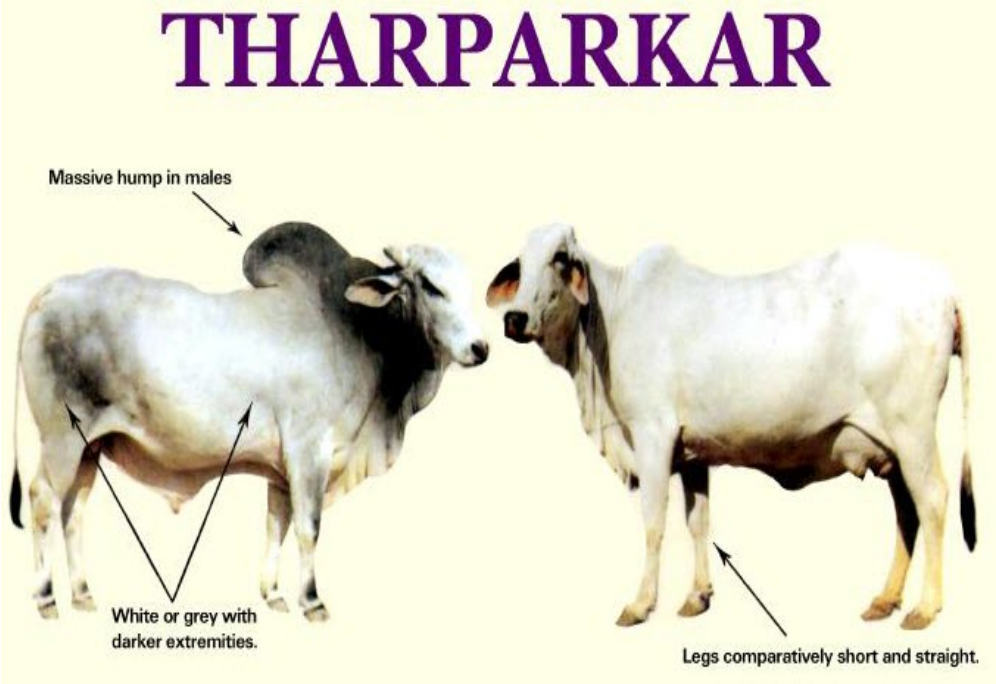
DUAL PURPOSE BREEDS





THARPARKAR

- *Origin:* Tharparkar district of southeast Sind in Pakistan.
- *Synonyms:* White Sindhi, Gray Sindhi, Thari.
- *Typical characteristics*
  - Body colour is white or light grey.
  - Horns are set well apart curving gradually upward and outward.
  - Tharparkar has proved to be one of the best dual-purpose breeds of India.
  - The bullocks are quite suitable for ploughing and casting and the cows are good milch animals (1,800 – 2600 kg).
  - Age at first calving ranges from 38-42 months and inter calving period from 430 to 460 days.



HARIANA

Origin

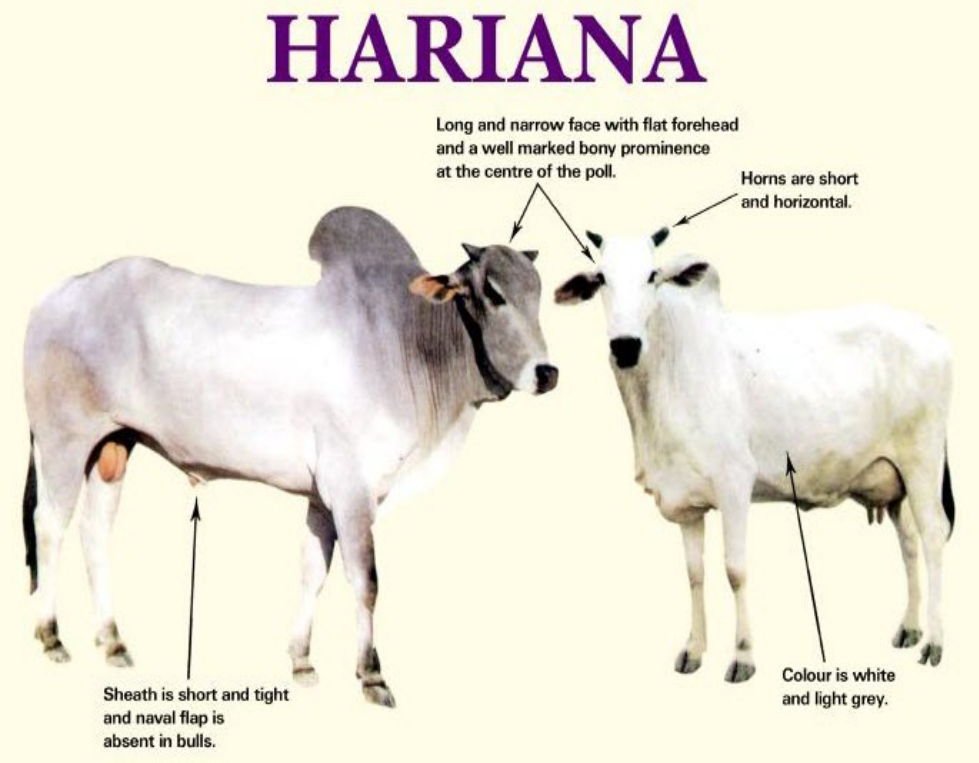
- Rohtak, Hisar, Jind and Gurgaon districts of Haryana.

Typical characteristics

- Horns are small
- Long and narrow face, flat forehead and well marked bony prominence at the centre of the poll.
- Udder is capacious and extends well forward with a well developed milk vein.
- White or light grey in colour. In bulls, colour in between fore and hnd quarters is relatively dark or dark grey.
- It is one of the most important breeds of cattle in India as a first class dual-purpose breed.
- Hariana cattle are proportionately built and are compact in appearance. The bullocks are good workers.

Production performance

- Hariana cows are good milkers yielding on an average 1.5 kg/cow/day in a lactation period of 300 days.
- Average milk yield 600 to 800 kg per lacation. The age at first calving is 40-60 months.



KANKREJ

Synonyms

- Wadad or Waged, Wadhiar.

Origin

- Southeast Rann of Kutch of Gujarat and adjoining Rajasthan (Barmer and Jodhpur district).

Typical characteristics

- Fore head is broad and slightly dished in the centre.
- Face is short ad nose is slightly upturned.
- Ears are large and pendulous and open.
- Horns are strong, and curved outward and upward in a lyre shaped fashion.
- They are covered with skin to a longer distance as compared to other breeds.
- The gait to Kankrej is peculiar to the breed; the action is smooth, there is hardly any movement of the body, the head held noticeably high, the hind hoof is placed well ahead of the impression of fore hoof. This gait is called 1 ¼ paces (sawai chal) by the breeders.
- Colour of the animal varies from silver-grey to iron-grey or steel black. In males forequarters, hindquarters and hump are slightly darker than the rest of the body.
    - Kankraj is the most prized breeds of cattle in India.
    - Kankrej or wadhiar is a carefully bred breed of cattle, and is valued for fast, powerful, draught cattle. Useful in ploughing and carting.
    - The cows are good milkers, yielding about 1360 kg in farms and less in village during the lactation period.
    - Kankrej is being breed by professional breeders.
    - The intensive work conducted at the Agricultural institute Anand (Gujarat) has established its milking potentialities.
    - It is one of the best dual purpose breeds of India, next only to Haryana.

ONGOLE

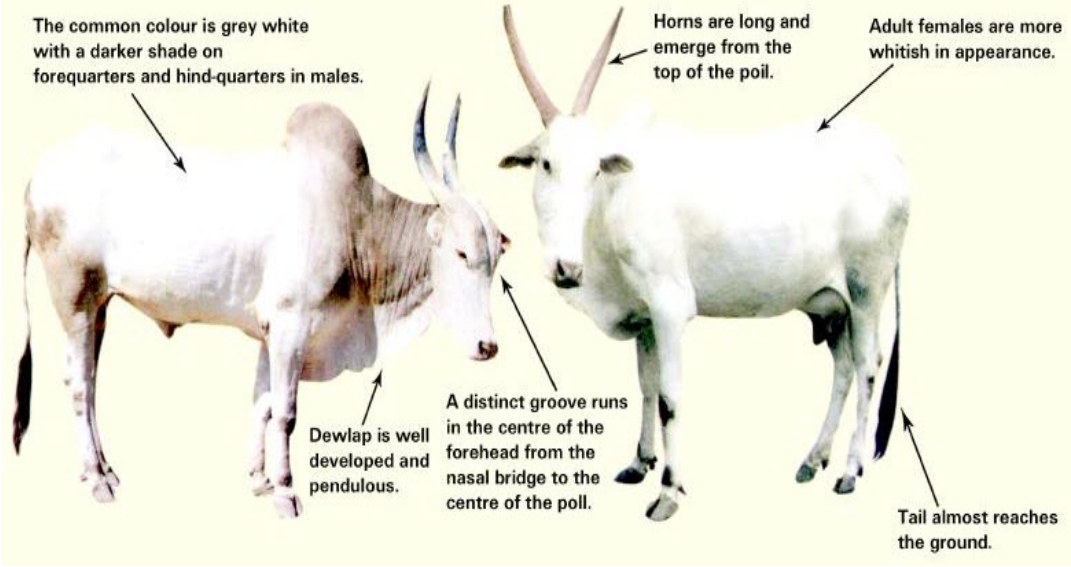
- *Synonym:* Nellore.
- *Origin:* Ongole taluk in Gantur district of Andhra pradesh.
- *Typical characteristics*
    - Animal posses great muscularity
    - Horns are short and stumpy growing outward and backward.
    - Hump is well developed, dewlap is fan shaped.

- Average milk yield is 1000 kg. age at first calving is 38-45 months with a intercalving period of 470 days.
- Excellent specimen of this breed have been exported to Brazil where large herds now exist. The are known as Nellore breed in Brazil.
- The famous Santa Gertrudis breed evolved in Texas, USA has the inheritance of Ongole breed it its development.
- Ongole cattle were exported to tropical America and other countries in large numbers.
- Like other zebu cattle their hardness, disease resistance, capacity of thrive on scanty and dry fodder have been quite helpful in evolving suitable beef breeds in other countries.
- Ongole have a glossy coat . Males have dark grey marking on head, neck and hump, black points on knees, aster, black muzzle, black eye lashes with a ring of black skin around eye.
- Tip of the ears and teats are black.

KRISHNA VALLEY

- Origin: black cotton soil of the water shed of the river Krishna in Karnataka.
- Typical characteristics
  - Animals are large, having a massive frame with deep, loosely built short body.
  - Forehead has a distinct bulge surmounted by small curved horns which usually emerge in an outward direction.
  - Dewlap is well developed and pendulous.
  - Ears are small and pointed; breeder prefers them not to droop too much.
  - Tail almost reaches the ground.
  - Common colour grey white with a darker shade on fore quarters and hind quarters in male. Adult females are more whitish in appearance.
- It is doubtful whether this is a pure breed as there is evidence to show an admixture of strain of the Mysore type of cattle.
- The bullocks of this breed are powerful animals useful for slow ploughing, and valued for their good working qualities.
- The cows are fair milkers, average yield being about 916 kg during the lactation period.

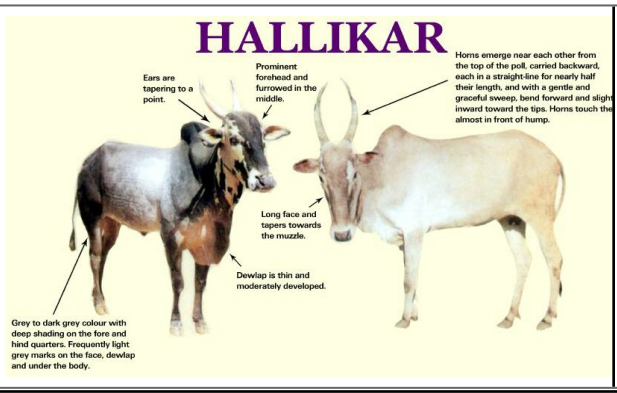
KRISHNA VALLEY



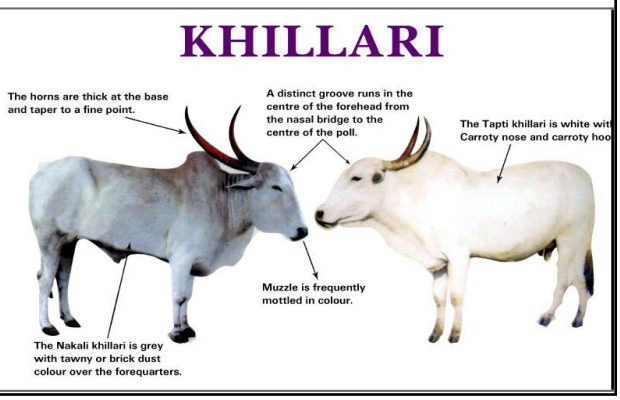
WHY DRAUGHT BREEDS?

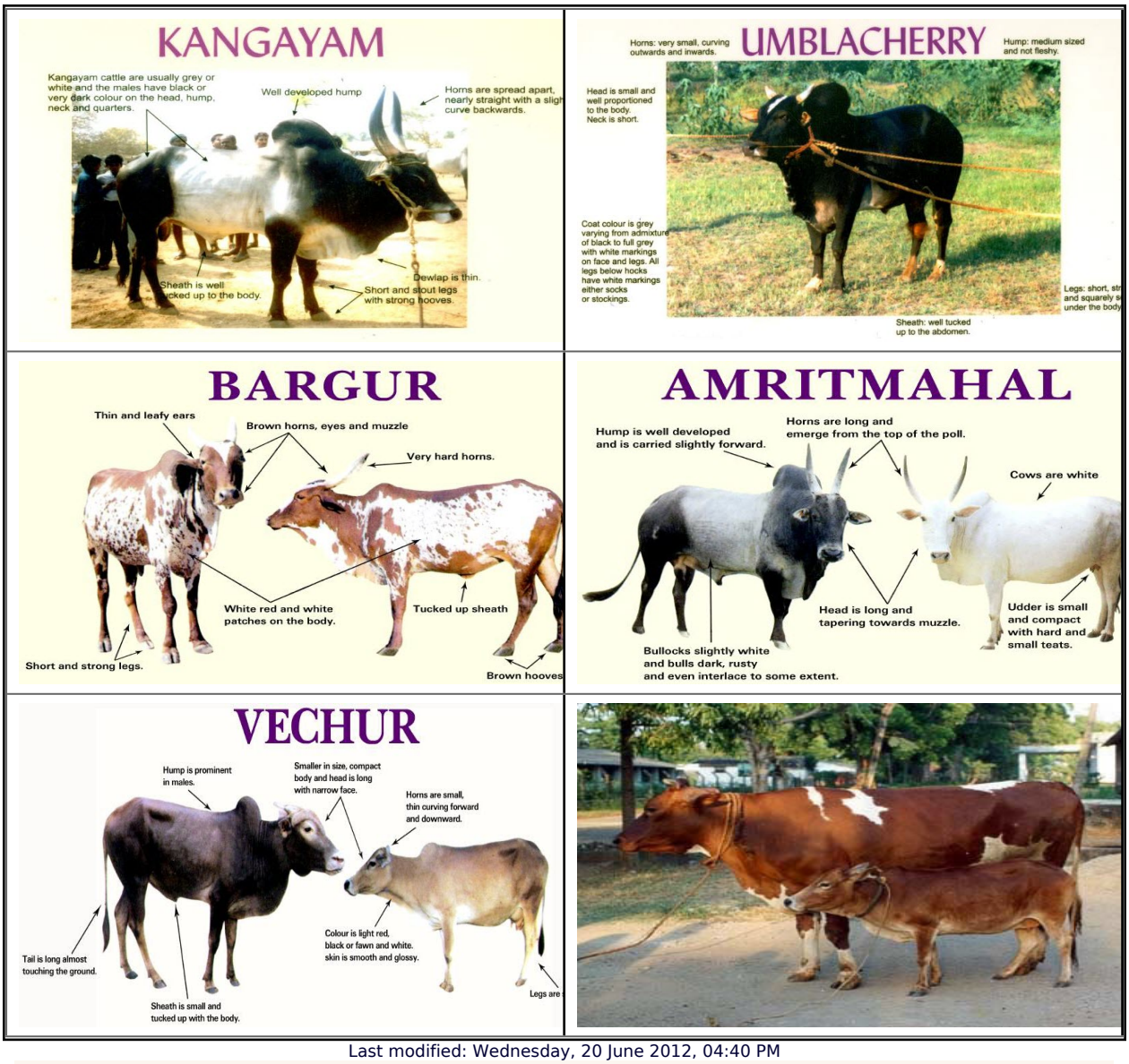
- India is rural based agricultural country. In India agriculture and animal Husbandry activities are going supplementary and complimentary to each other.
- More than 70% of the cultivator in India depends upon draft animal power for their agricultural activities.
- Draft animals are also used for transport purpose because most of Indian draft cattle are fast trotters on the road.
- Draft animals are the best converter of agricultural waste into farm yard manure.
- The following are the important draft breeds of India

HALLIKAR



KHILLARI





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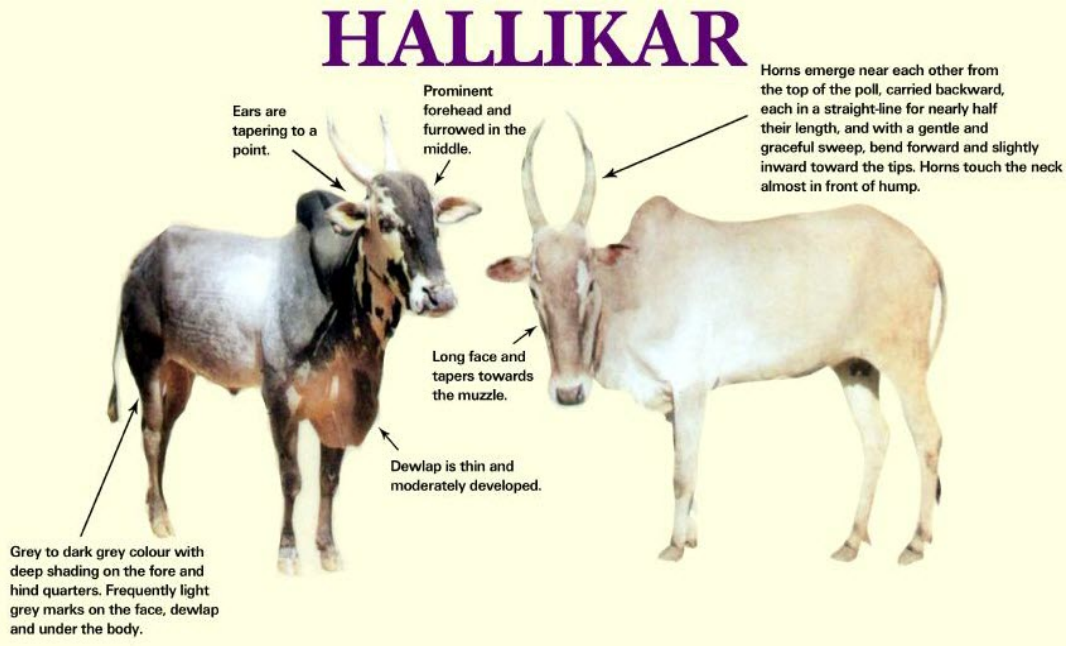
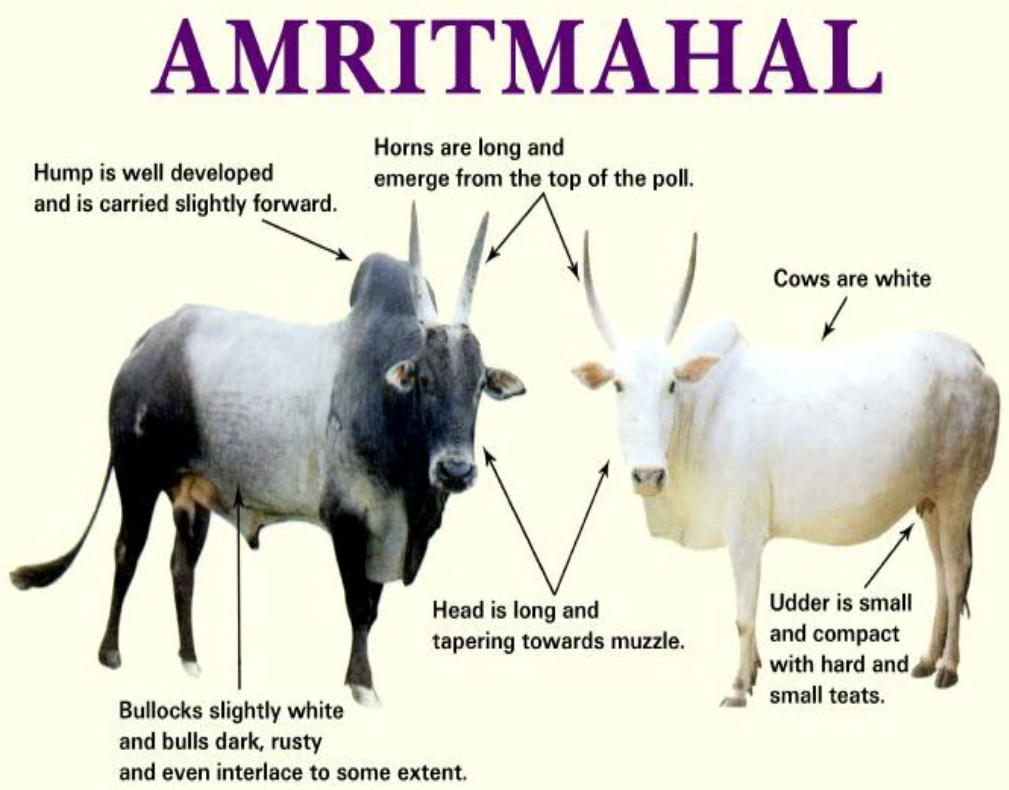
HALLIKAR

- Origin: from the former princely state of Vijayanagarm, presently part of Karnataka.
- Typical characteristics
  - The colour is grey
  - They are compact, muscular and medium size animal.
  - They horns emerge in proximity to each other near the top of the poll and are carried backward, straight for nearly half their length and then with a forward bend.
  - The forequarters are well developed and legs are strong.
  - The breed is best known for its draught capacity and specially for its trotting ability.
  - These animals were used in the war by Tipu Sultan for carrying cannons.



AMIRITMAHAL

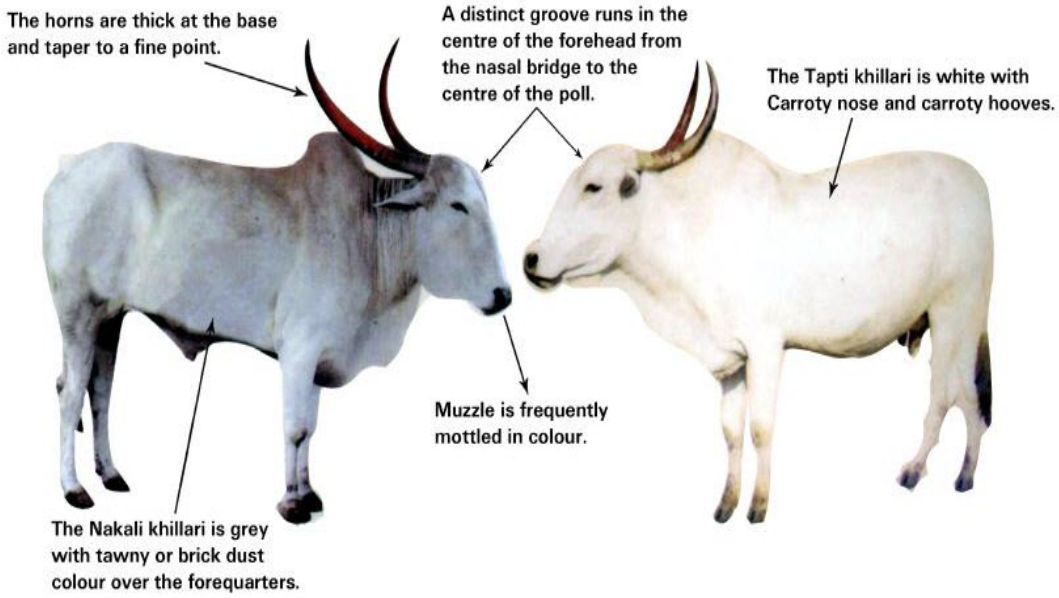
- *Origin:* Hassan, Chikmagalur and Chitradurga district of Karnataka.
- *Typical characteristics*
  - Amiritmahals are grey cattle but their shade varies from almost white to near black.
  - Head is long and tapering towards muzzle. Forehead is narrow bulging out with a furrow in the middle.
  - Horns are long and emerge from the top of the pole fairly close together in backward and upward direction, turn in and end in sharp black points.
  - Maharajas of Mysore had developed large farms called *Kavals* for developing this breed. They are closely related to Hallikar.
  - These animals were used in the war by *Tipu Sultan* for carrying cannons.



KHILLARI

- *Origin:* Sholapur and Sitapur districts of Maharashtra.
- *Typical characteristics*
  - Grey-white in colour.
  - The gait of Khillari is quick.
  - The forehead is long and with a convex bulge towards the horn with a distinct groove running in the centre of the forehead.
  - The horns are placed close together at the roof. They curve backwards for half the length and then turn forward in a peculiar fashion.

KHILLARI



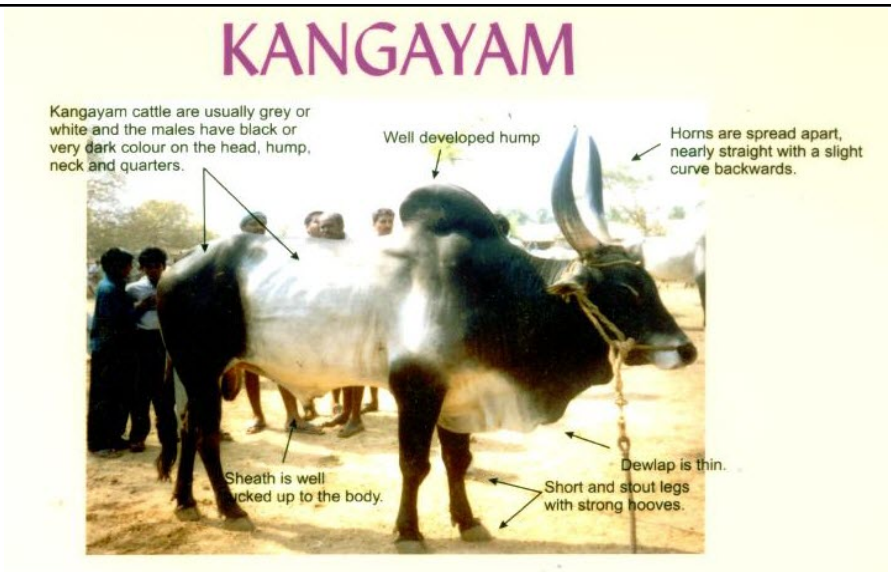
KANGAYAM

Origin

- Kangayam, Dharapuram, Perundurai, Erode, Bhavani and part of Gobichettipalayam taluk of Erode and Coimbatore district.
- The kangayam breed was developed by the efforts of the late Pattogar of Palayakottai, Sri N. Nallathambi Sarkari Manradiar.

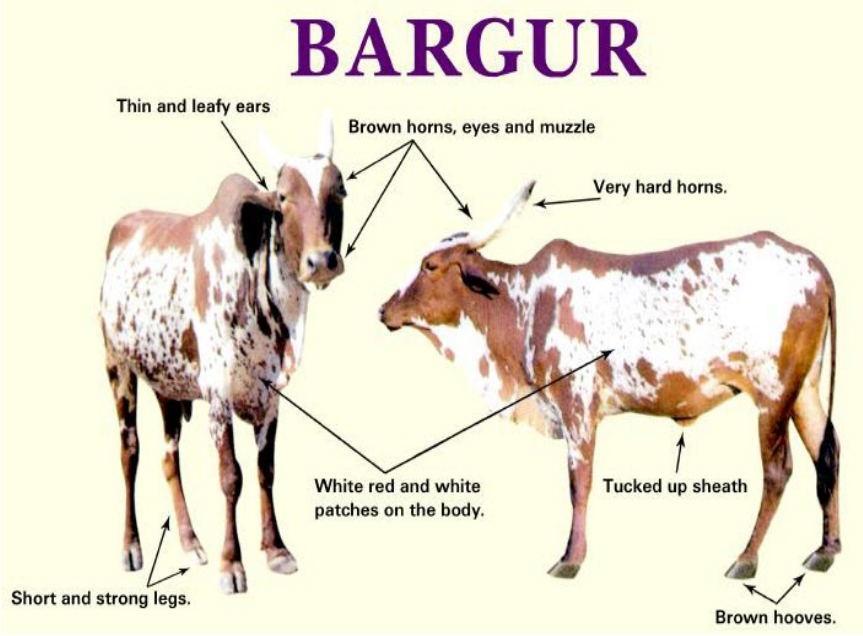
Typical characteristics

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



BARGUR

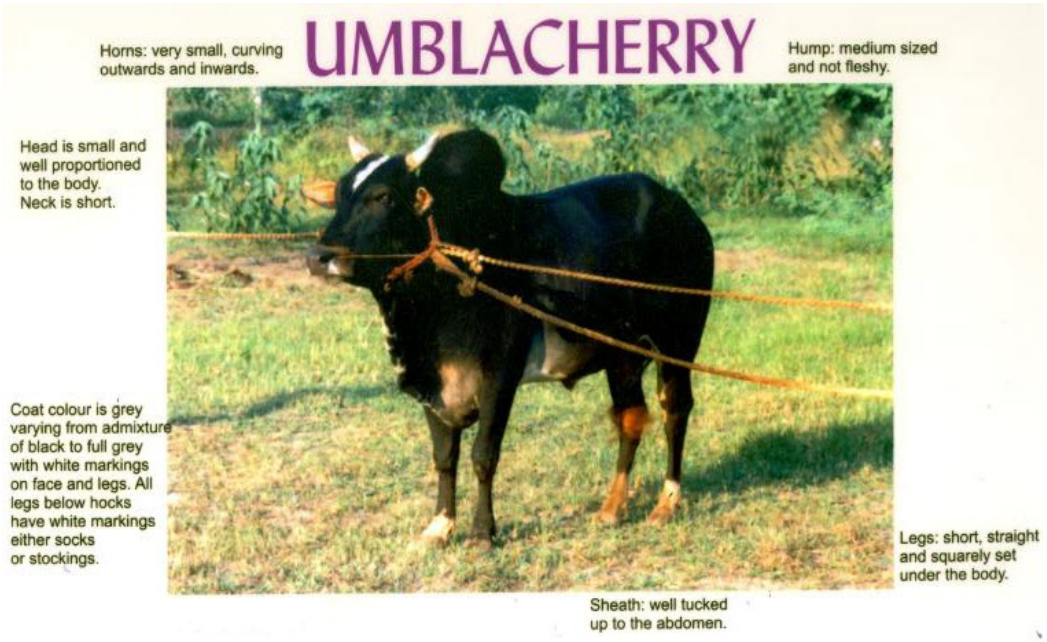
- Found around Bargur hills in Bhavani taluk of Erode district.
- Bargur cattle are of brown colour with white markings. Some white or dark brown animal are also seen.
- Animals are well built, compact and medium in size.
- Muzzle is moderate and black in colour.
- Horns are of light brown colour, moderate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



UMBLACHERY

- *Synonyms:* Jathi madu, Mottai madu, Molai madu, therkathi madu.
- *Origin:* Thanjavur, Thiruvarur and Nagappattinam districts of Tamil Nadu.

- *Typical characteristics*
    - Umblachery calves are generally red or brown at birth with all the characteristic white marking on the face, on limbs and tail.
    - The colour changes to grey at about 6months of age. In adult females, the predominant coat colour is grey with white marking on the face and legs.
    - All the legs below hocks have white marks either socks or stockings.
    - Horns are very small, curving outward and inward an sometimes spreading laterally.
    - The practice of dehorning bullocks is peculiar in Umblachery cattle. Horn buds are removed at 6 months of age by singing with red hot iron.
    - Ears are pruned and hot iron branding is done.



PULIKULAM / ALAMBADI

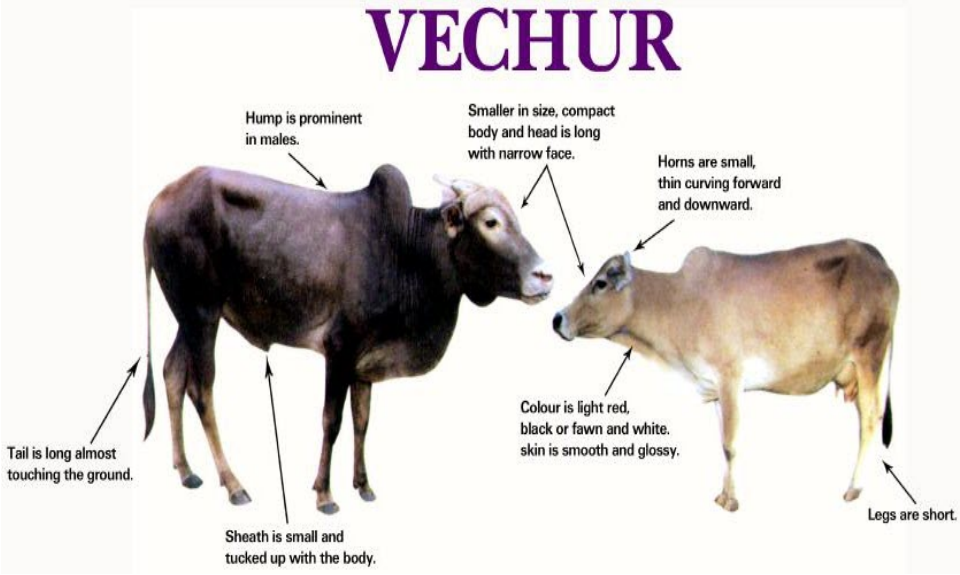
- Pulikulam / Alambadi bulls are dark grey, almost black and cows grey or white.
- They have the typical backward curving horns of Mysore type cattle.
- They are active, useful draught animals but not fast trotter.
- This breed is commonly seen in Salem and Coimbatore district of Tamil Nadu and part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

ALAMBADI

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

VECHUR CATTLE

- Till recently the number of Indian cattle breeds was estimated at 26. But the latest calendar of Indian Council of Agricultural Research (ICAR) on 'Cattle Breeds of India', published by the National Bureau of Animal Genetic Resources (NBAGR) showed pictures of 30 breeds. The latest addition was a dwarf cattle from Kerala called the Vechur cattle.
- The Vechur cattle thus became the first among Kerala cattle, all of which were hitherto referred to as nondescript, to get the stamp of approval as a distinct breed from the ICAR.
- A select group of animals of the same species with distinctive, inheritable characteristics is called a breed.
- The thirty recognised breeds in India constitute around 20 per cent of the country's total cattle population. The rest are referred to as nondescript.
- The Vechur cow has now attracted international recognition and attention .
- The Food and Agriculture Organisation (FAO) has listed the Vechur cattle among the Indian breeds in their Domestic Animal Diversity Information System.
- The World Watch List of Domestic Animal Diversity, also published by the FAO, has listed the Vechur cattle under the category of Critical Breeds, meaning nearly extinct.
- The credit of saving the Vechur cattle from the brink of extinction goes to a conservation programme undertaken by the Kerala Agriculture University (KAU). Had the programme been delayed for a few years, the Vechur cattle would have now been listed among the extinct animals.



CHARACTERISTIC FEATURES OF VECHUR CATTLE

- Subsequent to the studies conducted by the Kerala Agricultural University, the Vechur cattle are now recognised as the smallest cattle in the world.
- Before Vechur caught the attention of the scientific community, a Mexican cow measuring one metre in height was considered to be the smallest.
- The maximum height of a Vechur cow is 91 cms. This diminutive cow, weighing on an average 107 kgs. can give an average yield of 3 litres of milk per day which is the yield of the Mexican too.
- Proportionate to its body weight, the Vechur cow yields maximum milk in the world.
- The centre for Advanced Studies in Animal Genetics & Breeding (CASAGB), Kerala Agricultural University has been conducting extensive research on Vechur, a dwarf breed of cattle, which was very popular at one time as a household breed in Kerala.
- "Till the early 60's this variety was very popular in Kottayam, Ernakulam and Alappuzha districts.
- Extensive crossbreeding of native cows with exotic bulls for higher milk production slowly saw this breed disappearing,' said Dr. K.V. Raghunandnan, Director, CASAGB.

Easy maintanence

- "The animals are docile, short and disease resistant. Compared to other cross-bred species, these animals are easy to maintain," he said. Being small their food requirement is also low.
- "Adult females give 2.5-3.5 litres of milk a day, which has a high fat content of 4.5-5 per cent," Dr. Raghunandnan said. The milk is used in the preparation of ayurvedic medicines.

Breed characterestics

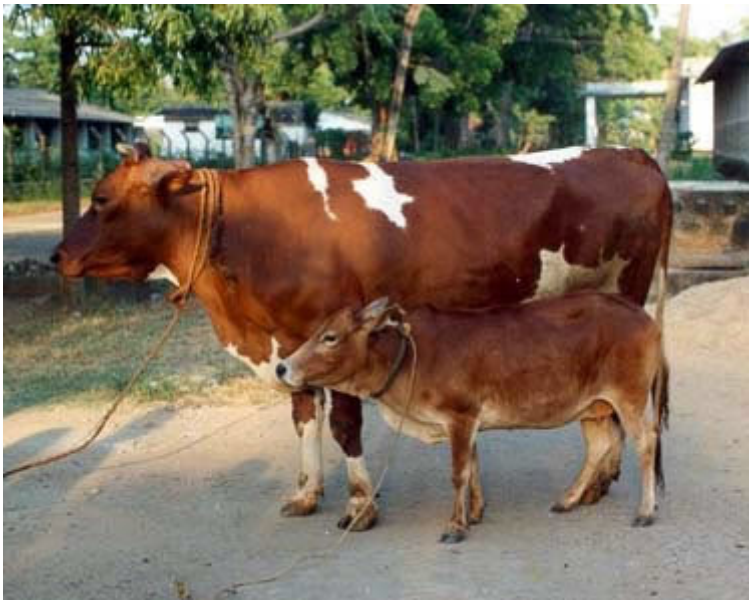
- Vechur cattle are the smallest of Indian cattle breeds.
- They are mostly light red or black in colour with a long and narrow face. The legs are short.
- The tail is long and tapering, almost touching the ground.
- According to Dr. Raghunandnan, the bulls reach a height of 85-95 cm and females, 80-90 cm.
- The animals have a small hump on their back, which is more prominent in males. The bulls, though small in size, are strong and used for ploughing fields.

Robust calves

- "Infant mortality is practically absent in this breed and new born calves are generally robust and strong," said Dr. Raghunandnan.
- "The cattle are also resistant to mastitis (blockage of teats in the udder), and foot and mouth diseases and respiratory infections," he pointed out.

Breeding programme

- With a view to popularise this breed , "a vigorous breeding programme has been undertaken by the centre to produce many pure Vechur cattle," explained Dr. Raghunandnan.
- "A stock of about 10 bulls and 80 cows is now being maintained in two farms at KAU," he said.
- "About 40 field units have also been established with the animals supplied from this stock in various parts of the state.
- "The centre provides Vechur semen from its semen bank for inseminating Vechur cows throughout the state.
- "The cost of insemination of Vechur cows comes to Rs. 25 per dose," said Dr. Raghunandnan. The centre also supplies calves (below 6 months of age) at Rs. 5,000.
- For more information, readers may contact the Director, CASAGB, College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala 680651, phone 0487: 370461, email: raghukv_kau@yahoo.com.



RAIN-FED MIXED FARMING SYSTEMS

TAYLOR BREED, JERSIND AND BROWN-SIND

Taylor breed

- Evolved near Patna using crosses of *taurus* bulls (Ayrshire bulls from UK) with local cows by Dr. Taylor.

Jersind

- Cross between Red Sindhi 3/8 and Jersey 5/8 for small body size and better adaptability

Brown-sind

- 3/8-5/8 Brown Swiss x Red Sindhi

KARAN SWISS AND KARAN FRIES

Karan Swiss

- It has been evolved by crossing American Brown Swiss bulls with Sahiwal and Red Sindhi cows at NDRI, Karnal.
- Brown Swiss inheritance is around 50%. The colour of the breed is red dun.
- It resembles Sahiwal in its body size and general appearance, and is pendulous as in Sahiwal.
- The average age at first calving is 32 months and first lactation yield was 3,564 kg with 4.2-4.4 % fat.

Karan Fries

- Cross between Tharparkar and Holstein Friesian at NDRI, Karnal. The breed has 50% Friesian inheritance.
- The breed carries black patches and sometimes is completely dark with white patches on the forehead and switch.
- Average yield 3700 kg with 3.8 to 4.0% fat.

SUNANDINI AND FRIESWAL

Sunandini

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

Frieswal

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

MODULE-22: BREEDS OF BUFFALOES

Learning outcomes

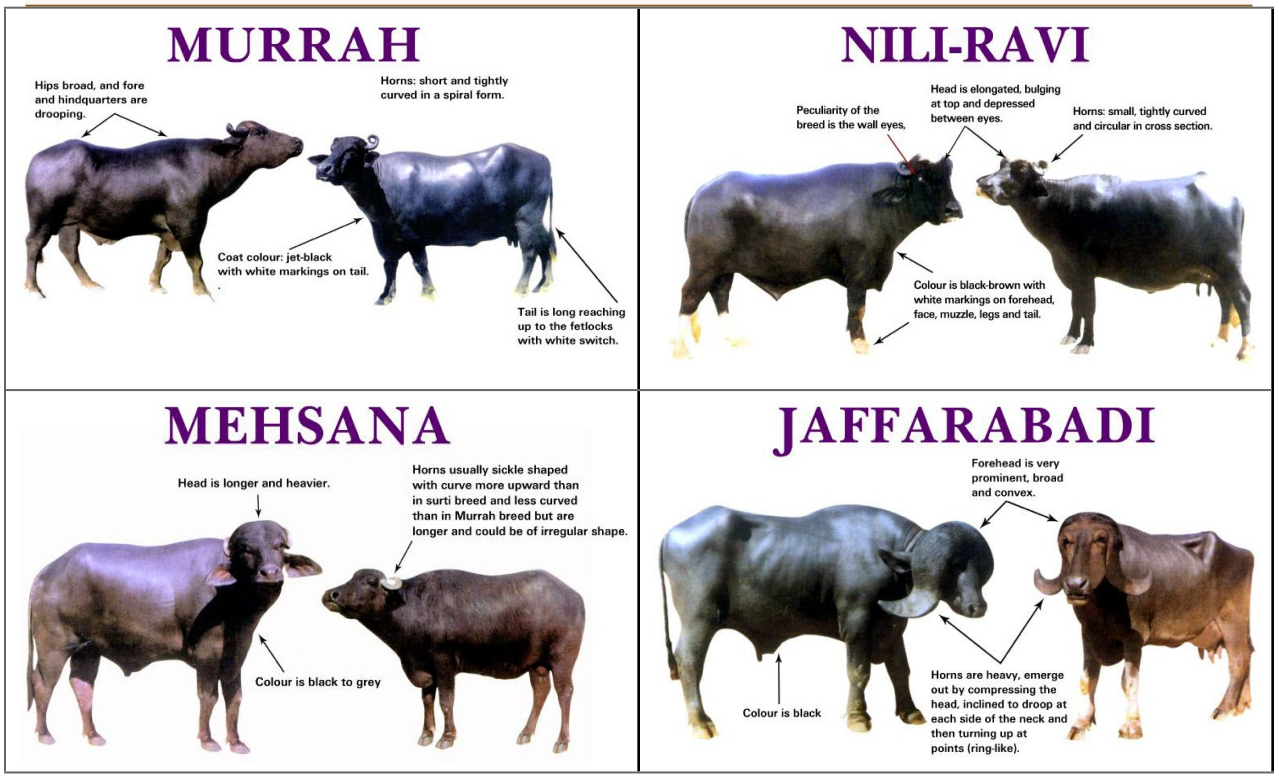
- At the completion of this module the learner will be able to describe important breeds of indigenous buffaloes.

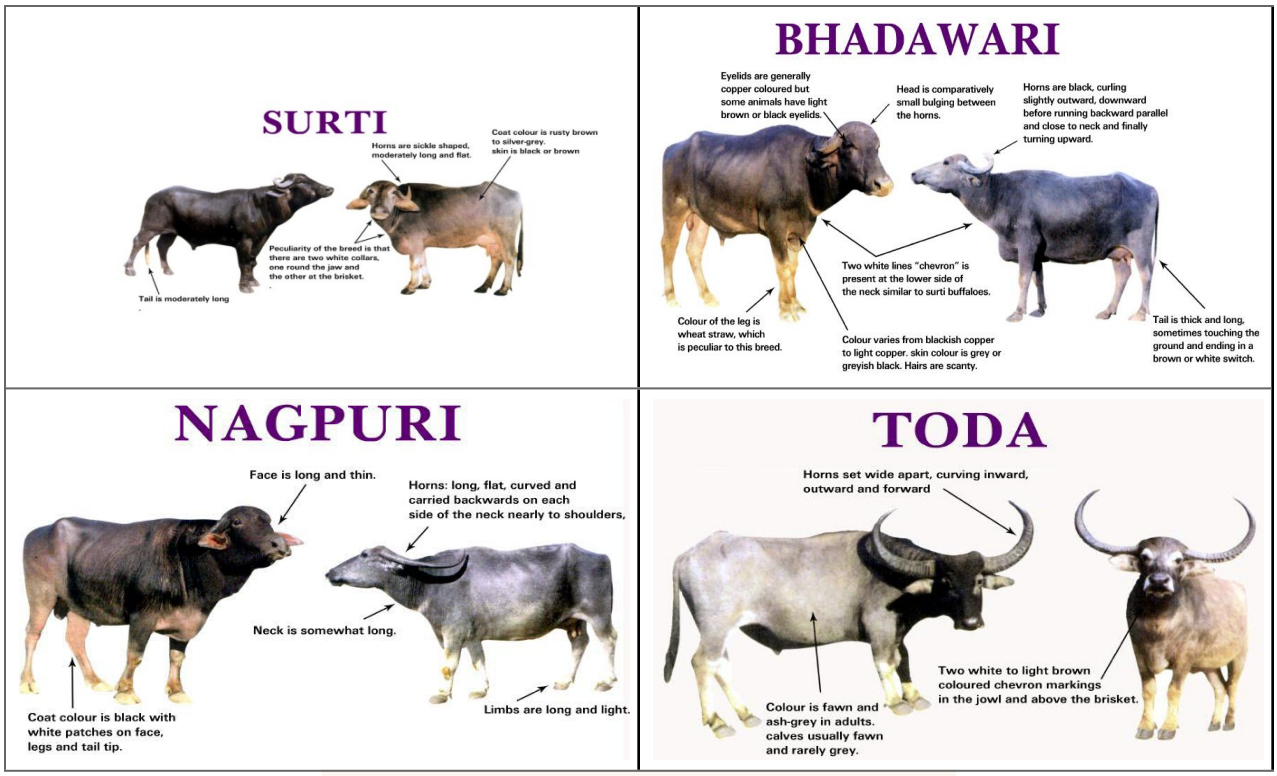
INTRODUCTION

- Nearly 97% of the World buffalo population is seen in the Asian continent out of which 60% are seen in India alone.

- The present Indian buffalo population is 96 million. Buffalo bulls are the important source of draft power in India. Buffalo meat is of good dietary value.
- The present day domesticated buffaloes are the descendants of *bos arni* found in wild state even today in north-eastern parts of India especially Assam and the surrounding areas.
- The buffaloes are normally classified into river ad swamp types though both are called *Bubalus bublis*.
- Most of the animals in India are river type though swamp type are also found in certain parts of the country specially in eastern parts of India.
- India is considered as the home tract of some of the best buffalo breeds. Because of preference of buffaloes for milk, many she buffaloes from the breeding tract are moved to the thickly populated urban and industrial center for meeting the milk requirements of urban population.
- In urban areas generally buffaloes are slaughtered after completion of lactation period.
- Their progeny is allowed to die due to improper management which results in non availability of superior germ plasm for future improvement.
- Indian buffaloes are the important source of milk supply to the milk basket of India.
- More than half of the total milk produced (55%) in the country is contributed by 47.22 million milch buffaloes, where as the 57.0 million cows contribute only 45% of the total milk production.
- Indian Buffaloes are of reverine type. Most of them are indigenous and non descriptive type where as some of are well recognized dairy breeds and produce large quantity of milk with more butterfat.

BREEDS OF BUFFALO

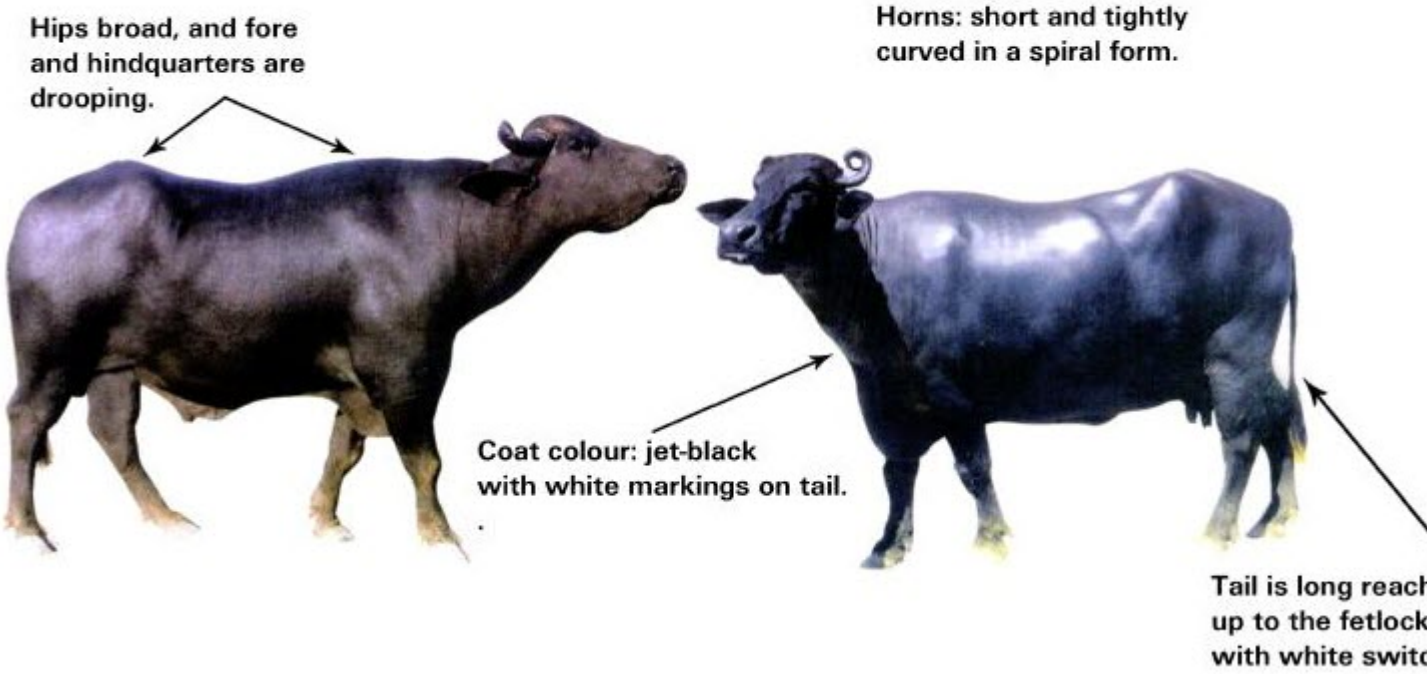




MURRAH

- *Synonyms:* Delhi, Kundi, Kali
- *Origin:* most important breed of buffaloes whose home is Rohtak, Hisar and Jind of Haryana and Nabha and Patiala districts of Punjab.
- The colour is usually jet black with white markings on tail and face and extremities sometimes found.
- The tightly curved horn is an important character of this breed.
- The body size is massive, neck and head are comparatively long. Head of females is short, fine and clear cut.
- Hips are broad and fore and hind quarters are drooping.
- The buffalo cows of this breed are one of the most efficient milk and butter fat producers in India.
- Butter fat content is 7% Average lactation yield is vary from 1500-2500 kg the average milk yield is 6.8 kg/day.
- While a few individual animals yield much as 19.1 kg/day.
- Age at first calving is 45-50 months and inter calving period is 450-500 days.

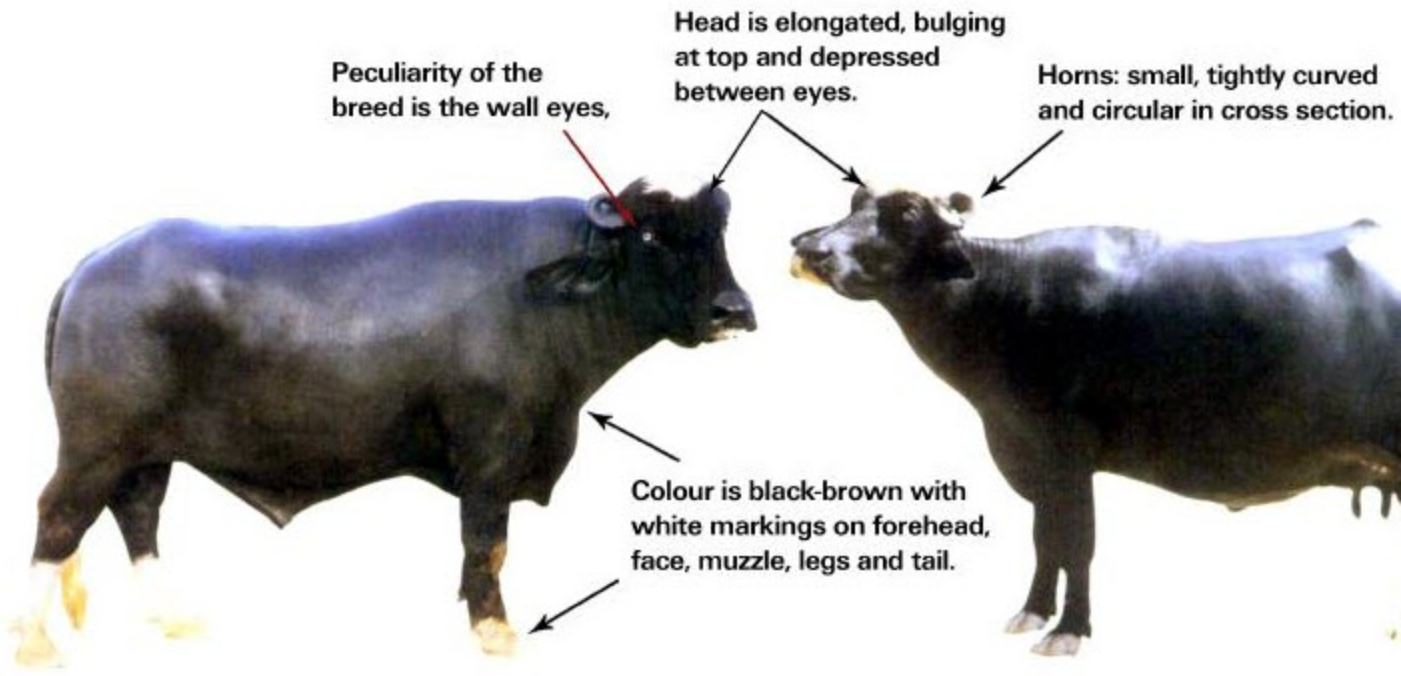
MURRAH



NILI RAVI

- *Home tract:* This breed is found in Sutleg valley in Ferozpur district of Punjab and in the Sahiwal district of Pakistan(bred around Ravi river).
- *Typical characteristics:* Usually the colour is black with white marking on forehead, face, muzzle, legs and tail.
- The most desired character of the buffaloes with such white markings highly desired and popularly called "Panj Kalian").
- The head is elongate, bulging at top and depressed between eyes.
- The muzzle is fine. The frame is medium sized.
- The peculiarity of the breed is the wall eyes.
- The horns are small and coiled tightly. The neck is long, thin and fine.
- The milk yield is 1500-1850 kg per lactation and the inter calving period is 500-550 days. Age at first calving is 45-50 months.

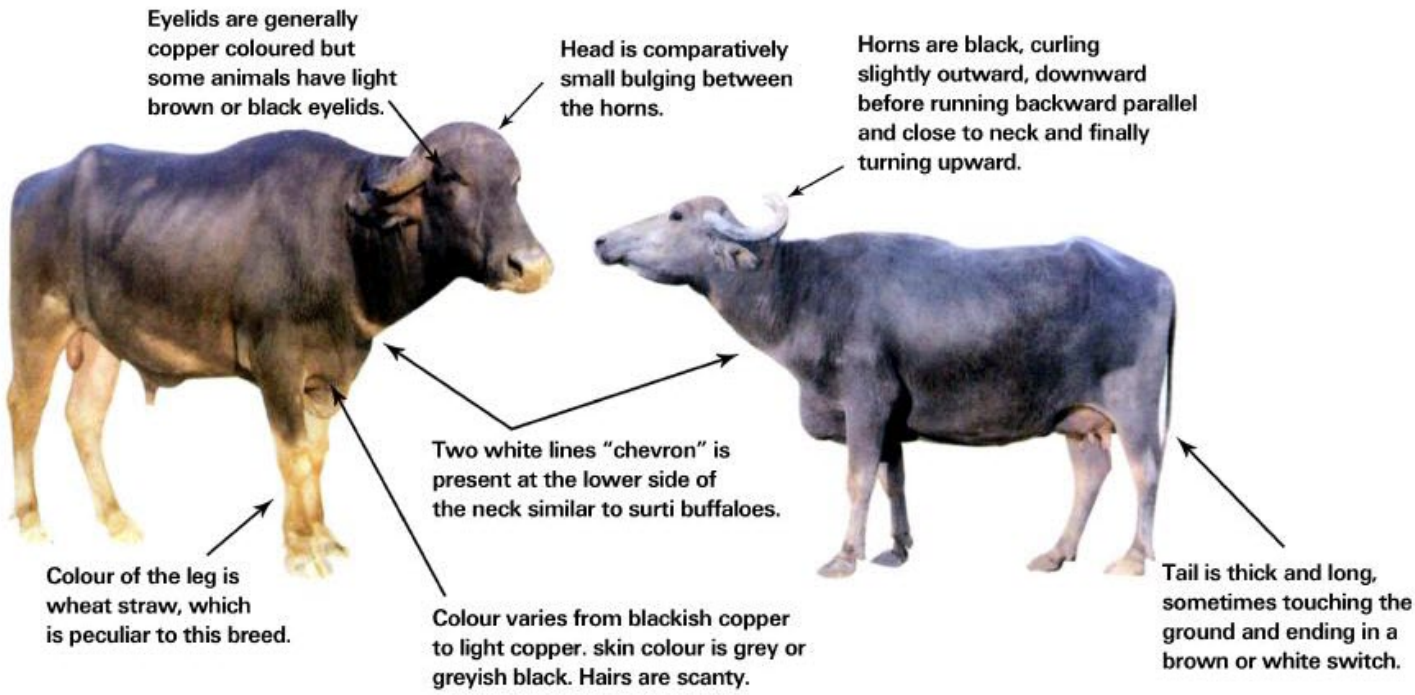
NILI-RAVI



BHADAWARI

- *Origin:* Agra and Etawah district of Uttar Pradesh and Gwalior district of Madhya Pradesh.
- *Typical characteristics*
  - The body is medium size and wedge shaped. The head is comparatively small, the legs are short and stout, and the hooves are black.
  - The hind quarters are uniform and higher than the forequarter.
  - The body is usually light or copper coloured is a peculiarity of this breed.
  - Eye lids are generally copper or light brown colour.
  - Two white lines ‘Chevron’ are present at the lower side of the neck similar to that of surti buffaloes.
  - Horns are black, curling slightly outward, downward before running backward parallel and close to neck, and finally turning upward.
- The average milk yield is 800 to 100 kg.
- The bullocks are good draught animal with high heat tolerance.
- The fat content varies from 6 to 12.5 per cent.
- This breed is an efficient converter of coarse feed into butterfat and is known for it high butter fat content.

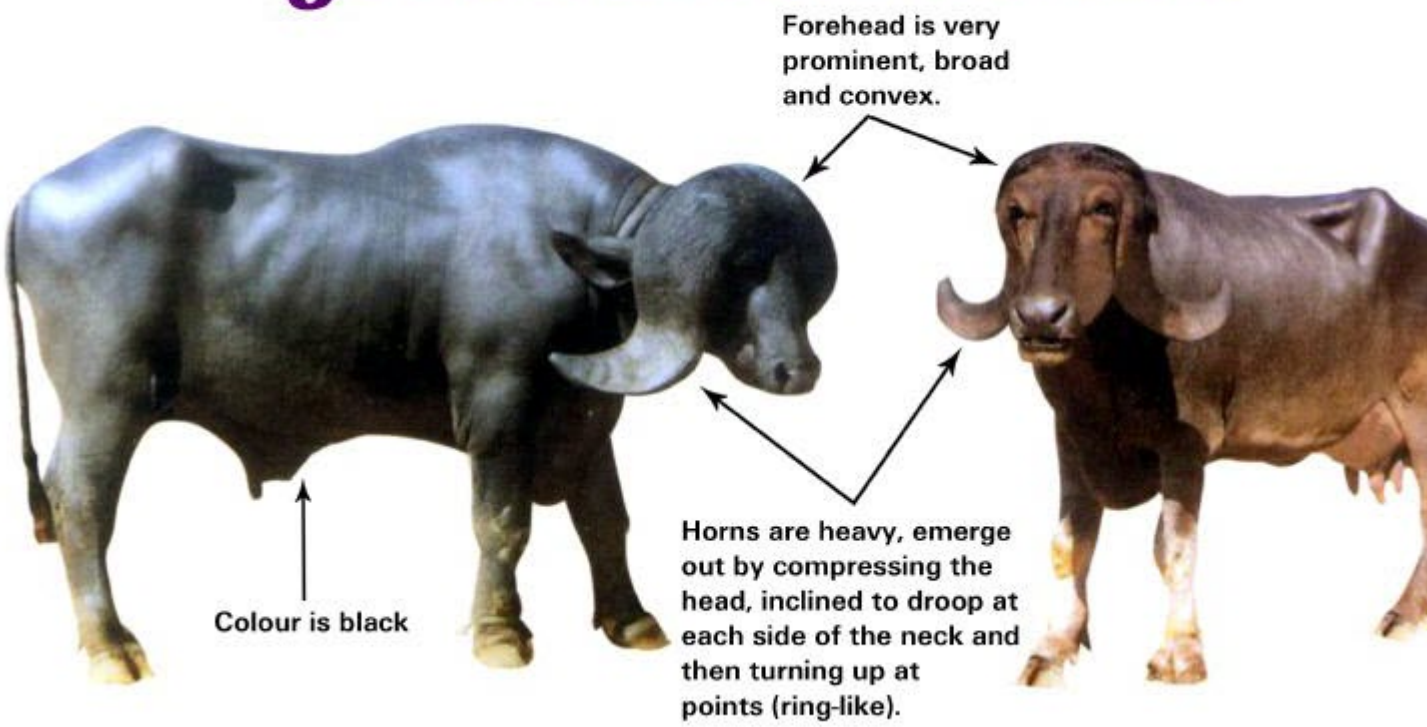
BHADAWARI



JAFFARABADI

- *Origin:* These are massive animals found in their pure form in Gir forests. The breeding tract of this breed is Kutch, and Jamnagar districts of Gujarat.
- *Typical characteristics*
  - The head and neck are massive. The forehead is very prominent, wide with a slight depression in the middle.
  - The horns are heavy, inclined to droop at each side of the neck and then turning up at point, but les tightly curved than in Murrah (drooping horns).
  - The colour is usually black.
  - The average milk yield is 100 to 1200 kg. these animals are mostly maintined by traditional breeders called Maldharis, who are nomads.
  - The bullocks are heavy and used for ploughing and carting.

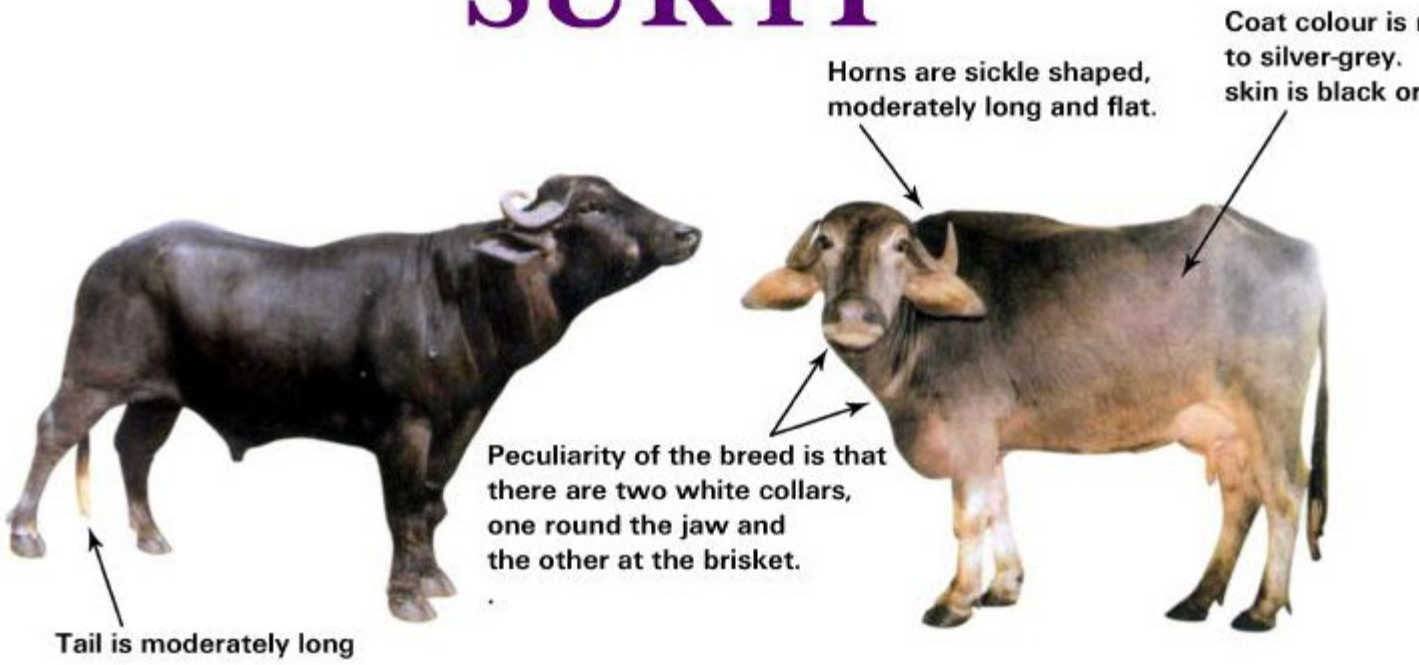
JAFFARABADI



SURTI

- *Orgin:* The breeding tract of this breed is Kaira and Baroda district of Gujarat.
- *Typical characteristics*
  - The body is well shaped and medium sized; the barrel is wedge shaped.
  - The head is long with prominent eyes.
  - The horns are sickle shaped, moderately long and flat.
  - Coat colour varies from rusty brown to silver-grey. Skin is black or brown.
  - The peculiarity of the breed is two white collars, one round the jaw and the other at the brisket.
- *Production performance*
  - The milk yield ranges from 900 to 1300 kg.
  - The age at first calving is 40-50 months with a intercalving period of 400-500 days.
  - The peculiarity of this breed is very high fat percentage in milk (8-12per cent).

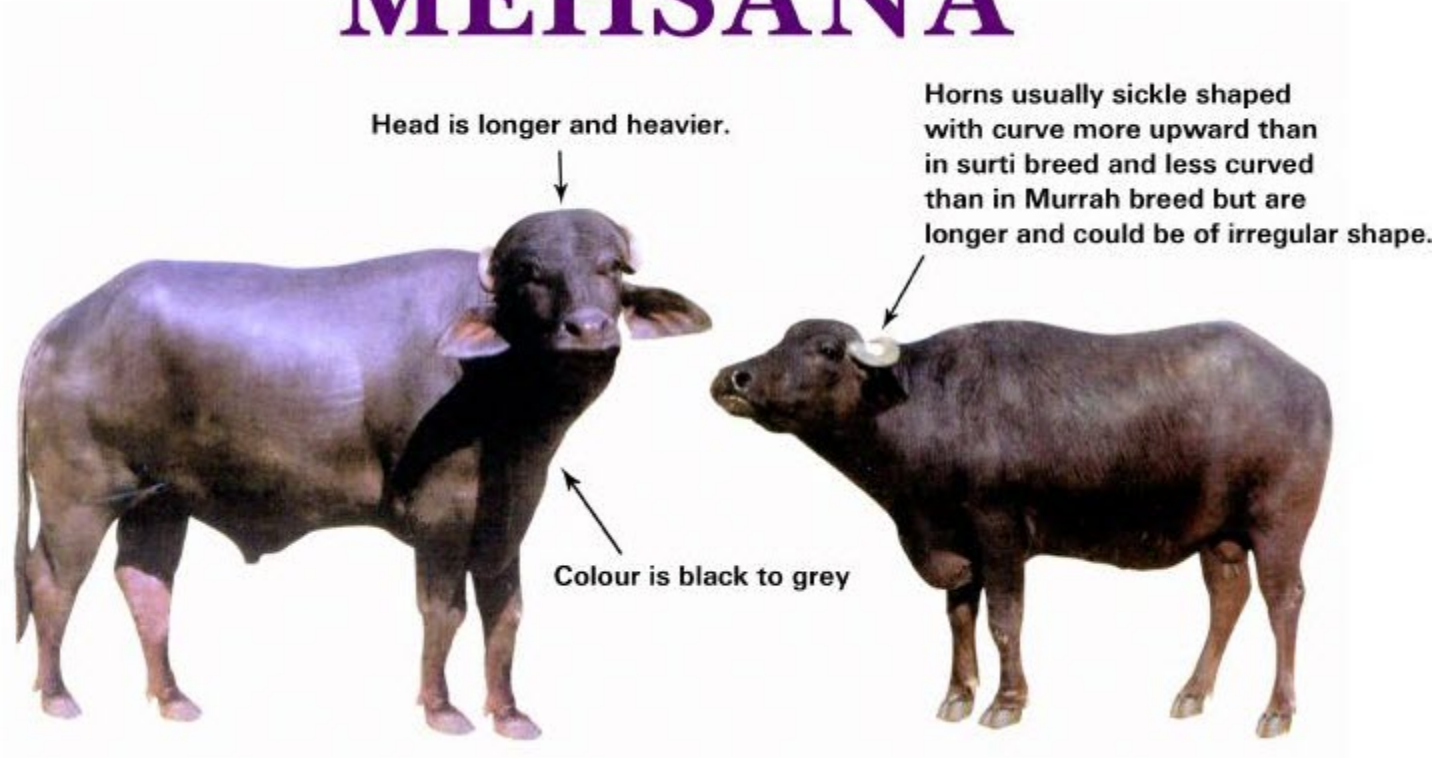
SURTI



MEHSANA

- *Home tract:* Mehsana is a dairy breed of buffalo found in Mehsana town in Gujarat and adjoining Maharastra state.
- *Typical characteristics*
  - Body is mostly black; a few animals are black-brown in colour.
  - The breed is supposed to have been evolved out of crossbreeding between the Surti and the Murrah.
  - The body is longer than in Murrah and the limbs lighter.
  - The head is longer and heavier.
  - The horns usually are less curved at the end compared to Murrah breed but are longer and could be of irregular shape.
- *Production Performance*
  - The milk yield is 1200-1500 kg. The breed is supposed to have good persistency.
  - The intercalving period ranges between 450-550 days.

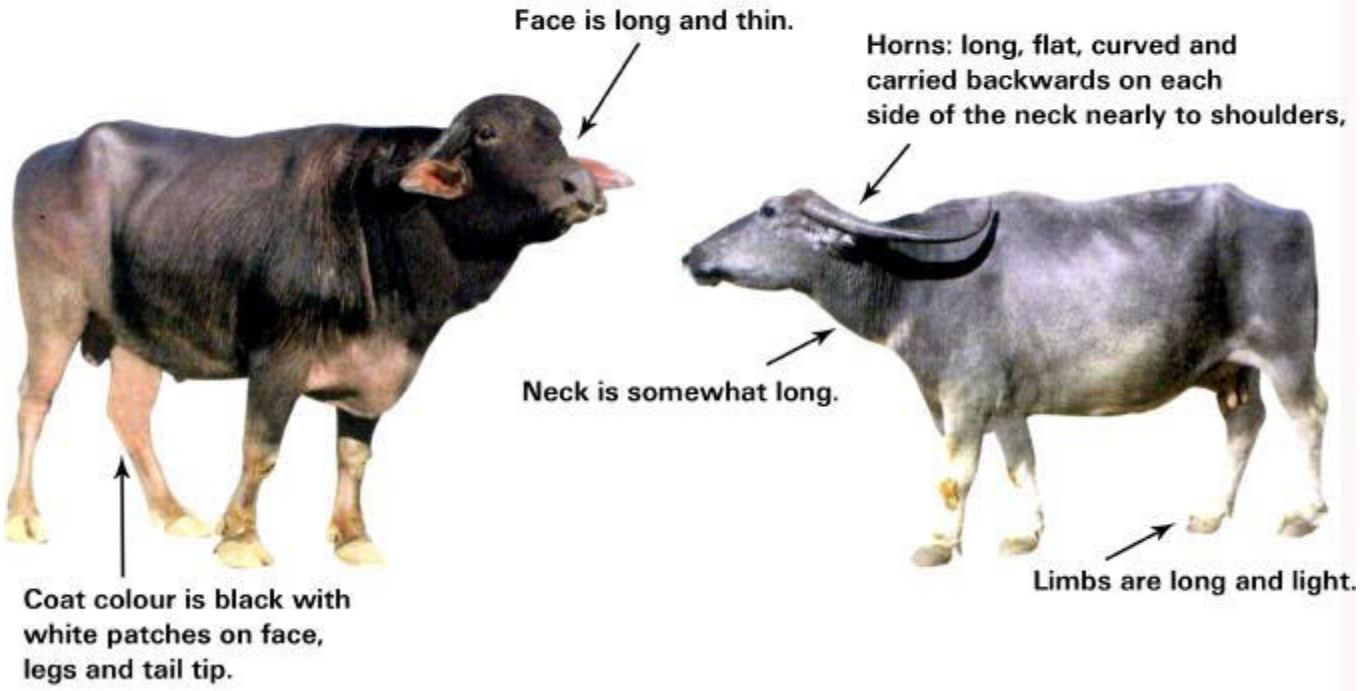
MEHSANA



NAGPURI (OR) ELLICHPURI

- *Home tract:* The breeding tract of this breed is Nagpur, Akola and Amrawati districts of Maharashtra.
- *Typical characteristics*
  - These are black coloured animal with white patches on face, legs and tail.
  - This is also called as Ellichpuri or Barari.
  - The horns are long, flat and curved, bending backward on each side of the back almost to should (sward shaped horns).
  - Horns of this type have a distinct advantage that they help the animals to protect themselves from wild animals and also easy to move in the forest.
  - The face is long and thin. The neck is somewhat long.
- *Production performance*
  - The average milk yield is 700-1200 kg per lactation.
  - The age at first calving is 45-50 months with a intercalving period of 450 - 550 days.

NAGPURI

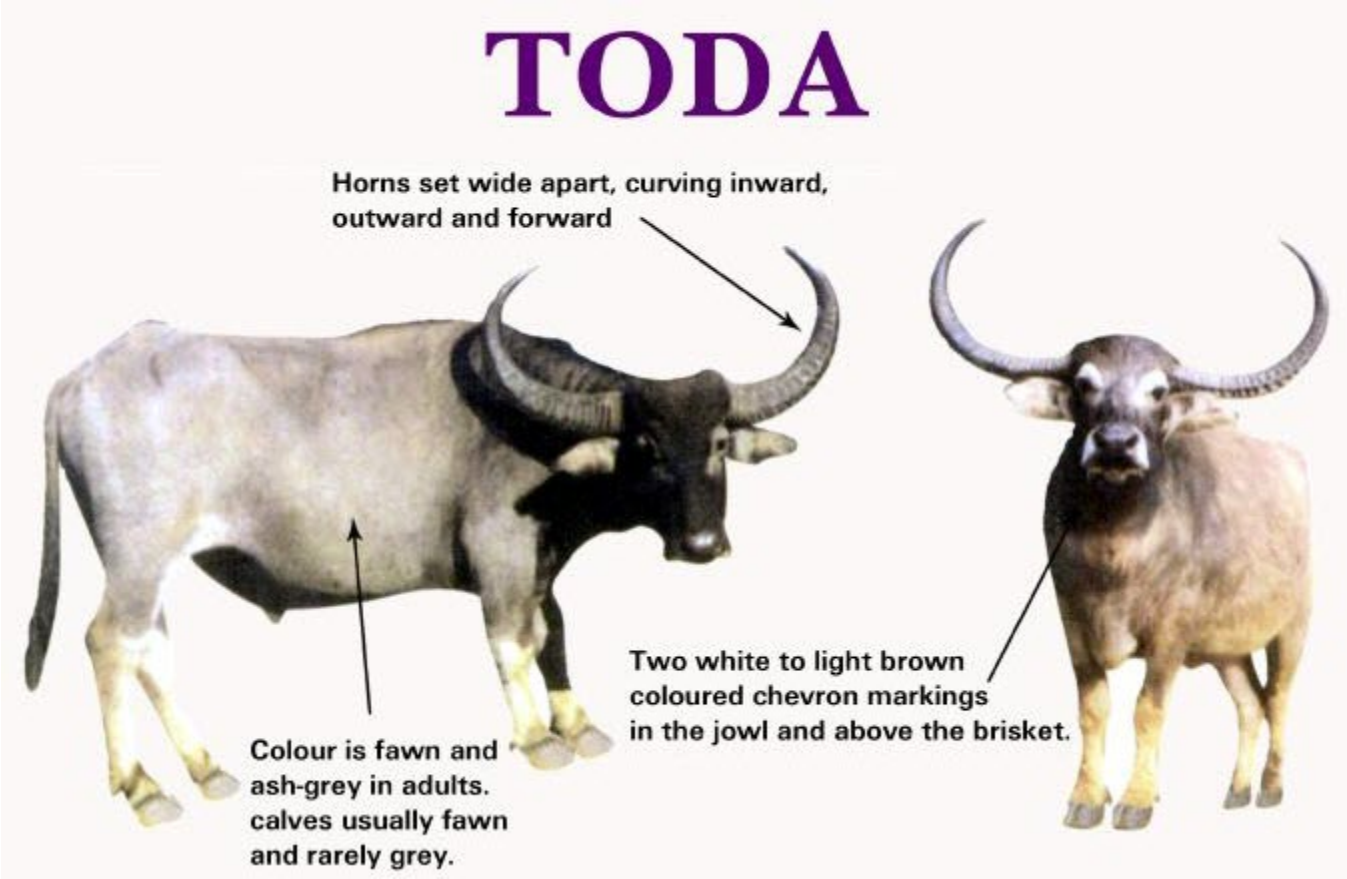


GODAVARI

- Godavari is a result of crossing of native buffaloes with Murrah bulls.
- The home tract is Godavari and Krishna deltaic area.
- The animals are of medium stature with compact body.
- The colour is predominantly black with a sparse coat of coarse brown hair.
- Godavari buffaloes are reputed for high fat with daily average milk yield of 5-8 litres and lactation yield of 1200-1500 litres.
- The animals breed regularly and have a short calving interval compared to Murrah.

TODA

- Toda breed of buffaloes is named after an ancient tribe, Toda of Nilgiris of south India.
- Coat colour of the calf is generally fawn at birth. In adult the predominate coat colours are fawn and ash-grey.
- These buffaloes are quite distinct from other breeds and are indigenous to Nilgiri hills.
- The animals have long body, deep and broad chest, and short and strong legs.
- The head is heavy with horns set well apart, curving inward outward and forward.
- Thick hair coat is found all over the body. They are gregarious in nature.



PANDHARPURI

- *Home tract:* Native of Kolhapur, Solapur districts in south Maharashtra.
- It is medium sized animal having long narrow face, very prominent and straight nasal bone, comparatively narrow frontal bone and long compact body.
- Typical characteristic of this breed is its horns which are very long, curved backward, upward and usually twisted outwards.
- The horns are very long extending beyond shoulder blade, sometimes up to pin bones.
- Body colour varies from light black to deep black.

MODULE-23: IMPORTANT ECONOMIC TRAITS OF CATTLE AND BUFFALOES

Learning outcomes

- On completion of this module the learner will be able to describe the economic traits of cattle and calculate the same.

INTRODUCTION

- Economic traits means the characters and features in which man has an interest with respect to his animals.
- Usually the owner of animal will have interest with respect to the characters of his animals by which he could make more money.

- Even if his animal is not having a particular beneficial traits or characters by which he could make more money, by selective breeding he can bring or fix all the desirable characters in his animal so that he can produce future generation of animals with all the economic traits.
- The economic traits could be grouped into
    - Fitness traits
    - Production traits
    - Quality traits
    - Type traits
    - Behavioral traits

AGE AT FIRST CALVING

- Age in days of the cow or buffalo on the date of first calving.
- Most indigenous breeds are late maturing and show wide variation due to variation in management and climatic conditions.
- Among various breeds Sahiwal (41 months), Red Sindhi (44 months) and Ongole (39 months) have lower age at first calving.
- Other breeds like Kankrej (47 months), Hariana (59 months), Tharparkar (48 months) and nondescripts (56 months) have longer age at first calving.
- Where as exotic breeds such as Holstein Friesian (36 months), Jersey (29 months), Brown Swiss (34 months) and their crosses (*B. indicus x B. Taurus*, 34 months) posses shorter calving interval under tropical climate.
- It showed that most of the indigenous breeds did not mature earlier.
- Further nutritional studies showed that the age at first calving could not be reduced below 35 months even after improving the feeding management and it could only be achieved by introduction of new variability.
- In case of buffaloes it is ranged between 40 to 50 months.

INTERCALVING PERIOD

- Days from the date of one calving to the date of next calving and this may designated as first intercalving period, second intercalving period etc.
- *(calving interval is equal to service period + gestation period or lactation period + dry period).*
- The average calving interval in Indian breeds varied between 16 to 18 months.
- Hariana, Red Sindhi and Ongole had longer calving interval (16-18 months), while Sahiwal, Tharparkar and Deoni had shorter calving interval (around 15 months).
- In case of *B. indicus x B. Taurus* calving interval is less than 13 months.
- Research findings showed that calving interval could also be improved by better feeding and management.

SERVICE PERIOD

- The interval between calving and subsequent service resulting in conception (as deduced from the birth of a calf).
- All the reproduction traits are dependent mostly on service period, which influence other traits.
- Service period ranges between 138 to 170 days in (Sahiwal, Red Sindhi, Tharparkar, Gir, Hariana and Deoni) most of the milch and dual purpose breeds.
- It is still longer in Ongole (221-240 days), Kankrej (206-220 days) and in nondescript (271-284 days); where as the service period is less in case of crossbred cattle (105-122 days).
- In case of buffaloes the service period ranged between 193-236 days.

BREEDING EFFICIENCY

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

DRY PERIOD

- Days from the date of drying to the date of next calving.
- Dry period of 130-160 days was common in Sahiwal, Red Sindhi, Tharparkar, Hariana, Kankrej.
- Longer dry period over 205 days was noticed in Ongole and non-descript cattle.
- The average dry period in cross bred cattle in India is around 90-94 days.
- In case of a wide variation was noticed (60-200 days in Murrah and 111-343 days in Surti buffalo).
- The ideal dry period in crossbred dairy cow is 56 days or 8 weeks.

LACTATION LENGTH

- Days in milk from the days of calving to the final drying off or cessation of milking at completion of 7th month of pregnancy.
- Most of the indigenous breed had a lactation length of 230-306 days, still longer lactation length was noticed in buffaloes (228-350 days).
- In case of exotic breeds like Holstein Friesian and Jersey it was longer (279-411 days).
- The standard lactation period considered for all calculation purpose is 305 days in cattle and 310 days in case of buffaloes.

LACTATION YIELD

- Milk yield in kg. from the date of calving to the date of drying (the order of lactation should be indicated as I, II etc.
- The average lactation yield incase of Sahiwal was 1500-2300 kg, followed by Red Sindhi (1500-1650 kg), Tharparkar (1450-2200 kg) and Gir (1300-1800 kg).
- The lactation yield was still lower in other breeds like Hariana (721-1436 kg), Ongole (613-1120 kg), Kankrej (960-1856 kg) and in non-descript cows it was still lower (376-535 kg).
- But the cross bred cattle produce average milk yield of 200-3100 kg per lactation.
- The mean lactation yield of most of the buffalo breeds ranges between 1000 - 2500 kg and non-descript buffaloes produced lesser milk (500-650 kg).

Lactation yield (305 days)

- When daily milk record is available
  - Milk yield in kg. from the date of calving to the 305th day of lactation.
- When there is on day a week stripping
  - Milk yield in kg. from the date of calving to the 305th day calculated from the weekly records (once a week record multiplied by 7 cumulated to 305 days).
- When lactation length is shorter than 305 days
  - Milk yield in kg. for this lactation period is considered as lactation yield (305 days).
- When lactation length is longer than 305 days
  - Milk yield in kg. corrected to 305 days using correction factors.

Lactation yield (180 days)

- Milk yield in kg from the date of calving to the 180th day of lactation.
- Milk yield per day of lactation
    - The average milk yield in Kg.
- Milk yield per day of calving interval
    - The average milk yield in Kg for the inter calving period.

PEAK YIELD

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

AVERAGE FAT PERCENTAGE

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

MODULE-24: GENERAL MANAGEMENT PRACTICES

Learning outcomes

- On completion of this module, the learner will understand about care and management of livestock especially ruminants.

SIGNS OF APPROACHING PARTURITION

- Cow will leave the herd and seek isolation.
- Loss of appetite and distress.
- Distention of teat and udder, considerable milk appears in the udder and there may be dripping of milk.
- Relaxation of pelvic ligament one day before calving, the ligament on the sides of the tail head is loosened so that hollows appear on either side of the backbone and the tail head is raised and the quarters are dropped.
- The vulva become enlarged and flabby
- Animal will be restless and will pace about often trying to kick or scratch the flank region.
- The parturition process has three stages a. preparatory stage (uterine contraction and dilatation of cervix) b. active expulsive stage c. expulsion of foetal membrane.
- Cow will deliver the calf with in 12 hours after commencement of first stage and lapse in this vaginal examination of assistance is required.
- Care must be taken to observe expulsion of placenta (after birth). It should be removed immediately so as to avoid cow eating it.

CALF MANAGEMENT - PREAMBLE

- Calves form the future dairy herd.
- Regular replacement of 20 to 30 per cent cows with freshly calved heifer-cows is highly essential to maintain production efficiency.
- Heifers raised in one’s own farm forms the most reliable replacement. Besides, the sale of heifer forms a major component of income in the dairy business.

- Raising calves is the most difficult operation in a dairy farm which requires a great deal of management skill, application and constant attention.
- Care of calf starts in the womb of the cow where it is a foetus. In the first 6 months of pregnancy, additional nutritional needs of cow due to foetal growth is negligible.
- More over during this period the cow is in milking and it must be fed with good quality of concentrate and green fodder.
- During dry stage the cow often neglected and fed with inferior quality fodder results in poor growth of calf.

CARE OF CALF AND COW AT BIRTH

- A few days before the probable date of calving, cow should be transferred to individual calving pens.
- Pregnant cow may be transferred to calving pen 1 to 2 weeks before the expected calving date.
- The number of calving pens required on a farm depends on the number of breedable cows and heifer, generally 5 per cent of this number.
- Ample amount of drinking water, laxative feed and generous supply of bedding may be provided.
- The calving pen should be scrupulously cleaned and sterilized before brining in the cow.
- Calving pen
    - It is a individual loose box or stall used for calving, which should be 3 m x 4 m size (12 m^2) and well ventilated. Sufficient lighting is essential.
    - It provided better protection to the cow and calf and avoid disturbances from other cows.
    - Special attention can be provided for which attendant quarters may be nearer to calving pen.
    - Attendant quarters may be established nearer to calving pen to monitor calving process during night time.
    - n the calving pen following items should be made available in all time.
- Antiseptic solution like tincture Iodine or Povidone iodine, thread, scissors, lubricants like liquid paraffin, vegetable oils, obstertical equipment like hook, snare, calf puller, wire saw; emergency drugs like local anesthetics, antibiotics, analgesic, calciumboroglugonate, other items like emergency light, towel, soap, buckets, aprons etc.
- In villages or farmers those who are maintaining only one or two animals must tie the animal in advanced stage of pregnancy separately under visibility.
- It must be protected from predators. The floor should be dry and clean and having clean grass cover is essential.
- The cow should not be tethered too close, it must be tied with sufficient rope so that animal can move freely and care the new born easily during night time when calving is unnoticed.
- If any abortion, calves should be examined thoroughly to ascertain the possible cause for abortion (age of the foetus, condition, necrotic foci if any etc).
- In such case the calving pen should be thoroughly sterilized with 4 per cent caustic soda.

MANAGEMENT IMMEDIATELY AFTER CALVING

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

- The cow should be monitored carefully for signs of any metabolic disorders like milk fever, grass tetany, Ketosis, acidosis and should be treated immediately.

CARE OF NEWBORN CALF

- Normally cow will lick and dry the calf immediately after parturition which may stimulate circulation and respiration.
- If the cow fails to do, it can be stimulated to lick by sprinkling handful of bran or salt over the body of the calf.
- Sometime primiparous cows may be nervous and inexperienced or cow may exhaust after a prolonged labour.
- Under such circumstances the mucus (phlegm) from the nostrils of the newborn calf should be wiped and cleaned with a dry towel.
- The calf should be massaged vigorously for some times with a handful of straw rolled into a ball.
- Some times respiratory passage may be block with mucus and interfere with calf's respiration.
- Under such condition the calf should be lifted by holding the hock in such a way that the head is down, so that the phlegm may flow off.
- Care should be taken while lifting the calf, it may slip off. A hand full of straw can be used to have a grip while lifting.
- The calf can also made to sneeze by tickling a twig of hay or grass inside the nostrils.
- If the above methods are failing, little time is left to lose. The attending person should apply his mouth to the nostrils of the animal and suck out the mucus.
- After that he should blow in his expired air through the calf's nostrils closing its mouth.
- Carbon dioxide in the expired air which has been blown-in the lungs of the calf will act as respiratory stimulant to initiate respiration.
- This should be followed with intermittent pressing and releasing of pressure on the chest wall of the calf to give artificial respiration.
- *Attending naval:* naval or umbilical chord should be ligatured with a sterile thread one inch from the body (under field condition the thread can be soaked with tincture iodine) severed 1 to 2 cm distal to the ligature and tincture iodine or povidone iodine should be painted liberally.
- This is very important because infection can gain easily through naval and cause serious illness like naval ill, naval abscess and joint ill.
- Neonatal ascariasis is common in buffalo calves and deworming should be made as early as possible, preferably in the first week of life.
- A single oral dose of 10 g piperazine adepate is recommended for the calves.
- Newborn calf should void meconium in 4 to 6 hours of first colostrum feeding and first faeces is tarry in colour and consistency.

COLOSTRUM FEEDING

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

Composition of colostrum and milk

- Colostrum is highly fortified source of nutrient having 7 times the protein and twice the total solids of normal milk, thus it gives an early boost in portion and solid intake.
- It contain higher amount of minerals and vitamin A which are essential to combat disease. Ingestion of these through colostrums substantially increase the calf's survivability.
- Colostrums give a laxative effect which is helpful in expulsion of muconium (first faeces).

- The cows should be vaccinated against contagious and infectious diseases which help to increase the quantity and quality of gama globulins in colostrums.
- Similarly colostrums of mature cow posses large quantities of gama globulins because they have greater chance of exposure to many infection.
- The gama globulins must be absorbed as such across the intestinal wall into blood stream without being broken down into the constituent peptides or amino acids.
- If it broken down before entering blood stream it will act as ordinary protein.
- The intestinal wall of the calf will allow the globulin to pass from inside the intestine to the blood stream for only a short period of time after the calf is born.
- This permeability is rapidly lost after the first few hours of life. Many studies have shown that these globulins pass across the gut wall at the most rapid rates during the first 1-2 hours of life.
- Taking this into view. It will be highly useful to feed colostrums in the first 15-30 minutes followed by a second dose in approximately 10-12 hours.
- The absorptive cell lining the small intestine are immature at birth. In this stage they indiscriminately take up large molecules like immunoglobins.
- As the cal grows older hour by hour, there is a transition of epithelia cells of small intestine from immature type to mature type which cannot allow large protein molecules.
- As the more and more cells mature the capacity of the calf to absorb immunoglbins diminishes proportionately until ‘closure’ when no more absorption can take place.
- This phenomenon is called ‘gut closure’. Concentration of antibodies at ‘closure’ is directly related to the disease resistance of the calf.
- If at closure the calf had absorbed only a small amount of immunoglobins from colostrum, the diminishing concentration soon puts the calf into a critical immune position.
- This increases morbidity and often leads to mortality of the calves.
- Quantity of colostrum to be fed is $1/10^{th}$ of body weight.
    - 15-30 minutes of life - 5-8 % of body weight
    - 10-12 hours of life - 5-8 % of body weight
    - 2^{nd} day - 10% of body weight
    - 3^{rd} day - 10% of body weight
- Excess colostrum can be milked out daily otherwise the calves can drink in excess and results in calf scour.
- The excess colostrum can be stored by refrigeration and can be used to other calves or orphan calves.
- Colostrum can also freezed and stored indefinitely. Colostrums can also be fermented naturally and stored for 5-7 days and can be used.
- Colostrum substitute: in case of non availability of colostrums due to accidental death of mother or agalactia colostrums substitute can be used.
- It can be prepared by mixing 2 whole eggs in one litre of milk and 30 ml of castor oil. It should be fed three times in a day.

COMPOSITION OF COLOSTRUM

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

Globulin	15.06	12.5	-
Total protein	21.32	23.8	3.34

WEANING

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

Disadvantages

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

IMPORTANT GUIDELINES IN YOUNG CALF REARING/MILK FEEDING

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

TRAINING OF CALF FOR PAIL FEEDING

- Weaned calves should be trained to drink milk from pails so that feeding management is easier.
- Generally crossbred calves learn quickly to drink milk from pail or nipple. But it is little difficult to train buffalo calves.
- Buffalo calves and lazy and slow in learning to drink milk or milk replacer from the pail or bucket.
- The scheduled quantity of boiled and cooled milk poured in the milk pail and should be moved to the calf.
- Care should be taken to avoid frightening.
- The calves should not be forced to drink milk by immersing the head in to the bail.

- Frightened calves may refuse to come close to the pail.
- The attendant should first dip his two fingers (index and middle fingers) in to the milk after cleaning and kept close to the mouth of calf.
- After testing the milk calf will start suckle the fingers.
- Gradually the fingers should be lower to the bail and should be dipped in to the milk.
- When the calf takes one or two mouthfuls of milk remove the fingers.
- This process may be repeated whenever the calf stops drinking and lifts its head.
- Training of buffalo calves required patience and efforts.

FEEDING MANAGEMENT OF CALVES

- Reticulo-rumen is non functional in calves and hence feeding of calves should be treated as non-ruminant and they are not equipped to utilize cellulose.
- The calves cannot utilize roughages containing higher amount of cellulose.
- To encourage the early development of rumen and reticulum the calves should be fed with good quality leguminous hay and other roughages.
- Because of non availability of good quality protein due to lack of ruminal microbial digestion.
- The calves have little capacity to utilize non-protein nitrogenous coumpo0unds and therefore substance like urea should not be included in their ration.
- Due to the same reason, B-complex vitamins also are dietary essential for calves in addition to vitamin A and D.
- For digestion of milk and enzymatic digestion in the abomasums and small intestine is more important that bacterial fermentation in the rumen, which is more wasteful.
- To avoid this oesophageal groove exist in the reticulum connecting the oesophagus with the omasum.
- During nursing and milk feeding, the sides of the groove are raised by reflex action to form a tunnel through which milk passes from oesophagus to omasum by-passing the rumen and reticulum.
- This continues to function even after considerable development of the rumen if milk feeding is continued.

DISBUDDING A CALF

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

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

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

- Chemical method
- Rubber band method
- Electrical method

NURSE - COW METHOD

- Most of the draught breeds produce milk just sufficient to meet the requirement of calves and calves are allowed to suckle form the mother.
- But in case of crossbred cows which produce more milk than the requirement of calf, to regulate the milk production and also to avoid over feeding of calves leaving one or two teats for calf while milk out the other is practiced.
- In nurse-cow method 3 or 4 calves are allowed to suckle one nurse cow.
- To avoid calf rejection the mucous at the time of calving is applied to all the calves to be adopted by the nurse cow and placed before her to lick and dry.

- This will help to avoid rejection of calf. The number of calves to be allotted depends on the production level of nurse cow.
- Use of nurse-cow is an easy alternate way of raising calves and required least managemental skills.

EARLY WEANING AND WHOLE MILK FEEDING

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

Economic raising of calve with limited whole milk and calf starter

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

CALF FEEDING BUCKET	COMMUNITY FEEDER FOR CALVES	MINI COMMUNITY FEEDER
		

FEEDING SCHEDULE FOR CALF - I

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

10th week	10% of body weight – 4 kg	ad lib.	ad lib.

FEEDING SCHEDULE FOR CALF - II

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

FEEDING OF CALF

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

CALF FEEDING SCHEDULE WITH LIMITED WHOLE MILK AND CALF STARTER

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

17th to 20th week (5th month of age)	-	-	Ad. lib	1.75
21st to 24th week (6thmonths of age)	-	-	Ad. lib	2.00

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

AGE	COLOSTRUM	WHOLE MILK	SKIM MILK	CALF STARTER (g)	ROUGHAGE	JAGGERY (g)
	(as percentage of body weight)					
0 - 4	10	-		-		
5 - 12		5	5	To be introduced	Ad lib	30
13 - 20		2.5	7.5	50-100	Ad lib	50
21 - 30			8.3	250	Ad lib	70
31 - 40			8.3	500	Ad lib	85
41 - 60			6.6	750	Ad lib	110-150
61 - 90			5	800	Ad lib	170-180
91 - 120			-	1000	Ad lib	200-250

MILK REPLACERS

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

GENERAL CHARACTERISTICS OF GOOD QUALITY MILK REPLACERS

- Contains minimum 50 per cent spray dried skim milk powder

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

ITEM	AMOUNT IN Kg
Dried skim milk	70
Dried whey	18
Lecithin	2
Animal fat	10
Dicalcium phosphate	1.7
Copper sulphates, Ferrous sulphates, Manganese sulphates, Antibiotic	Traces

PARTIAL MILK REPLACERS

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

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

Antibiotic	0.2
TOTAL	100

CALF STARTER

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

Composition of calf starter

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

DAIRY ANIMAL MANAGEMENT

General care and management calf

- We must give good feeding and management for the calves so that they develop well and will become useful replacement stock.
- The feeding and care of the calf begins before its birth.
- The dam should be dried 6-8 weeks before expected date of calving and should be fed well.
- Underfed animals will give weak and Small calves.
    - *Early Management*
        - Immediately after birth remove any mucous or phlegm from those nose and mouth.
        - Normally the cow licks the calf immediately the birth. This helps' dry off the calf and helps in stimulating breathing and circulation.
        - When the cows does not lick or in cold climate, rub and dry the calf with a dry cloth or gunny bag.

        - Provide artificial respiration by compression and relaxing the chest with hands
        - The Naval should be tied about 2-5 cms away from the body and cut 1cm below the ligature and apply Tr. Iodine or boric acid or any antibiotic.
        - Remove the wet bedding from the pen and keep the stall very clean and dry in condition.
        - The weight of the calf should be recorded.
        - Wash the cow's udder and teats preferably with chlorine solution and dry. Allow the calf to suckle the first milk of the mohter i.e. Colostrum.
        - The calf will be standing and attempts to nurse within one hour. Otherwise help too weak calves.
    - *Feeding of Calves*
        - Feed colostrum i.e. the first milk of the cow for the first 3 days. The colostrum is thick and viscous.
        - It contains higher proportions of Vit A and proteins.
        - The proteins are immune globulin which gives protection against many diseases.
        - Colostrum contains antitrypsin which avoid digestion of immunoglobulins in the stomach and is absorbed as it is.
        - Whole milk should be given after 3 days it is better to teach to, drink the milk from the pail or bucket.
        - Feed twice a day which shoulq be warmed to body temperature. For weak calves feed thrice a day.
        - The limit of liquid milk feeding is 10 % of it's body weight with a maximum of 5-6 liters per day and continue liquid milk feeding for 6.10 weeks. Over feeding causes 'Calf Scours'.
        - The milk replaces can be given to replace whole milk.
        - Give calf starter after one month of age.
        - Provide good quality green fodder and hay from 4'h month afterward.
        - Feeding of antibiotics to calves improves appetite, increases growth rate and prevents calf scours. E.g. aureomycin, Terramycin etc.

Other management practices

- Identity the calf by tattooing in the ear at birth, and branding after one year.
- Dehorn the calf within 7-10 days after birth with red hot Iron or caustic potash stick or electrical method.
- Deworm the calf regularly to remove worms using deworming drugs. Deworm at 30 days interval.
- Fresh water should be given from second week onwards.
- House the calves in individual calf pens for 3 months afterwards in groups.
- After six months males and females calves should be housed separately.
- Weigh the calves at weekly interval up to 6 months arid at monthly interval afterward know the growth rate.
- Mortality in calves is more in first month due to pneumonia, diarrhoea and worms.
- Extra teats beyond 4 should be removed at 1-2 months of age.
- 8-9 weeks of age, males should be castrated.
- Keep the body clean and dry to avoid fungal infection.
- Mineral-blocks should be provided, so that the calves lick and no changes for mineral deficiency.
- Wean the calf from the mother and feed through pail feeding system.

Calf hutch

GENERAL CARE AND MANAGEMENT OF HEIFER

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

- For the heifer the calving is first time and it may have difficulty in calving. So take extra care during calving.

Early pregnancy

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

GENERAL CARE AND MANAGEMENT OF MILCH ANIMAL

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

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

GENERAL CARE AND MANAGEMENT OF DRY AND PREGNANT ANIMAL

- The good care and management practices given to pregnant animal will give good calf and also high milk yield during the successive lactation.
    - Extra concentrate mix of 1.25 to 1.75 kgs should be provided for pregnant animal as pregnancy allowance. Feed good quality of leguminous fodder.
    - The animal should not be too lean and too fat in condition.
    - Provide clean drinking water and protection from thermal stress.
    - Do not allow them to mix with other animals that have aborted or that are suffering from or carriers of diseases like brucellosis.
    - Allow moderate exercise, which helps in calving normally. Do not tire them by making long distances especially on uneven surfaces.
    - Do not allow them to fight with other animals and take care that they are not chased by dogs and other animals.
    - Avoid slippery conditions, which causes the animal to fall receiving fractures, dislocation etc.
    - If accurate breeding records are available, calculate the expected date of calving. Separate it one or 2 weeks before and shifted to individual parturition pens.
    - These pens are thoroughly cleaned and fresh bedding may be provided.
    - Feed one kg extra concentrate during last 8 weeks of gestation.
    - Feed laxative about 3 - 5 days before and after calving (Wheat bran 3 kgs + 0.5 gs of Groundnut cake + 100 gms of mineral mixture of salt).
    - Symptoms of delivery may be observed i.e. swelling of external genitalia, swelling of udder, usually majority of animals will deliver without any help.
    - If there is any difficulty, provide veterinary help.
    - After parturition external genitalia, flank should be cleaned arid protect the animal from chill and give warm water.
    - Placenta will normally leave the cow within 2 - 4 hours after calving. It not take the help of a veterinarian.
    - Take care of the animal before calving from milk fever. Give calcium supplement.
    - Some times the udder will be swollen just before calving. Remove the milk partially.
    - Take care, of the animal, if at all any abortion.
    - Provide always free access to drinking water.

GENERAL CARE AND MANAGEMENT OF BULL

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

Care and management of bullock

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

MANAGEMENT OF BULLS

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

RESTRAINING

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

TRAINING

- The young bulls should be trained for handling and leading.
- It is much easier to maintain control on a mature bull if he was properly trained when young.
- Even when the bull is 4-6 months of old a simple halter may be put over his face and he become accustomed to handling.
- After the nose ring is put he should be led either by chain or pole.
- While leading, the attendant should never walk in front of the bull, but must lead from the side holding the nose always higher than natural level.
- If the nose is allowed to drop, the bull may get inclination to butt.
- While handling and leading, all bulls should be considered as potentially dangerous and no complacency should be shown at any time even in case of old as well acquainted bulls.

EXERCISE

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

Bull Exerciser

Bull exerciser

Buffalo bulls in bull exerciser

CARE OF MATURE BULLS

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

MAINTENANCE OF SEXUAL LIBIDO

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

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

FEEDING OF MATURE BULLS

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

IMPORTANAT REPRODUCTIVE DETAILS / BREEDING GUIDELINES

S.NO	PARTICULARS	INDIGENOUS	EXOTIC/CROSSES	BUFFALO
1	Age at puberty	24 months	12-15 months	24-30 months
2	Age at first mating	30 months	18-20 months	30-36 months
3	Optimum weight at first mating	250 kg	180-275 kg	300-350 kg
4	Oestrus cycle length	17-24 days	21±3	21 days
5	Duration of oestrus	18 hours	18 hours	18 hours
6	Time of ovulation	12-16 hour after end of estrus		
7	Optimum time of insemination	Mid heat (standing heat and 6 hr after firs insemination		
8	Conception rate	60 per cent		
9	Services per conception	1.5-1.75		

10	Gestation period	280-290 days		305-318 days
11	Dry period	60	60	60
12	Calving to first heat	40 days	40 days	40 days
13	Calving to first service	60 days or less		
14	Caving to conception	85 days		
15	Lactation length	305 days		
16	First service pregnancy rate	65 %		
17	60-90 days non-return rate	70 %		
18	Abortion rate	Less tan 5%		
19	Breeding age of bull	2-2 ½ year		
20	Number of service per week	2-3 per week		
21	Milk yield	1500-2000	3500-5000	1500-3000
22	Birth weight	25	25-35	30-40

- *Proestrus:* 2 or 3 days
- *Estrus:* 12 to 18 hours
- *Ovulation:* 12 to 16 hours after end of estrus
- *Estrous cycle:* 21± 3 days

PUBERTY

- Puberty is the stage at which animal become sexually mature and secondary sex characteristics become conspicuous.
- The term sexual maturity means that the animal is capable of reproduction.
- Puberty is the age at which the first estrus occurs in the heifer and the bull-calf starts giving semen with viable sperms.
- The reproductive organs undergo marked increase in size at the time of puberty.
- Under good feeding a calf attains puberty approximately at 66 per cent of adult body size.

MODULE-25: GENERAL MANAGEMENT PRACTICES (contd...)

Learning outcomes

- On completion of this module, the learner will be able to understand the feeding management of young and adult animals.

CARE AND MANAGEMENT OF YOUNG STOCK

- Normally newborn animals will be taken care by its mother and required little assistance.

- In case of cattle, sheep and goat immediately after birth the mucus around the nostrils should be whipped out using dry cloth or a hand full of straw can be used for this purpose.
- Calm environment should be provided to the mother and young animals for development of bond.
- The mother should be allowed to lick the newborn, if the dam fails to lick it can be stimulated by sprinkling small quantity of salt or bran over the young one.
- Immediately after birth the naval cord should be ligated with clean sterile cotton thread 1 inch from the body and tincture iodine should be applied to the naval cord.
- With in 1 hour after birth the newborn will able to stand and it should be allowed to drink adequate quantity of colostrum (first milk) which will give immunity to the newborn.
- Young animals should be housed comfortably. Adequate care should be taken to avoid housing young stock with adult stocks.
- In winter condition adequate warmth condition should be provided.
- Adequate bedding materials like straw or hay should be provided to newborn animals.
- For giving extra heat artificial light source can be utilized.
- Proper light, ventilation and hygiene should be maintained to avoid spread of disease.

MANAGEMENT OF DRY AND PREGNANT ANIMALS

Care of Dry animals

- A dry animals means animal, which completes their lactation and drying is essential to give adequate rest to the udder of the animal.
- Dry animals should be separated from other milch animals.
- In case of cow, dry cow can be treated for mastitis to prevent mastitis in next lactation.

Care of Pregnant animals

- Pregnant animals should be provided with extra ration to meet the requirement of fast growing foetus as well as store energy for future lactation.
- Pregnant animals should be separated in advances stage from other non pregnant animals
- They should be housed separately in place called calving pen
- Adequate bedding materials should be provided in the pregnant animals shed
- Floor of the pregnant animal shed should be non-slippery
- Adequate clean fresh drinking water should also be provided in the calving pen
- In advance stage of pregnancy laxative diet should be provided.

CARE AND FEEDING OF BULLOCKS

- Bullocks should not be made to work in direct sun during the hot part of the day.
- During summer working hours may be restricted to 5.00 to 10.00 hours in the morning and 16.00 to 19.00 hours in the evening.
- The bullocks should be properly shoed before using them for work on hard ground, as otherwise their feet may get injured.
- Animals working in the fields required renewal of shoes once in 2 or 3 months.
- The maintenance requirement of bullocks are similar to that of cows and for light work roughage feeding is sufficient, for heavy works supplementation of energy rich concentrate (1-2 kg daily) is required.

FEEDING MANAGEMENT OF MILCH CATTLE AND BUFFALO

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

Watering of cattle and buffaloes

Click here

- Watering should be done as frequently as possible
- Continuous water supply must be available
- Automatic watering system is now possible (see the video)

FEEDING OF DAIRY COW AT DIFFERENT STAGES OF LACTATION

- Under practical feeding condition it is not possible to select much among the roughages or vary the ingredient in concentrate mix.
- The farm manger should carefully plan a cropping programme to ensure year round supply of mixture of leguminous and non leguminous forages.
- One feeding schedule based on thump rule is

	Quantity of green grass to be give (kg) for animal weighing			Concentrate (kg)
	250 kg	300kg	350 kg	
Dry cow	25	30	35	• For non-pregnant cows no concentrate is required. • Pregnant cows should be fed additional quantity of 1.5 kg of concentrate from 7th month of gestation • In case of dry cow, allowance up to 1 kg concentrate can be given if the condition of cow is poor or the fodder quality is inferior.
Milch cow	25	30	35	• 1.0 kg for every 2.5 kg of milk of average 4% fat percentage, in case of buffalo 1.0 kg for every 2.0 kg of milk produced.

Watering of cattle and buffaloes

- See a video on "Automatic watering system"

Click he

EARLY LACTATION

- The recently calved high producing cow is unable to eat enough feed to support her milk production.
- This means that the cow should have enough reserve to store nutrient to be drawn to tide over the period of heavy demand in early lactation, during which period the cow loses weight.

CHALLENGE FEEDING

- Challenge feeding means the cow with high milk production potential are to be fed increase quantity of concentrate to ‘challenge’ them to produce to the maximum.
- This starts two weeks before expected date of calving. This challenge feeding will condition her digestive system for the increased amount of concentrate and provide enough nutrients to initiate lactation on a higher plane.
- Two weeks before the expected date of calving start feeding 500 g of concentrate mixture.
- The quantity should be increased daily by 300-400 g until the cow is consuming 500-1000g concentrate for every 100 kg body weight.

- After calving, the concentrate allowance should be increased by 500 g per day in the first 2 weeks of lactation until the cow achieves peak yield somewhere in the second month of lactation on free choice basis.
- After this the milk yield is tested and the concentrate allowance is fixed accordingly.

CHALLENGE FEEDING SCHEDULE

S.NO	PERIOD	CONCENTRATE ALLOWANCE
1	Last 2 weeks before calving	Starting from 500g, increase 300 - 400g daily until the cow is eating 500 – 1000g per 100kg body weight.
2	First 2 weeks of lactation	Increase 500g per day to free choice level.
3	Second week to peak yield (test day)	Free choice
4	From test day onwards	According to production as per thumb rules. E.g. 1Kg for every $2^{1/2}$ kg milk produced
5	Remaining lactation	Concentrate adjusted to monthly test of milk Production
6	All periods	Green fodder and dry fodder given adequately

FEEDING DURING MID AND LATE LACTATION

- The nutrient deficit period of early lactation is followed by a relatively stable period during which the cow can consume enough feed to meet the various demands for nutrients and the body weight of the cow remains more or les stable.
- During this period the cow maybe fed a well balanced ration of god quality fodder and concentrate according to the milk yield and fat percentage of milk.
- During the late lactation, intake ability of the cow exceeds nutrient needs. This is the time when the cow starts needing extra allowance for the growing foetus.
- This is also the period when the cow can readily replenish the already depleted body reserve and gain weight very fast.
- From 7 ½ month to 10 months of lactation, cow may be fed 1-2 kg concentrate feed in addition to their nutrient requirement for maintenance and milk production to replenish the condition lost in early lactation.

FEEDING OF DRY COW

- More than half of the calf's foetal growth takes place during the last quarter of pregnancy-the dry period.
- Feeding of cow during this period is often neglected because the cow is not returning anything in terms of milk.
- Due to this reason, good fodder and concentrates are generally withheld from the dry cow. This will have adverse consequences on her future production.
- A dry cow should be fed adequate quantity of well balanced ration for
    - Maintenance of the cow
    - Forming sufficient reserve for ensuing lactation
    - Growth of foetus
    - Production of colostrum with high nutritive value.
- The condition of the cow can be controlled by feeding extra nutrients during the latter part of lactation or during dry period.
- If the condition of cow is poor, the quantity of concentrate should be increased.

- During dry period a weight gain of 20-25 kg for smaller cows and 30-40 kg for larger cows should be ensured.
- A cow produces only 10-15 kg of dry matter in the foetus, foetal membranes and fluids. This is equivalent to 50-100 kg of milk production.
- Thus it is the requirement for the replenishment of body reserve that constitute the major additional requirement of dry cow, not foetal development.
- The cow can be made to regain condition either during late lactation or during dry period.
- It has been found that the former is better because of the following reasons.
    - The efficiency of feed utilization for weight gain is better during late lactation than dry period.
    - Many of the problems resulting in ketosis, displaced abomasum, fatty liver, retained placenta, prolapse etc. can be minimized by restoring to all roughage feeding during the dry period.
    - The roughage should be tough enough to stimulate and restore rumen muscle tone.
- If the cow is in poor condition at drying off, she should be given extra concentrate to regain condition.

FEEDING HIGH PRODUCING DAIRY COWS

- High producing dairy cow should eat a large volume of nutrient daily to sustain th milk production at that level.
- This is simply not possible with bulky forages alone due to physical limitation of volume intake (space in the rumen).
- If high level of concentrate is fed it may change the microbial and chemical atmosphere of the rumen and cause disfunction.
- Rumen fermentation can be controlled by a) composition of ration b) ratio of ingredients in the ration c) quantity of feed supplied d) frequency of feeding and e) physical form of feed.
- For a high producer the forage fed should of superior quality which also reduce the quantity of concentrate required.
- Crude fibre is very important in the ration of milking cow because it is well known that rumen fermentation leading to acetic acid production is dependent on the percentage of cellulose in the ration.
- Cows need acetic acid for maintaining normal milk fat percentage as well as total milk production.
- Ruminant ration should contain a minimum of 20-25 per cent crude fibre.
- Higher percentage of grain in the ration reduce cellulose digestibility and cause disturbances like depressed milk fat, depressed milk production and in extreme cases damage to the rumen wall, development of acidosis and death.
- Frequency of feeding: dividing the daily ration into 3 or 4 parts and feeding them in so may installments has been found to be useful in overcoming this problem.
- This also results in greater digestibility and better utilization of protein apart from preventing explosive release of acids.
- A high concentrate ration induces less amount of saliva flow compared to roughages.
- But when feed is given in 4 or 5 installments the proportion of Na and K salts in rumen return to normal.

MIXING OF CONCENTRATE AND ROUGHAGES

- Traditionally, concentrate are fed at the time of milking. Roughages re offered either before or after milking.
- In high producers, when concentrates are fed in heavy doses at milking time, the appetite of the cows will be reduced temporarily and they may not eat roughages for some time.
- Consequent, there will be 4 different fermentation, two primarily due to concentrate and two primarily of roughages.
- The feeding of concentrates separately from roughages during a four time feeding schedule reduces acidic acid production and increases propionic acid.
- It has been observed that feeding grain on top of silage increased the fat percentage of milk production.
- Feeding concentrates either on top of forages or mixed with forages has been four to favour optimum rumen fermentation.
- This has led to the concept of complete feeds which incorporates both roughages and concentrates.

COMPLETE FEEDING

- In order to simplify feeding of dairy cows complete diet system have been introduced.
- Complete diet is an intimate mixture of concentrate and roughages in a desired proportion processed in such a way as to preclude selective eating. It forms the sole source of food for the cow.
- It reduces labour requirement and keeps a tighter control on the cow's nutrition.
- It also facilitates the application of least cost method of ration formulation.
- Feeding of complete diet ad libitum to dairy cow has been found to be advantageous in that it increases feed intake, preserve milk quality as result in better utilization of nitrogen.
- These are in addition to the most obvious advantage of prevention acidosis from over-eating of concentrate by high producer.
- The complete diet feeding system is radically different from conventional feeding method in that there is no individual approach in feeding cows.
- Group feeding is practiced in complete feeding system. There are also fewer changes in diet formulation according to the milk yield.
- This has come as a result of the experimental and practical feeding observation that yield and efficiency are not improved by individual rationing compared to flat rate feeding of cows grouped according to milk yield or stage of lactation.

GUIDELINES TO FEED HIGH YIELDER

- Ratio of a diary cow should contain minimum 20-25 per cent dry matter forages.
- In the case of high yielder, the forages given should be of superior quality.
- It should be cut at the proper state of maturity (45 days). 30 % to 50 % per cent of roughages should be of leguminous crops.
- Processing and reducing the forage to smaller bits may be avoided except incase of very coarse fodder.
- For high yielder when large quantities of concentrates are to be fed, it should be either fed immediately after feeding roughages or preferably, it may be fed mixed with the roughages.
- To ensure proper nutrient intake of roughage and concentrate ration, a density x digestibility value of 35 may be maintained.
- The feeding schedule should be such that it maintains a continuous fermentation in the rumen.
- The cow should be fed a minimum of 4 times a day, each feeding comprising of both concentrate and roughages.

RAISING BUFFALO MALE CALVES FOR MEAT PRODUCTION

- Buffen or carabeef is quite popular in the human diets of buffalo rearing countries.In addition to milk,mutton, chevon, egg and fish, buffalo meat (buffen) is also ao excellent source of protein in the diet of human beings. In buffalo rearing, the male calves are not given proper care and poorly fed right from its birth. The farmer wants to dispose off the male calves as soon as after weaning, as it is uneconomic to keep these animals.
- But the demand of buffalo meat is increasing for domestic cousumption and also for export. As the feeding cost of these animals comes to 70%, it needs special consideration.
- The buffalo male calves are generally weaned late by 10 to 12 months of age with the body weight of 70 to 100 kg.. The buffen produced from such animals are found to be superior than that available in the local markets.
- In India, buufen is considered the cheapest meat among mutton, chevon and chicken. Large number of buffalo male calves are born at rural areas and saccumb to drastic starvation in early life. They are generally fed on left overs of productive animals and sometimes, they are allowed to feed on scrubs. Further they are allowed for short suckling periods. At present such male calves are fed on low plan of nutrition and then disposed off by 3 to 4 years at a body weight of 250 to 350 kg for work purpose or sometimes for meat production.

Types of buffaloes available for meat production in India.

1. *New born males:* Since killing by starvation and other means is a common practice at most of the urban and sub urban buffalo dairy stalls, such calves may be procured in first week of age for veal production.
2. *Residual male calves:* These animals are mostly available with the farmers in rural areas. In rural areas male buffalo calves are neglected animals but farmers feed these calves to keep life because these required for short suckling of their dam for stimulating let down of milk. Such calves of poor condtion are available after weaning at 9-12 month of age. These are largely poor animals of 70-100 kg body weight. However, they have shown satisfactory growth on the feeding of adequate amount of nutritious feed.
3. *Sterile females:* There is large variation in the age and body weight of sterile females. These may be sterile heifer of 5-7 years of age to sterile female after first, second or third lacation and 7-10 years of age. These are mostly healthy animals and rearely need high level of feeding for finishing.
4. *Aged spent animals:* These include aged females of 10-15 years of age after milk producion for 5-7 lactation and working buffaloes retired generally at about 15 years of age. The condition of these animals is generally poor which can be reasonably improved by feeding at high plan for 2-3 months before slaughtering.

Dry matter requirement

- The mean DMI (dry matter intake) may be 80, 85, 90 and 100 g per Kg metabolic body weight for about 100 kg body weight with the ADG (average daily gain) of 400, 400-500, 500-600 and more than 600 g, respectively.

Energy requirement

- Maintenance requirement may vary with the kind of feeds used and it has been found to be 28.31 and 34 g TDN or 108, 115 and 125 kcal ME per kg metabolic body weight in the feeding of high, medium and low energy diets respectively.

Protein requirement

- The diet should contain about 12% CP on dry matte basis. If the digestibility of CP is less than 60% it may be increased accordingly.

Mineral requirement

- An average 0.4% calcium. 0.3% phosphorous and 0.1% sodium in dry matter of the diet would be adequate. Since phytate is present in most of the feeds, the concentrates are normally fortified with 2% mineral mixture and 1% common salt. Iodized salt may be used in iodine deficient areas. Supplementation of copper, zinc or some other trace elements may be required in some areas.

Vitamin requirement

- In the tropical countries feeding of one kilogram green fodder is suggested to take care of vitamin A requirement. Supplementation of other vitamins is generally not rerquired under normal feeding.

Feeding of growing buffalo male calves for meat production

1. *Straw / stover based feeding system:* A higher percentage of concentrate mixture is required to be fed when basal roughage in the diet are wheat bhooa, chaffed jowar and similar poor quality fodders. For a reasonable ADG of 300-500g the diet should contain about 60% concnetate mixsture of at least 19% CP on DM basis and 65-70% TDN. A small amount (1-2 kg per day) of green fodder from any edible source should be fed for the supply of vitamin A requirement.

2. *Green cereal fodder based feeding system:* Cereal fodder like maize, jowar, bajra, oats and grasses are preferably fed from head formation to dough stage of growth when palatability and digestiblity of these fodder are optimum. With adequate cereal fodders, concentate requirements may be reduced to 30-40% of daily dry matter intake. About 500-600 g ADG is expected on such diets up to 300-350 kg body weight.
3. *Green legume based feeding system:* Common leguminous fodder cultivated for livestock feeding are berseem, lucerne, cluster bean, cowpea and other legumes. Green musterd, carrot, turnip and safflower are also considered with legumes diet due to high protein content. The CP content in green legumes is normally 16-22% on DM basis. Hence, for balancing protein in the diet a low protein concnetate is preferred. Calcium content is also higher in these plants. A concentate of wheat bran alone or with ccereal grains has been found to be more suitable for feeding with the legume fodders. Such diets may support 500-700 or even higher ADG, if there is potential in the buffalo calves.

(Source of information: N.N.Pathak (1996), Nutrition and feeding of male buffalo calves for the production of buffalo meat and working animals. Published by the Centre of Advanced Studies in Animal Nutrition, IVRI, Izatnagar.)

CHAFF CUTTING OF GRASSES

- Green roughages are essential feeding components for ruminant livestock. The harvested grasses should be cut into small pieces for efficient utilization by the animal
- The chaff cutters are available in different models for the requirement of the farming activity. The cost ranges from Rs.7000 to Rs. 70,000.
- It is the duty of the manager to select the right model of the machine suitable for the farm
- The benefits of the cutting in to small pieces are as follows
- Wastage reduces
- Stem also is consumed by the animal
- Digestibility improves
- Milk yield improves
- Milk fat increases to some extent.
- The efficiency of the machine is very important. Frequent sharpening of the blades is very essential to get good results.

MODULE-26: DRAUGHTABILITY OF CATTLE AND BUFFALOES

Learning outcomes

- On completion of this module, the learner will be able to understand the draught capacity of cattle and buffaloes, methods to choose and train work bullocks.

INTRODUCTION

- Bullocks for the backbone of agriculture and transport in rural India . The Indian farmers considers cow as the mother of work bullock and looks upon the buffalo as the milk producers.
- A study of the FAO indicated a high rate of increasing crop yield for increasing power inputs up to a level of about 0.4 KW/hectare, which corresponds to a crop yield of about 2.5 tones/hectare, one adult worker plus a pair of oxen would provide such power for about 3 - 4 hectares of land, i.e., about one small farm holder.
- Thus draught animal power is most suited to the condition of small holder farming typical to developing countries.

DRAUGHT CAPACITY OF BULLOCK AND BUFFALO

TYPE OF ANIMAL	MATURE WEIGHT (Kg)	LOW SPEED			AVERAGE SPEED		
		Speed (km/h)	Tractive effort (kgf)	Power(kw)^2	Speed (km/h)	Tractive effort (kgf)	Power(kw)^2
Ox							
Light	210	2.5	30	0.21	4	21	0.23
Medium	150	2.5	64	0.44	4	5	0.50
Heavy	900	2.5	129	0.89	4	90	0.99
Cow							
Light	200	2.5	20	0.13	3.5	16	0.15
Heavy	575	2.5	58	0.40	3.5	48	0.46
Buffalo							
Light	400	2.5	56	0.39	3.2	40	0.35
Medium	650	2.5	91	0.63	3.2	65	0.57
Heavy	900	2.5	126	0.87	3.2	90	0.80

ESTIMATED CAPABILITIES OF CATTLE AND BUFFALO FOR PACK LOADS OVER 6-8 HOURS PER DAY

ANIMAL	MATURE WEIGHT (kg)	SPEED (kg/h)	LOAD (kg)	
			Average	Maximum
Ox				
Light	210	3.5	25	55
Medium	450	3.5	55	115
Heavy	900	3.5	110	225
Buffalo				

Light	400	3.0	50	60
Medium	650	3.0	82	100
Heavy	900	3.0	110	140

WORKING CAPACITY OF BULLOCKS

- The average speed of a pair of bullock pulling a cart is around 4-5 km per hour. If not overdriven, they can travel 25-30 kg or even 40 km daily under favourable conditions.
- The pace and distance covered by bullocks depend not only on the weather but also on their condition, type of harness and equipment used and to a considerable extend on the drives.
- At any rate bullocks should not be used for more than 5 hours a day for tiring work like plouging and heavy transport along uneven surfaces.
- The average draft (weight on neck) developed by bullock varies from $1/5^{th}$ to $1/6^{th}$ of their body weight.
- Optimum draft for an average pair of Hariana bullocks are to be about 60 kg. maximal load pulled by indigenous as well as cross bred bullocks varies between 1210 to 1310 kg.
- Generally a pair of good bullock is sufficient to carry out all the cultivation and transport job during one year on a 5 hectare holding.
- A good bullock should of good size, height and length; the; last mentioned character indicates good speed.
- The animal must have an easy natural gait and good pace. A thick and muscular neck indicates heavy draught capacity while a slender and sinewy neck denotes speed.
- A tight skin is generally considered to denote great sensitivity and fiery temper as in some south Indian draft breeds like Amritmahal, Kangayam and Hallikar.

CHOOSING OF WORK BULLOCK

- Indigenous bullocks of about 4 years of age are good for working. Too young animal will not be strong enough.
- They would not have finished growing and their bones will not be strong.
- The tendency of yoke injuries and yoke galls were fond to be greater if too young animals are put to work.
- On the contrary, too old animals will be difficult to train.
- Even if trained, they will be in working condition only for a few years than bullocks trained when young.
- Bull calves intended to be converted into bullocks should be castrated before they are between 1 ½ years of old.
- Bull calves castrated at proper age turn out to be better bullocks; their docility and robustness being markedly improved.
- The bigger is a bullock the stronger it will be for work. A good bullock should not have any quarter or limb less developed or ill formed.
- The hump should be firm and plump, back level, legs strong, the bones thick and the whole body muscular.
- Malformation of hooves and excessive turning out of toes are undesirable. The hooves should be hard black and waxy.
- The two halves of the hoof should be even, while the cleft should be narrow.
- Lameness from sprains and body enlargements of knee and hock are to be specially looked for.
- The neck must be examined for swelling or yoke galls, which can often be so severe as to incapacitate the animal altogether.
- An ideal draught bullock should have good carriage ad disposition, exhibiting health and vigour.
- Animals that keep their head erect when standing and their tail high while at work are considered to be more alert and be brisk.
- Bullocks should have a docile temperament lest they will be difficult to train. On the other extreme too languid and lazy animals will not do much work.
- The two member of a pair of bullocks should be of the same size and of similar temperament.
- If one is bigger than the other, the yoke cannot be properly fitted.
- In that case yoke bothers both the animal but the bigger one may have to bear most of the strain.

TRAINING OF YOUNG BULLOCK

- When bullocks are well trained only one man can drive a pair while plouging or carting. If the bullocks are not trained one man has to be in the front to lead the bullocks, a second man to hold the plough and perhaps a third to urge the bullocks from the side. Time spend on well trained bullocks is never a waste.
- First step in training is to bet the bullocks used to being led by man. The trained should be a calm and gentle person who should pat and urge the beasts while training.
- Periodically offering tem some fodder or grain first to make them feel at ease.
- Abuses, beating and rough treatment given to young bullocks at this state make them shy away at the sight of a man.
- Second step in training is to teach bullocks to carry a yoke. Always train the same pair together, putting always each bullock on the same side.
- When the bullock accustomed to carry simple yoke on their neck, additional weight up to 75 kg can be added at the middle of the yoke.
- After the bullocks are accustomed to pulling a weight tied to the yoke they can be taught to obey commands to stop, start, to run to turn right and left and to walk straight. For this one has to make them do the same maneuver a number of times simultaneously uttering the command and obliging the bullock to obey the command.
- Newly trained bullocks should be used initially for light work, such as light transport and cultivation.
- Later on they can be made to do more tiring work like heavy transport and plouging.
- Training of bullock can be started at 2-3 years of age and they can be put in work only after 4 years of age.

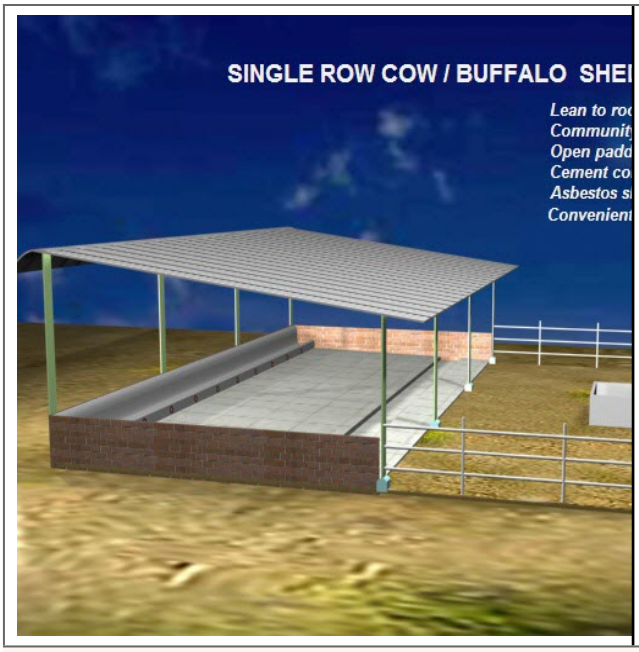
MODULE-27: HOUSING OF DAIRY ANIMALS

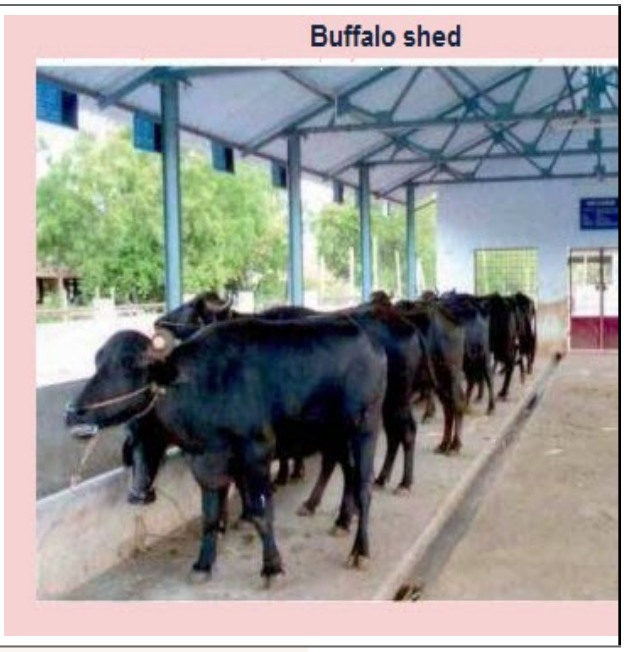
Learning outcomes

- On completion of this module, the learner will be able to know about the housing systems, lay out and designs for various buildings for dairy animals including the floor space requirements, feeding and watering space.

HOUSING OF DAIRY CATTLE AND BUFFALOES

- In India, a great diversity exists in the design of dairy animal shelters.
- Traditional animal shelters have grown out of needs, resources and ingenuity of farmers.
- Building design and construction materials largely affect the thermal comfort inside dairy shelters.
- Efficiently designed sheds can help lesser the thermal stress thereby increasing feed intake, milk production and reproductive efficiency.
- Under varied climatic, geographical and economical conditions prevailing in India, designing an ideal set of building for dairy animals throughout the country is impossible.
- Hence, practically there are two systems of housing for dairy animals viz.,
    - Loose housing and
    - Conventional barns
- The former being widely used in the country.
- See a video clip on double row cow shed 





LOOSE HOUSING

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

Advantages

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

Disadvantages

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

CONVENTIONAL BARNS OR STANCHION BARNS

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

Advantages

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

Disadvantages

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

VARIOUS BUILDINGS OR UNITS REQUIRED FOR DAIRY FARMS

- Dairy cow building must have following places
  - Feeding passage
  - Manger
  - Standing space
  - Gutter or drainage channel
  - Milking passage
- Main building units
  - Milking barn or parlour
  - Down calver shed / calving pen
  - Calf pen
  - Young stock or heifer shed
  - Dry animal shed
  - Bull shed
  - Isolation shed
  - Quarantine shed
- Accessory buildings
  - Store room
  - Milk room
  - Hay or straw shed

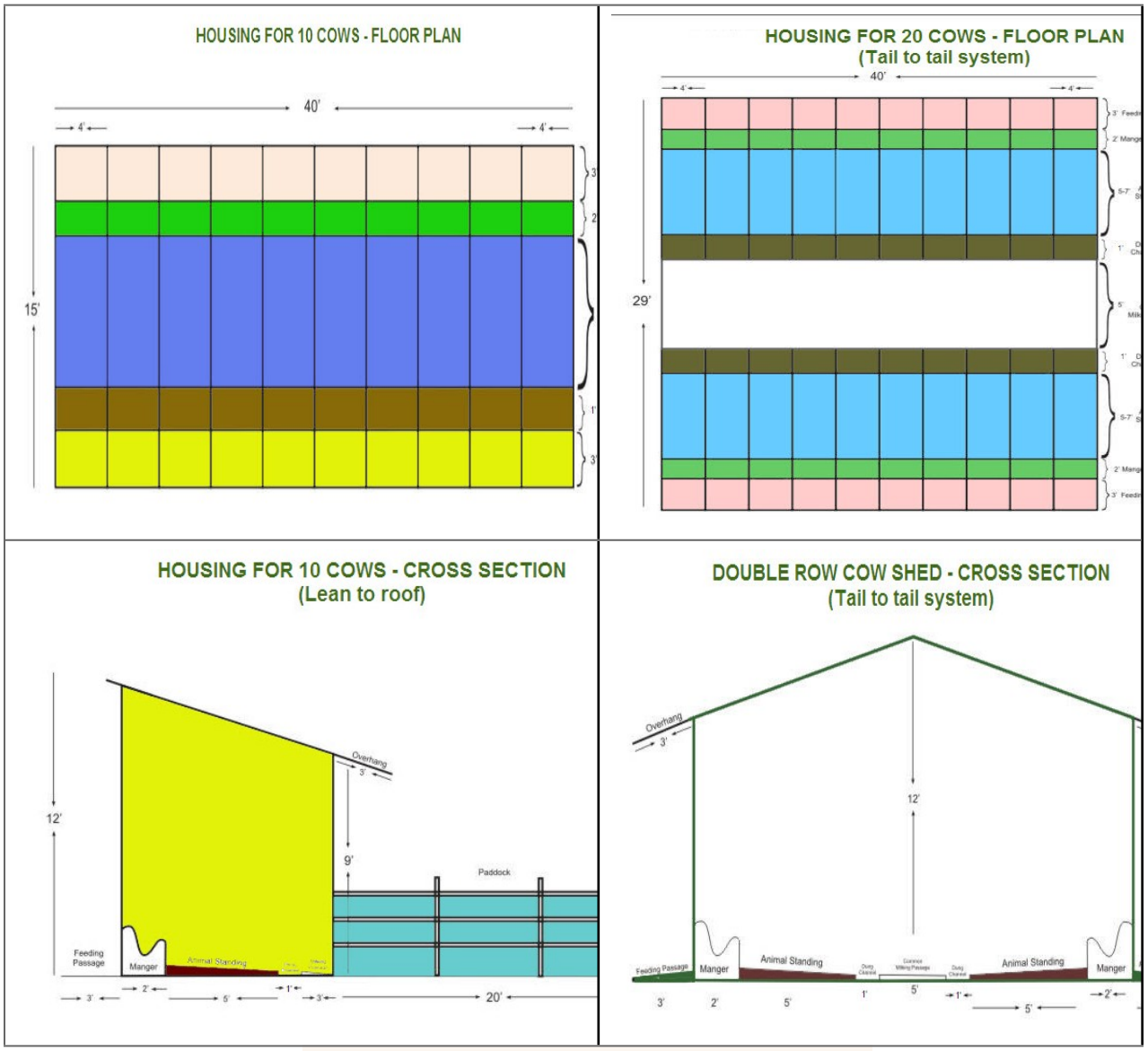
LAY OUT DESIGNS

Milking barns

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

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

- As per ICAR norms, in single row system, 12-16 numbers of animals can be kept. If it is greater than 16, then double row system is preferable.
- In double row system upto 50 animals can be maintained in a single shed. The distance between two sheds should be greater than 30 feet or it should be twice the height of the building.
- There shall be an individual standing in the milking barns and the number of standings required should be 25% of total number of milch animals in the herd and the milking operation should be carried out in batches.



ADVANTAGES OF MILKING BARNS

Tail to tail system

- Cleaning and milking of animals easy.
- Supervision of milking also easy.
- Less chance for transmission of diseases from animal to animal.
- Animals can get more fresh air from outside.

Head to head system

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

DISADVANTAGES OF MILKING BARN

- Milking supervision is difficult.
- Possibilities of transmission of disease is more.

Shed for milch / dry cows

- Milch and dry cows are generally housed separately.
- The floor in the covered area should preferably be made of cement concrete.
- Under Indian conditions, in smaller farms, milch and dry animals can be housed together.
- Normally, one third of the animals in a farm will be in dry or in dry cum pregnant stage.

Calving pen

- Pregnant animals are transferred to a calving pen 2 to 3 weeks before the expected date of calving.
- Calving pen of 3m x 4m (12 m^2) is essential to keep the animals in advanced stage of pregnancy.
- It should be located nearer to the farmer's quarters for better supervision.
- The number of calving pens required is 10% of the number of total breedable female stock in the farm.

HOUSING OF CALVES

- The main objective in planning and designing of calf housing is to provide an environment which will minimize the requirement for veterinary aid, minimize calf mortality and encourage the production of healthy calves.
- The calf housing should provide a suitable environment to both the calf as well as the stockman.

FUNDAMENTAL REQUIREMENTS

- Provide dry bedding.
- Well ventilated environment.
- A specific minimum cubic air capacity per calf.
- A draught free environment at calf level.
    - A dry bed is important to reduce heat loss to the floor and minimize the use of straw.
    - Moisture removal from a calf house is usually accompanied by a combination of drainage and ventilation.
    - Good ventilation also removes the products such as ammonia, hydrogen sulphide, carbon dioxide and methane.

    - The cubic air capacity per calf is important in all calf housing designs because it dilutes the intensity of disease producing organism in a building thus reducing the danger of cross infection.
    - Height and space provided in the housing allows the air to be introduced into a calf house well above the level of calves thus, minimizing the risk of draught at calf level during winter months.
- If all-in all-out system is practised proper disinfection and cleaning operation between batches should be ensured.
- A minimum period of 3 weeks between batches should be allowed.
- The age range in a group of calves should be narrow.
- Only calves from the similar background should be grouped together wherever practicable.

TYPES OF HOUSING

- Calf housing is basically of three types. They are
    - To house dairy and beef calves reared for replacement or for beef production.
    - To house calves reared for veal production.
    - To house sucking calves.
- Most of the calves reared come under the first category.
- The type of housing used for calf rearing varies from situation to situation.
- There is great diversity of opinion whether the calves should be reared in individual pen or in groups.
- In India, calves are generally reared in groups in ordinary stall barn or in the same house along with adult cattle.
- Even in organized farms, situation is not much different.
- In India, high level of calf mortality amounting between 30 to 40% in many farms can be attributable to this kind of housing and management of calves.
- Individual pens should be constructed so that they can be easily cleaned and disinfected.
- Individual pens provide effective separation for each calf.
- This prevents naval sucking and prevents the spread of disease through facial or other contact.
- If railed pen divisions are used, contact is not completely prevented so that they can able to see each other.
- But in other types of housing, the contact is completely prevented.
- It is better to keep the calves in individual pens at least 1 month, if possible, upto 3 months.
- After 3 months, 3 to 5 calves are kept in single pen. After 6 months to breedable age, the animals are kept in singles.
- After 6 months of age the male calves are usually disposed for either breeding or slaughter purpose.
- For ease of management, calf shed or calf unit should be placed adjacent to the dairy unit.

RECOMMENDED FLOOR SPACE REQUIREMENT FOR DIFFERENT AGE GROUP OF CALVES

Age of Calves (months)	Floor space requirement covered area(m^2)	Floor space requirement open area(m^2)	Number of calves per pen
0-3	1.0	2	24
3-6	1.5	3	16
6- 12	2.0	4	12

HOUSING OF BULLS

- Bull is half of the herd, is literally true in the sense that the dairy bull contributes the off-spring half of the herd's genotype.
- In hot regions, the bull's semen production is affected if it has not been properly housed.

- So, adequate, well facilitated bull house is needed to improve the breeding efficiency in a dairy farm.
- Bulls are housed in pen and yard system. Bulls must be housed individually; it may be housed in singe row or double row system.

Purpose

- To protect from inclement weather and for safety and easy handling.
- Provisions for exercise.
- To improve the reproductive efficiency in the dairy farm.

Floor space requirement

- In the covered area 12m^2 per bull can be provided and the open exercise yard 120m^2 per bull.
- If open yard is not provided the bull exerciser is needed.

Last modified: Thursday, 31 May 2012, 08:44 AM

CONSTRUCTION PRINCIPLES

Wall

- In an enclosed loose box, the solid wall should be constructed with the height of 1.5 meter and above these walls two or three horizontal tubular rods with the gap of 20 to 30 cm are fixed.

Floor

- Flooring should be laid properly for bulls because this will help to reduce the hoof problem.
- Floor can be constructed with rough cement concrete and should have a gradient slope of 1/40 to 1/60 to have easy accessibility to the drainage channel.
- In hot regions, the floor should be cool in summer and should insulate the heat properly.
- Generally, vitrified paving bricks can be used in order to prevent slippery floors.

Roof

- Gable or monitor roof with eaves of 2.5 – 3 m height should be provided and ridge height should be 3.2 – 3.5 m.
- Roofing material used for the bull shed in hot regions should be of good insulating property and poor conductivity of heat.
- Generally, asbestos or galvanized iron sheets are used as the roofing materials.

FITTING AND FACILITIES

Manger

- A cement concrete manger with the dimension of 60 cm width, 40 cm depth and 50 cm height of inner wall should be provided inside the bull shed.
- The essential part of fitting in the manger is construction or provision of yoke or tubular stanchions set over the manger.

Water trough

- The bull shed should have a water trough with the dimension of about 60 to 75 cm length.
- The best method for watering in bull shed is by automatic water bowl.

Doorway

- Each bull box should have a main entrance of the half door type 4 feet width and 7feet height, the upper part of the doorway having two strong bars across the opening to prevent any possibility of a bull jumping the lower door when the upper half is left open.
- Provision should be made on the opposite end of the box for a means of exit, either to a feeding passage or yard.

Yard

- A yard is an open area for the bull and should be of 120m^2 and the yard should be enclosed on all sides by 0.3 m solid wall and iron tubular rods as partitions to a height of 1.2 m placed at 0.25 m intervals.
- A doorway of 1.2 m width is provided at the end of the yard. The yard should have the floor with cement concrete type and should be grooved and roughened properly and should have easy access to the drainage system.
- The bull yard is provided for the bulls for the purpose of exercise and also they can view the other animals of the herd so that the feeling of isolation can be avoided for the bulls.

Service crate

- The exercise yard should also communicate with a service crate through a swing gate which serves the use of an attendant to bring the bull to the service crate.
- The semen collection yard and processing laboratory should be close to the bull house.
- One bull is required for 50 breedable cows. If, AI is practised there is no need for maintaining bulls.

PROTECTION AGAINST HOT CLIMATIC CONDITIONS

- The libido and semen quality of bull vary with season and they decrease during summer due to hot weather.
- To reduce the thermal stress the following facilities can be provided.
    - Bull should be housed in cool and well ventilated shed.
    - Showering or splashing of cold water 2-3 times during hotter part of the day is also effective.
    - The bulls can be taken for grazing or exercise in the early morning or late evening i.e., cooler part of the day.
    - Planting quick growing tall trees around the shed to provide natural shade and good ventilation which will also reduce the effect of unfavorable solar radiation.
    - Spreading straw over the roof may reduce the heat inside the animal house.
    - The upper surface of the roof may be painted with white or light coloured material to reflect the heat.
    - The under side of the roof may be painted with black or dark colour.

ISOLATION SHED AND QUARANTINE SHED

Isolation shed

- It is the separation of sick animals from apparently healthy animals to avoid transmission of diseases to healthy stock.
- It should be located at the corner of the shed.

Quarantine shed

- It should be located at the entrance of the farm.
- The newly purchased animals entering into the farm should be kept in quarantine shed for a minimum period of 30 to 40 days to watch out for any disease occurrence.

Hay or straw shed

- An adult animal consume about 5 to 10 Kg of hay or straw per day, while young stock consume about 2 to 5 kg of hay or straw per day.
- The annual requirement can be calculated and the space requirement can be arrived.

STORE ROOM AND MILK ROOM

Store room

- All the four walls should be closed and it should be rat proof.
- There should be one concrete store room with feed mixing unit at a distant place and a smaller feed store room behind the milking parlour.

Milk room

- It is essential to keep the milk and also to chill the milk in larger dairies having 400 to 700 litres production capacity that requires 3.7 m x 5m size of room and an additional 0.37 m^2 for every 40 litres of milk production.
- For a smaller dairy unit below 100 litres a small room with a dimension of 3.75m x 3m can be sufficient for storing milk and concentrate feed.

HAY OR STRAW SHED

- An adult animal consume about 5 to 10 Kg of hay or straw per day, while young stock consume about 2 to 5 kg of hay or straw per day.
- The annual requirement can be calculated and the space requirement can be arrived.

Dimensions of milking barn

- Length of standing space : 1.5 – 1.7 m
- Width of standing space : 1.05 – 1.2m (80% of length, of standing space)
- Width of central passage : 1.5 – 1.8 m
- Width of feed alley : 0.75 m
- Width of gutter : 0.30 m
- Overhang : 0.75 m

FLOOR SPACE REQUIREMENTS

TYPE OF	FLOOR SPACE	MAXIMUM NUMBER OF	HEIGHT OF THE

ANIMAL	REQUIREMENT (m^2)		ANIMALS/PEN	SHED (cm)
	Covered area	Open area		
Bulls	12.0	24.0	1	175 cm. in medium and heavy rain fall and 220 cm. in dry areas.
Cows	3.5	7.0	50	
Buffaloes	4.0	8.0	50	
Down – calver	12.0	12.0	1	
Young – calves	1.0	2.0	30	
Old – calves	2.0	4.0	30	

FEEDING AND WATERING SPACE REQUIREMENTS

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

DIMENSIONS OF FEED MANGER

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

SINGLE ROW AND DOUBLE ROW COW SHED - ANIMATION

- In the following animation single row and double row cow sheds are depicted. Note the animal arrangements and how pipeline milking machines are established.
- Repeat the animation by clicking on refresh button kept in the right bottom corner.

MODULE-28: LABOUR MANAGEMENT AND ROUTINE DAIRY FARM OPERATIONS

Learning outcomes

- On completion of this module the learner will be able to describe the daily routines in a dairy farm, know about the role of farm manager in successful management of farm including labour.

INTRODUCTION

- A skillful use of facilities and materials for production is known as management.
- The farm manager or the owner of the farm is the central figure around whom the whole farm activity revolves. His quality, skill and honest role are the key factors for success of dairy enterprise.

QUALITY OF GOOD MANAGER

- A good manager should lead his staff and not drive them from behind. Subordinates should have confidence in his managerial judgment and ability.
- A good manager gests things done by tact, persuasion or somtme4s by controlled use of harsh words, depending upon the situation.
- At the same time he should avoid involving in non-managerial routine or physical work.
- In dairy farm manager should give priority to needy department without any bias.
- He should give attention to all the departments like husbandry, health, nutrition, fodder production etc.
- A good dairy farm manger should establish a system in such a way that even with out his presence the work of the farm should not be stopped.
- A sound health, sound judgment and sound and firm decisions of a manger is highly essential for success of farm business.
- The manager should have practical mind and all decision should be aimed towards farm economy.
- The manager should save man power and machine power to achieve the benefit. He should go for time motion studies to achieve this object.

PLANNING

- Breeding, feeding, weeding (culling), heeding (husbandry and health) and the four pillars of animal enterprise.
- The purchase, selection, breeding and culling, fodder production, conservation of surplus fodder, procurement and storages of feed ingredients are to be well planned.
- Proper cropping programmed should be drawn to ensure fodder supply throughout the year.
- Feed ingredients should be purchased and stored properly during harvesting season which may be cost less.
- Every days work should be planned at least one day earlier.
- The daily farm routine and routine farm operations should be planned and should be put down in a register.
- Work allotment to the labour should be depending upon the inclination and capacity of each labourer.
- It is not necessary to follow a rotation of work to all the labourer. Work should be allotted according to their skills.
- The quantum of work assigned to each should be such that he is kept busy throughout without being overworked.

ORGANISING

- A proper man at the proper place and at the proper time is the success of labour management.
- The manager should know the norms and the quantum of work that a labourer is expected to finish in a particular time.
- On this basis work has to be assigned. The manager should probe the psyche of his sub-ordinates deeply to find out their temperaments and aptitudes so that he can allot to each labour the type of work he likes.
- Organising skill is the key to utilize the labour efficiently.
- The order in which the works have to be completed, should be prepared and followed.

DIRECTIONS

- Most of the dairy farm labourers are unskilled and illiterate.
- The directions given to them should be simple and short.

- Most confusing and inconsistent orders given to them and changing or renewing at short interval will results in poor turn over.
- Any order should be specific and simple. Some of the powers should be give to the subordinates, supervisors and inspiring them will be very useful.
- If some skilled labourers are there they can be give specific assignment to complete in time with sufficient labour force.
- The labour should be rewarded for his good work and if someone failed, the reason for the failure should be ascertained fully before scolding or punishing him.
- Any directions misleading the labourer should be avoided.

CO-ORDINATION AND CONTROL

- Many problems can be solved easily, if there is a good communication between each other.
- Co-ordination has to be achieved between persons working in different section like feeding and feed and fodder supply, milking and milk handling, detection of animal in heat and breeding operation, maintenance of equipment and utensils, calf care and disease control. Strict respect for the time schedule is unbeatable.

OTHER MANAGEMENT TOOLS IN DAIRY FARM

- Sufficient homesteads should be made available for the farm labourer
- Skilled operations like milking and milk handing, the labour should be trained properly.
- Periodical refreshment of information should be highly essential.
- Person involved in feeding operation should be trained properly, easy way and mean should be given to them for economic feeding, feeding properly according to the requirement and avoiding of feed wastage.
- A person with patience, dedicated skill should be allotted to calf pen and calving pen.
- Modern facilities like close circuit cameras, intercom systems can be used to facilitate good monitoring.
- Safety of farm labour is very important. No compromise should be done in this regard, particularly equipment, electrical fittings and facilities should be monitored properly to avoid any untoward incidences.

THUMB RULE OF LABOUR REQUIREMENT FOR DIFFERENT TYPE OF WORKS

TYPE OF WORK	NUMBER OF LABOURERS
Milking operation including clearing of animal, heat detection	10 animal per one male labour (in hand milking) 15 animal per one male labour (in machine milking)
Shed cleaning and grazing	1 labour per 25 animals
Calf management inclusive of feeding, cleaning	One labour per 25 calves
Other works like cleaning the premises, fodder chaffing etc	One labour per 50 animals

ROUTINE DAIRY FARM OPERATION

TIME (hours)	SI.NO	FARM OPERATION

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 milk pick up van of dairy plants and 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 of farm premises
	4.	Isolation of sick animals
	5.	Isolation of "in-heat" cows for artificial insemination
		Note: use milk man at the rate of one for every 12-14 cows, for all the above operations. Milk man go off duty by 8 am and farm labour come on duty
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. Manger in all sheds should be filled with green fodder
		Note: animals should be taken for grazing (if practiced) between 9 a.m and 2 p.m. in winter and between 6 a.m and 10 a.m. and again between 5 p.m. and 7 p.m. in summer
12.00 - 13.00	1.	Lunch cum rest period for labourers
13.00 - 15.00	1.	Miscellaneous jobs of dairy farm like stock identification, periodical vaccination, preparation of concentrate mixture, repair of farm fences, fitting and repair of equipments, rope and halter making, weekly scrubbing and white washing of drinking water tank, manure disposal/conservation, hay and silage making, periodical spraying of animal houses with suitable pesticides, periodical deworming of stock, clipping of 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 planed 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 extra time on such occasions**.**
		Milkers come duty by 14.30 hours and remain up to 1730 hours whereas general farm labour go off duty by 1700 hours**.**
14.30 - 15.00	1.	Washing/brushing of milch cows by milkers
15.00 - 16.30	1.	Feeding the other half of daily concentrate ration to milch 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
16.30 - 17.00	1.	Delivery of milk (in cans) to milk pick-up vans of milk plants and collection of morning's empty cans
	2.	Washing and disinfection of milking barns
	3.	Feeding dry and green fodder to calves, dry stock and bulls
17.00 - 18.30	1.	Cleaning of milk cow shed
	2.	Feeding green / dry fodder to milch stock
	3.	Cleaning of farm premises
18.30 - 03.00		Night watchman on duty

MODULE-29: METHODS OF HAND MILKING, MASTITIS AND ITS PREVENTION

Learning outcomes

- On completion of this module, the learner will be able to understand the different procedures for clean milk production and prevention of mastitis to animals.

METHODS OF HAND MILKING

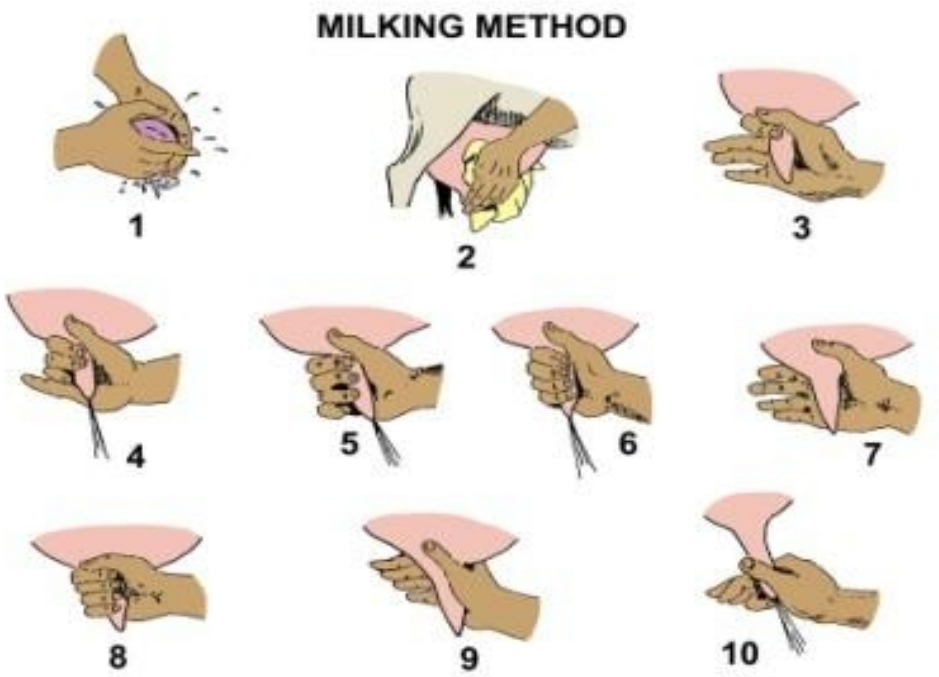
The following are the different methods of hand milking

- Stripping
- Fisting
- Knuckling
- Full hand milking
- Full hand milking followed by stripping

The recommended method is "full hand milking followed by stripping". In the following picture the stages of full hand milking is presented

- **Step 1.** Hand washing
- **Step 2.** Udder washing and wiping

- **Step 3.** Teat massaging
- **Step 4 to 9.** Full hand milking actions
- **Step 10.** Stripping



A COMPARISON OF MACHINE MILKING WITH HAND MILKING

Following is the animated picture which tells you how machine milking is better than hand milking.

- In machine milking the peak yield is achieved quicker and remains longer than hand milking.
- In machine milking the total yield is more than hand milking

HAND MILKING MACHINE - ANIMATION

- Hand milking machines are now available for cheaper cost. Farmers are interested to buy low cost milking machines because the imported machine available in the market is too costly.
- Note the design of the machine
- See hoe it functions

INTRODUCTION

- Mastitis is defined as the inflammation of mammary gland caused by physical, chemical and biological agents such as bacteria, fungi, virus, yeast etc.
- Mastitis is characterized by physical and chemical change in milk, and pathological changes in glandular tissues.

- Important pathological changes include discolouration, presence of clots or flakes and or large number of leukocytes.
- The most important bacterias responsible are *Streptococcus agalactiae, Staphylococcus aureus, Corynebacterium pyogenes, Corynebacterium bovis, Mycobacterium species* and *E.coli*.

CLASSIFICATION OF MASTITIS

- Depending upon the severity and onset of symptoms**.**
- Mastitis can be classified into
  - Acute mastitis
  - Chronic mastitis

Acute

- Onset of symptoms will be quick; the gland will be reddened, swollen, high temperature painful on touch with discolouration of secretion.
  - Per-acute : Systemic reactions like fever, depression, anorexia etc, in addition to udder infection.
  - Sub-acute : Persistent abnormalities with mild inflammation.

Chronic

- Recurrent attacks of inflammation with a little change in milk.
- Based on clinical symptoms
  - Clinical mastitis: The clinical symptoms observed outwardly, markedly so we can diagnose easily by symptoms.
  - Sub-clinical mastitis**:** Clinical symptoms are not observed outwardly, diagnosis by laboratory tests.

MASTITIS DETECTION IN A HERD

- In a herd of cow, few animals may be suffering from mastitis with or without clinical symptoms.
- Mastitis which do not have visible symptoms is called "sub-clinical mastitis"
- Milk sample examination will help in mastitis detection.
- More than 98% of somatic cell found in the milk comes from white blood cells that entered the milk in response to bacterial invasion of the udder.
- A somatic cell count of 2,00,000 cells per ml. of milk indicates the presence of sub-clinical mastitis.
- Herds having effective mastitis control programme consistently have somatic cell count less than one lakh cells per ml.
- In contrast, somatic cell count more than 5 lakhs cells per ml. indicates that 1/3 of the mammary gland is infected.
- The somatic cell count of a composite sample does not reveal the type of infection nor identify the infected cows.
- However it is a good tool to monitor the prevalence of mastitis in the herd over a time.

MASTITIS DETECTION IN INDIVIDUAL ANIMAL

(see Mastitis detector)

Physical examination of udder

- Signs of acute mastitis include swollen, warm and painful quarters.
- The animal does not allow touching the udder, due to pain.
- Reddening of teats, consistency changes of milk are the other signs

- Changes in size and presence of scar tissue may be detected more easily after milking when the udder is empty.

Appearance of milk

- Observation of first stream of milk (foremilk) permits the detection of abnormal milk that should be withheld and discarded promptly.
- Abnormal milk may show discolouration, flakes or clots.
- Abnormal milk may be watery also.

PREVENTION OF MASTITIS

- It can be achieved by proper udder hygiene and floor hygiene
- Proper milking and hygiene
    - Teat should be cleaned and dried before and after milking. Keep the animals clean and healthy.
    - Dipping of teats with $KMnO_4$ after each milking is most effective against *Staphylococcus aureus*, *Streptococcus agalactiae* and to reduce the incidence of mastitis.
    - If milking machine is used, it should be checked periodically. Vacuum level in the milking unit should be between 275-380 mm of Hg. and the fluctuation should be as little as possible. The vacuum regulator should be kept clean and checked regularly for accuracy.
- Treatment of all quarters of cows at the time of drying off
    - Effective uses of long acting antibiotics infused in each quarter at the last milking of the lactation reduce the incidence of new infection during the dry period. In addition, dry cow therapy is the best way to cure chronic and sub clinical mastitis that can rarely be treated successfully during lactation.
- Culling of chronically infected cows is generally effective for clinical mastitis cases.
- Nutritional deficiency of selenium and vitamin E in the diet has been associated with increased rate of new infection.
- Feed the cows immediately after milking, so that it can remain standing for an hour before lying down which will allow complete closure of teat canal there by prevent the of entry of microbes into the teat canal.
- Milk the infected cows at last.
- High yielders are more prone for mastitis, so extra care is needed for them.

TREATMENT OF MASTITIS

Acute mastitis

- Mainly caused by coliform bacteria, which may sometimes endanger the cow’s life.
- Milk the affected quarters, every 2-3 hours, which will help to eliminate the toxins.
- Proper antibiotic coverage is necessary preferably after "antibiotic sensitivity test".
- Application cold water fomentation to the udder will be useful in confronting the inflammation.
- Affected animals should be milked in the last in a herd of milch cattle.

Clinical mastitis

- Mastitis caused by *Streptococcus agalactiae* can be treated successfully with antibiotics.
- Response is more than 90%.
- However, when mastitis is caused by *Staphylococcus aureus*, bacterial coliforms and many other organisms, the success rate of antibiotic treatment rarely exceeds 40-50% and sometimes it is as low as 10%.
- Application cold water fomentation to the udder will be useful in confronting the inflammation

Sub-clinical mastitis

- There may be increased somatic cell count in milk, based on this we can treat the cows with antibiotics.
- Cases of sub clinical mastitis can be best treated by giving antibiotic therapy at the time of drying off.
- Intra-mammary infusion of slow releasing antibiotics will decrease the incidence of 50% of mastitis cases caused by staphylococcus aureus, 80% of Streptococcus mastitis (*Streptococcus uberis, Streptococcus dysgalactiae*).

MODULE-30: MILKING AND CLEAN MILK PRODUCTION

Learning outcomes

- On completion of this module, the learner will be able to describe the methods of milking, hygienic milk production and about machine milking.

PREREQUISITES FOR GOOD MILKING

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

PREPARATION FOR MILKING

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.

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.

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

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.

Dry hand milking

- In this method, the milking operation is practised without lubrication of the milker's hand and teats.
- It is considered to be the best method as it doesn't cause any chaffing/sore on the teats.
- There are fiver types of dry hand milking
    - Full hand milking
    - Stripping
    - Knuckling
    - Fisting
    - Pinching
- *Full hand milking*
    - It comprises holding the whole teat in the ring formed by the palm and the forefingers.
    - Simultaneously, the teat is squeezed using middle, ring and the little fingers and hollow of the palm thus forcing the milk out.
    - This process should be repeated in quick succession.
    - Full hand milking removes the milk quicker than stripping.

    - Cows with large teats and buffaloes are milked by full hand method.
    - Full hand method is superior to stripping.
- *Stripping*
    - It consists of firmly holding the teat at its base between the thumb and the forefingers and drawing down the entire length of the teat pressing it simultaneously to force the milk to flow down in a string. The process is repeated in quick succession.
    - Both the hands may be used, each holding a different teat stripping alternatively.
    - Stripping is practised in cows with very small teats. It causes more irritation and teat injuries due to repeated sliding of the fingers.
    - In spite of this few strippings are done to milk the cow completely especially at the end of the milking process.
    - The last drawn milk is called strippings which is richer in fat.
- *Salient points*
    - Pre-milking routines are as important.
    - It is important to use a smooth and comfortable milking technique.
    - The ”knuckling” or ”stripping” method is used in the wrong belief that it is necessary in order to overcome the resistance in the teat sphincter. These milking methods might cause elongation and damage to the teats.
    - A much more comfortable and appropriate method is the ”full hand” technique.
    - This technique imitates the calf’s suckling and is therefore a better stimuli .

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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.

HISTORY OF MILKING MACHINE

YEAR OF INVENTION	SCIENTIST	TYPE OF MILKING MACHINE
1865	L.O. Colvin	First vacuum type of milking machine
1878	Mrs.Anne Baldwin	Hygienic glove milker with hand pump
1884	J.P. Martin	Milking machine with teat cups connecting tubes and vacuum pump
1885	Modestus Cushmon	Pulsator
1892	Mehring milker	Milking machine powered by hand pump and later foot pump
1903	Alexander Gillies	Modern milking machine

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 STEPS 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.

HYGIENIC MILK PRODUCTION / CLEAN MILK PRODUCTION

Quality milk production should be the aim for better and sustainable market

- Milking schedule should be fixed and definite and there should not be any frequent change in the process. If at all any change it should be gradual.
- Milking parlour should be cleaned at least half an hour before milking.
- Milking vessels or cans should be thoroughly cleaned and dried.
- Ensure that such vessels are round in shape and without any joints.
- Heating of milking vessel before milking (dry heat application) will improve the keeping quality of milk.
- Udder should be washed with lukewarm water, in which few crystals of potassium permanganate can be added. (Amount sufficient to change the colour)
- Massage(light) the udder while washing.
- Ensure that person entrusted with the job of milking is aware of importance of personal hygiene: clean hand and trimmed nails are must.
- Dry the udder with clean cloth from the tip of the teat upward.
- Always ensure that milking is performed with full hand method (Not with folded thumb), quickly, completely and comfortably (Animal should feel comfortable). Milking should be by gentle squeezing of teats NOT by dragging or giving jerks to teats.
- Complete the process from washing to milking within 8 minutes.
- After milking dip the teats in disinfectant solutions e.g. weak iodine solution.
- Always milk animals in calm and quite atmosphere preferably play light music (if possible)
- Animals that have recently calved and animals giving more milk should be milked first thenthe animals giving less milk or in the last phase of lactation.

- Animals withdiseases or with mastitis should be milked separately at the end.
- Animals giving up to 10 liters of milk should be milked twice a day. The frequency needs to be increased to thrice in case of production ranging from 12-15 liters.
- Employ two persons for simultaneous milking in case the production is more then16liter per day.
- Milk from animals with medication in teat (s) should not be mixed with other milk.
- Milk should be strained through muslin cloth (four layers) or through thin nylon mesh.
- Cool the milk (by putting ice around the milk can) and transport it to the retailcenter or collection center of the cooperative society as early as possible.
- Ensure that, water used in cleaning of utensils is clean and free from contamination.
- Milk is a good media for growth of microorganism. A single contamination may render it unfit for human consumption.
- Low quality affects shelf life of the milk besides there maybe change in flavor, taste, or nutrient composition.
- Quality production ensures profitability as you can get premium price for quality.

MAINTAINING GOOD HYGIENE

Simple guidelines for keeping good hygiene in the barn or milking parlour

- Dung should be removed both prior to and during milking in order to minimize exposure of the milking equipment to dirt.
- If the equipment for some reason becomes dirty, it must be cleaned properly before using it again.
- Hands should be clean when milking or handling the milk. Clothes should be clean.
- Use one udder-towel per buffalo, discharge towels in a separate bucket after usage.
- Post-dipping of teats should always be done.
- All containers with milk should have a lid on at all times.
- Milk should not be stored nearthe dung or feeding place. There are several reasons for this;
    - milk is sensitive to odours and may ”pickup” dung or feed odours.
    - Bacteria from dungor feed are more easily transferred to the milk if it is stored nearby.
    - Particles from the dung heap or the feed may contaminate the milk.
- It should not be possible for animals such as dogs, cats and rats to approach the containers.

PRE-MILKING AND AFTER MILKING

Pre-milking

- Pre-milking is defined as actions to induce milk let-down by cleaning the udder and pre-milk in a strip cup.
- Cleaning the udder should be done with a lubricated towel (washable textile or disposable paper).
- Separate towels should be used for each buffalo. The udder should never be splashed with water.
- Pre-milking is necessary for various reasons; the most important being preparing the buffalo for actual milking and checking for mastitis or other infections.
- Pre-milking must be done in a strip cup, never on the floor! The purpose of using a strip cup is to be able to easily observe changes in the milk.
- Furthermore, the spreading of pathogenic bacteria is limited. Pre-milking is done with dry hands and the fullhand method.
- The hands should be cleaned between buffaloes during the milking, if necessary.

After milking

- After milking the teats should be disinfected. This reduces, if not completely inhibits, bacterial growth on the teats.
- The teat canal stays open for a while after milking is completed, thus eliminating the important protection against entry of bacteria.

- The dip solution will both act as a physical hindrance for bacteria and as a disinfectant.
- Preferably the teat-dipping-solution should contain some lubricant in order to maintain teat condition and to prevent chapping and sores.
- Because the teat canal is open after milking, sometimes for as long as half an hour, the buffaloes should be prevented from lying down.
- This can be done by giving enough feed to last for a long time after milking.
- Special detergents for cleaning of the milking equipment is available and should be used correctly.
- All buckets, containers and machines used for milking must be cleaned both outwards and inwards immediately after usage.
- The towels used for cleaning and drying of the udder should be cleaned properly after each milking.
- They can be stored in a bucket with a lid and clean water containing chloride until the next milking.

MILKING ROUTINE

- An appropriate milking routine is important for hygienic reasons as well as for creating a comfortable and smooth environment for animals and milkers.
- It is easier to maintain a good hygiene if a consistent milking routine is applied.
- In dairy cows, strict milking routine results in increased milk production.
- The routine mentioned below can be followed by both hand and machine milkers.
- Routine check of the milking machine should be done before each milking session according to the manufacturers recommendations.

Machine milking of buffaloes

- Start by tying (if not already tied) and feeding the animals.
- Remove dung from the floor.
- Wash hands with soap and dry them.
- Clean the teats with special towels and massage them thoroughly.
- Foremilk the buffalo by hand in a strip cup, checking the appearance of the milk.
- Apply the cluster gently. Check tube alignment.
- Check the buffalo every now and then to make sure that she is comfortable with the machine.
- Palpate the udder to check that it feels empty.
- Remove the cluster gently.
- Dip the teats in a suitable disinfectant solution.
- Clean all the equipment in the milking room.
- When machine milking, it is important that the milking machine is nearby and ready to be applied to the udder at the right time (after pre-milking).
- Thus, each buffalo must be cleaned, massaged and pre-milked and then have the machine applied directly.
- It must be emphasized that it is not possible to clean all the buffaloes first and then apply the machines to the first buffaloes.
- The oxytocin release has a short duration (a few minutes). If the machine does not start milking after this time, a whole new procedure must start after half an hour.

MODULE-31: FACTORS AFFECTING QUANTITY AND QUALITY OF MILK PRODUCTION

Learning outcomes

- After the completion of this module, one will be able to understand why the quality milk varies from animal to animal, time to time, between age groups etc. This module helps in learning methods how to improve the quality of milk.

FACTORS AFFECTING MILK YIELD

- Under normal conditions, milk production increases during the first six weeks of lactation and then gradually decreases.
- The actual amount of milk poduced during the lactation period is affected by several factors namely.,
    - Breed
    - Stage of lactation
    - Parity (Order of lacation)
    - Season of calving
    - Geographic region (Environmental condition)
    - Management factors (Nutrition, feeding system, frequency of feeding etc.,)

BREED AND INDIVIDUAL VARIATION

Breed and individual cow

- Milk yield and composition varies considerably among breeds of dairy cattle. Jersey and Guernsey breeds give milk of higher fat and protein content than Shorthorns and Friesians.
- Variation in the ability of cow to produce total milk, fat and solids not fat is an inherited character. There is both a breed difference and an individual difference. In general higher the production, lower will be the fat %.
- Zebu cows can give milk containing up to 7% fat. However, very little variations are noticed in the composition of milk yield between Indian breeds of cattle.
- Individual variations within a breed is also common.

Variability among cows within a breed

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

BREED	TOTAL SOLIDS	FAT	PROTEIN
Holstein Friesian	12.4	3.7	3.1
Brown Swiss	13.3	4.0	3.6
Ayrshire	13.1	4.1	3.6
Guernsey	14.4	5.0	3.8
Jersey	14.6	5.1	3.9
Sindhi	13.6	4.9	3.4
Gir	13.3	4.7	3.3
Tharparkar	13.2	4.5	3.3

sahiwal	13.3	4.5	3.3

STAGE OF LACTATION

- The greatest variation in the composition of milk takes place immediately following parturition within the first 5 days. The secretory product colostrum contains more vitamin A, vitamin D, iron, calcium, magnesium, chlorides and phosphorus than normal milk. But it contains less lactose and potassium than normal milk.
- Milk yield generally increases up to 50th day of lactation and declines steadily to the end of the period. But the fat percentage increases towards the end of lactation.
- Colostrum changes to normal milk in about 10 days. Then remains generally constant in composition to about 90th day of lactation. From this day, the protein % increases until the end of the lactation period. Lactose remains practically constant for the entire lactation period except in the colostral period.
- During advanced lactation, milk becomes bitter after standing for a shorter period. This is due to an enzyme lipase, which splits fat into glycerol and fatty acids. The free fatty acids, which taste rancid, unite with the cations of the milk and form soap, which contributes to the bitter taste.

OESTROUS AND PREGNANCY

- During oestrus period there is a decrease in milk yield and increase in fat %. Some animals hold up the milk due to excitation, thus milk with low fat % will result.
- A marked drop in milk production occurs during the latter period of gestation. It begins about the 6th month of gestation and continues with an increasing rate of inhibition until parturition.

Reasons

- Growing fetus requires nutrients, which compete with the requirements for milk production.
- Possibly due to large amounts of oestrogen and progesterone flow into the blood.

VARIATION IN MILKING

- The fat % in last drawn milk is higher than that of first drawn milk.

	YIELD	FAT
Foremilk	15%	1.9%
Middle milk	58%	2.3%
Strippings	27%	6.8%

- Among the milk drawn from each quarter, fat alone varies and not other constituents. In an average fore quarters produce 40% and the rear quarters remaining 60% of the milk.

AGE AND SIZE OF THE ANIMAL

Age variation

- The age of the cow has a definite effect on production.

- Most cows reach maturity and maximum production at about 6 years of age following which there is a decline in production.
- Records indicate that cows produced approximately 2%, 15%, 8%, and 2% more milk at maturity than they did at 2 years 3, 4, and 5 years old.
- After 6 years fat gradually decreases with advancing age.
- As cows grow older the fat content of their milk decreases by about 0.02 percentage units per lactation.
- The fall in SNF content is much greater

Size of the animal

- There is a direct relationship between milk production and size of the cow. Larger cows have more udder secretory tissues and larger digestive system and hence more in milk yield

FEED AND FEEDING

- Quality and quantity of feed has a direct effect on quality of milk.
- Underfeeding brings about a marked decline in the milk yield.
- The fat content of milk can be increased to some extent by feeding.
- Feeds high in fat such as cottonseed oil, linseed oil and soybean oil increase the fat content of milk.
- A minimum amount of fat in the ration is necessary for normal milk production.
- A feed ration devoid of fat but adequate in all other factors results in lower milk yield and also fat%.
- High fat diets tend to cause a decrease in the casein content and thus the protein content of milk.
- Fat of the feed also affects the composition of milk fat.

SEASON

Temperature

- If the temperature is between 40 ° F and 70 ° F it is termed as comfort zone and has no effect on milk production.
- If the temperature goes below 40 ° F, there is no adverse effect on milk production. But extra feed is required.
- Cold temperature [5 ° F or Less] may have detrimental effect on milk yield. Larger breeds are [Holstein] more tolerant to low temperature than smaller breeds.
- Milk fat content as well as SNF and total solids % increases with the decreasing temperatures.
- With increased temperature, there is a slight decrease in yield and slight decrease in milk fat, SNF and total solids. At temperatures above 75 ° F, a decrease in milk yield occurs. This decrease is milk yield may cause an increase in milk fat. The smaller breeds particularly Jersey is more tolerant to higher temperatures.
- In summer, milk production is less and milk production is 15-50% more in monsoon season.

DISEASES

- Diseases of udder and other digestive disturbances and systemic diseases reduce the milk yield and quality.
- In mastitis, composition of milk changes depending on the severity of infection.

During mastitis,

- Lactose content decreases
- Chloride content increases
- Decrease in casein and increase in heat sensitive protein, increase in soluble nitrogen.

- pH changes to alkaline side.
- In severe mastitis, fat percentage drops to 0.3%.

OTHER FACTORS

Length of dry period

- A dry period of approximately 60 days is recommended following each lactation period. This is important because it permits the cow's body to store up reserves to meet the resource demand of the next lactation and it permits proper involution of the uterus and conditioning of udder. A short dry period usually results in lower milk production.

Condition of cow at calving time

- A cow maintained in good condition will generally give 25% higher yield than the one maintained in poor condition. Cows in very fat condition at calving time produce milk of much higher fat content for a considerable time after calving.

Frequency of milking

- Cows milked 3 times a day produce more milk than those milked twice a day. Cows milked 4 times a day produce more milk than those milked 3 times daily. Also it has been observed that cows milked more frequently are persistent in their production throughout their lactation. Frequency of milking has no effect on butterfat.

Irregular milking

- Unequal intervals between milking affect both quantity and composition of milk. More milk of slightly lower fat content is obtained following longer intervals.

Change of milker

- High producing milch cows may be under stress with the result that they are usually very sensitive to any changes, including that of the caretaker. Creating a pleasant, quiet and comfortable environment causes a cow to perform more efficiently.

Day to day variation in fat

- Research has shown that day-to-day butterfat varies from 0.1-2%.
- Interval between milkings
    - The fat content of milk varies considerably between the morning and evening milking because there is usually a much shorter interval between the morning and evening milking than between the evening and morning milking.
    - If cows were milked at 12-hour intervals the variation in fat content between milkings would be negligible, but this is not practicable on most farms.
- Normally, SNF content varies little even if the intervals between milkings vary.

MODULE-32: DAIRY FARM ACCOUNTS AND RECORDS

Learning outcomes

- At the end of this module, the reader will understand the importance of different records maintained in a livestock farm and how to maintain them properly, so that the records will become useful indicators of reflecting the performance of the animals in the livestock farm.

REGISTER TO BE MAINTAINED

- Daily stock register
- Birth/calving register
- Calf/young stock register
- Adult stock register
- Breeding register/AI register
- Weighment/growth register
- Milk yield and distribution register
- Sales/disposal register
- Mortality register
- Feed stock register
- Fodder stock register
- Receipt/Income register
- Herd health register

DAIRY FARM RECORDS

- The complicated job of management of a dairy herd requires sound planning for synchronization of all the inputs and all the factors that are chain linked to each other.
- It requires day to day planning, coordination, execution and evaluation, keeping in mind, the ultimate objective.
- This is possible only when the manager has all the facts pertaining to the stock before him. Such facts can be obtained from production and reproduction records.
- Great strides in the development of dairy industry in UK, USA, Netherland and other countries have been taken only after initiation of scientific keeping and exploitation of performance records.
- Thus, record keeping management axis can be seen in decision making on the following lines.

On-herd uses of records

- Each animal in the herd is identified with respect to their production performance.
- Close management and appropriate feeding levels can be provided on the basis of production level.
- Efficiency of culling and selection has been increased which in turn will increase the profit rate.
- Relative influence of feeding, management and breeding can be assessed on production performance.
- Livestock marketing can be promoted on the basis of performance records.

Off-herd uses of records

- Comparison of herd performance between and within breeds is possible.
- Superior stock can be identified for extensive use in breeding programmes.
- Herd and breed registration programmes can be implemented more effectively.
- Realistic research, development planning and plan implementation are possible.
- The twin objectives of performance recording in rural areas are;
    - It should help the dairy manager / farmer to produce more quantity of milk at lower cost.
    - It should provide required data to the administrators (for planning), research organizations (for processing and analyzing the enterprise scientifically), breeders (for formulating selection and breeding programmes) and extension personnel (for getting feed back information from the farmers).

- In India, as in most of the other developing countries, barring on government farms, particularly no performance recording exist at the farmer's level.
- Illiteracy, poverty, ignorance, lack of incentives etc are the common causes for this situation.
- Creation of following incentives to the farmers as means of developing field recording systems in rural areas is a meaningful attempt.
    - Paying for fat and protein content of milk.
    - Giving free advice on feeding and management to the farmers supplying records.
    - Providing facilities like AI of good bulls, at free of cost or at low cost to the farmers participating in the performance recording programme.
    - Paying for daughter records of selected young bulls.
- Major practical requirements of performance recording

In developing countries

- The scheme must be simple that is involved little paper work for farmers.
- The scheme must be appealing to the average farmer; they should feel that it benefits them in managing the animals better.
- The direct cost to the farmer should be small.
- The records kept should enable the farmers to identify the best and the poorest producer and should make it possible for progeny testing of bulls.
- The information from the records should be made available to the farmer quickly and in simple form and should be utilized for extension and research purpose.
- The milk recorder must visit each farmer at least once a month to maintain contact and give advice.
    - Though, monthly test recordings were found to be fairly accurate in North America and Europe for selection and monthly recording for progeny testing.
    - In Kenya it seems preferable not to go beyond 14 days interval for recording if relatively high accuracy is desired in the selection of individual cows.

METHODS OF MILK RECORDING

- There are two main methods generally adopted.
    - Cow day method
    - Lactation method

Cow day method

- It is particularly applicable to commercial milk producers and the end result is obtained by relating total milk produced in a herd for 12 months period to the number of cows, which is adjusted to the feeding cost.
- This is an estimate of the average herd performance.

Lactation method

- It meets the requirements of pedigree breeders where emphasis is given to lactation yields as distinct from annual yield.
- The breeder is more concerned with the specific performance of individual with in this herd and the comparisons between them so as to assess the results of the breeding plan.

Registers to be maintained

- Daily stock register
- Birth / calving register

- Calf / young stock register
- Adult stock register
- Breeding register / AI register
- Weighment / growth register
- Milk yield and distribution register
- Sales / disposal register
- Mortality register
- Feed stock register
- Fodder stock register
- Receipt / Income register
- Herd health register

IMPORTANCE OF RECORDS

- The performance of the farming enterprise can be seen through the records.
- The daily stock position, daily addition and deletion of animals can be easily assessed from daily stock register.
- The number of young and adult animals, the number of male and female animals available in the farm can be taken immediately from the stock registers.
- The daily milk production, monthly total, animal-wise total production, annual production can be calculated from the concerned registers at once.
- Simultaneously the daily milk disposal also can be maintained.
- In a day the money transactions namely the expenditure and receipt can be quickly estimated from the daily account register.
- The breeding performance of the male and female animals can be assessed from the breeding records, so that poor performing unwanted animals can be removed from the farm.
- The value of the farm enterprise will be available only from the records.
- From the health register, it is possible to collect the details of incidence of diseases in the past and the precautions to be taken in the future.

ON-HERD USES OF RECORDS

- Each animal in the herd is identified with respect to their production performance.
- Close management and appropriate feeding levels can be provided on the basis of production level.
- Efficiency of culling and selection has been increased which in turn will increase the profit rate.
- Relative influence of feeding, management and breeding can be assessed on production performance.
- Livestock marketing can be promoted on the basis of performance records.

OFF-HERD USES OF RECORDS

- Comparison of herd performance between and within breeds is possible.
- Superior stock can be identified for extensive use in breeding programmes.
- Herd and breed registration programmes can be implemented more effectively.
- Realistic research, development planning and plan implementation are possible.
    - The twin objectives of performance recording in rural areas are
        - It should help the dairy manager/farmer to produce more quantity of milk at lower cost.
        - It should provide required data to the administrators (for planning), research organizations (for processing and analyzing the enterprise scientifically), breeders (for formulating selection and breeding programmes) and extension personnel (for getting feed back information from the farmers).
    - In India, as in most of the other developing countries, barring on government farms, particularly no performance recording exist at the farmer’s level.

- Illiteracy, poverty, ignorance, lack of incentives etc are the common causes for this situation.
- Based on Kenyan experience, Lindstorm suggest creation of following incentives to the farmers as means of developing field recording systems in rural areas of third world countries.
    - Paying for fat and protein content of milk.
    - Giving free advice on feeding and management to the farmers supplying records.
    - Providing facilities like AI of good bulls, at free of cost or at low cost to the farmers participating in the performance recording programme.
    - Paying for daughter records of selected young bulls.

RECORDING OF INFORMATIONS

- The recording must be simple that is involved little paper work for farmers.
    - The recording must be carried out in an appropriate time
    - The frequency of recording should be as low as possible. At the same time information should not be missed
    - The recording must be appealing to the average farmer; they should feel that it benefits them in managing the animals better.
    - The direct cost to the farmer should be small.
    - The records kept should enable the farmers to identify the best and the poorest producer and should make it possible for progeny testing of bulls.
    - The information from the records should be made available to the farmer quickly and in simple form and should be utilized for extension and research purpose.
    - The records containing expenditure and income details should be checked daily.

MODULE-33: DEMOGRAPHY OF SHEEP AND GOAT POPULATION AND THEIR ROLE IN ECONOMY

Introduction

- Sheep in India are mostly owned by nomads or semi-nomadic people who constantly move their flocks in search of good pastures and water.
- Sheep farming is a hereditary occupation with these people. The size of their flock varies from a few to hundreds.
- The husbandry practices are most primitive.
- There are certain advantages connected with sheep farming and these are:
    - Sheep requires little concentrate food as compared to cattle.
    - On an average sheep get 80-90 per cent of their protein from forages as against cattle which get about 60-65 per cent.
    - Sheep are an economical converter of grass into meat and wool.
    - Sheep are the best animal that can be raised on stubbles as well as on grasses and other plants growing between stubbles.
    - In fact there is no substitute for sheep as a class of livestock for utilizing waste land or weed from the field.
    - Unlike goat sheep do not damage the trees.
    - Sheep require less labour than other kinds of livestock and get along well with low-cost housing and equipment.

Sheep in dry land agriculture

- In the chronically water deficient area in India the current farming practice is involves millet production for human consumption.
- In addition to this sheep farming has always flourished in dry areas.

STATUS

Domestication

- Sheep and goats were perhaps the first ruminants to be domesticated around 10,000 B.C.
- Sheep were first domesticated probably in Iran, Turkestan and Pakistan.
- Sheep in India and in Arabia have originated from their wild ancestor *Ovis orientalis vignei.*
- Goats are believed to descended from two living races of wild goats namely the Bezoar or Pasang (*Capra hircus aegagrus*) breed of the high mountains of Iran and Asia minor and the wild goats of Sind (*Capra hircus blythi*). Toys from Harappa & seals from Mohenjodaro show goats that greatly resemble the ancestral wild goats.
- Sheep with its multifaceted utility (for meat, wool, skin, manure and to some extent milk) play an important role in the Indian agrarian economy.
- They are better adapted to arid and semi-arid tropics with marginal and sub marginal lands, other wise unfit for crops, due to their superior water and feed especially protein economy.
- They have an excellent ability to survive over a prolonged period of draught and semi starvation and are less prone to extreme weather conditions, ectoparasites as well as diseases.
- Sheep can also constrict or relax blood vessels in face, legs and ears for control of heat loss.
- Because of their hardiness and adaptability to dry conditions the north western and southern peninsular regions of the country have large concentration of sheep.

- Because of their close grazing nature and ability to utilize very low set vegetation which no other animal can utilize, and their capacity to cover long distances in search of forage and water, they are often associated with creation of desertic conditions.

SCIENTIFIC CLASSIFICATION OF SHEEP AND GOATS

- Kingdom Animalia - Animal
- Phylum Chordata - Vertebrates (back bone)
- Class Mammalia - Hairy & suckling their young ones
- Subclass III Eutheria - Females possessing placenta
- Order IV Ungulata - Hoofed mammals
- Suborder Artiodactyla - Even toed animals
- Section Pecora - True ruminants
- Family Bovidae - Hollow horned ruminants

Sub family

- Ovinae - Sheep
- Caprinae - Goats

Genus

- *Ovis* - Domesticated and wild sheep
- *Capra* - Domesticated and wild goat

Species

- *Ovis aries* - Domesticated sheep
- *Capra hircus* - Domesticated goat

DOMESTICATION

- Sheep and goats were perhaps the first ruminants to be domesticated around 10,000 B.C.
- Sheep were first domesticated probably in Iran, Turkestan and Pakistan. Sheep in India and in Arabia have originated from their wild ancestor *Ovis orientalis vignei*.
- Goats are believed to have descended from two living races of wild goats namely the Bezoar or Pasang (*Capra hircus aegagrus*) breed of the high mountains of Iran and Asia minor and the wild goats of Sind (*Capra hircus blythi*).
- Toys from Harappa and seals from Mohenjodaro show goats that greatly resemble the ancestral wild goats (FAO, 1985).

DIFFERENCE BETWEEN SHEEP AND GOAT

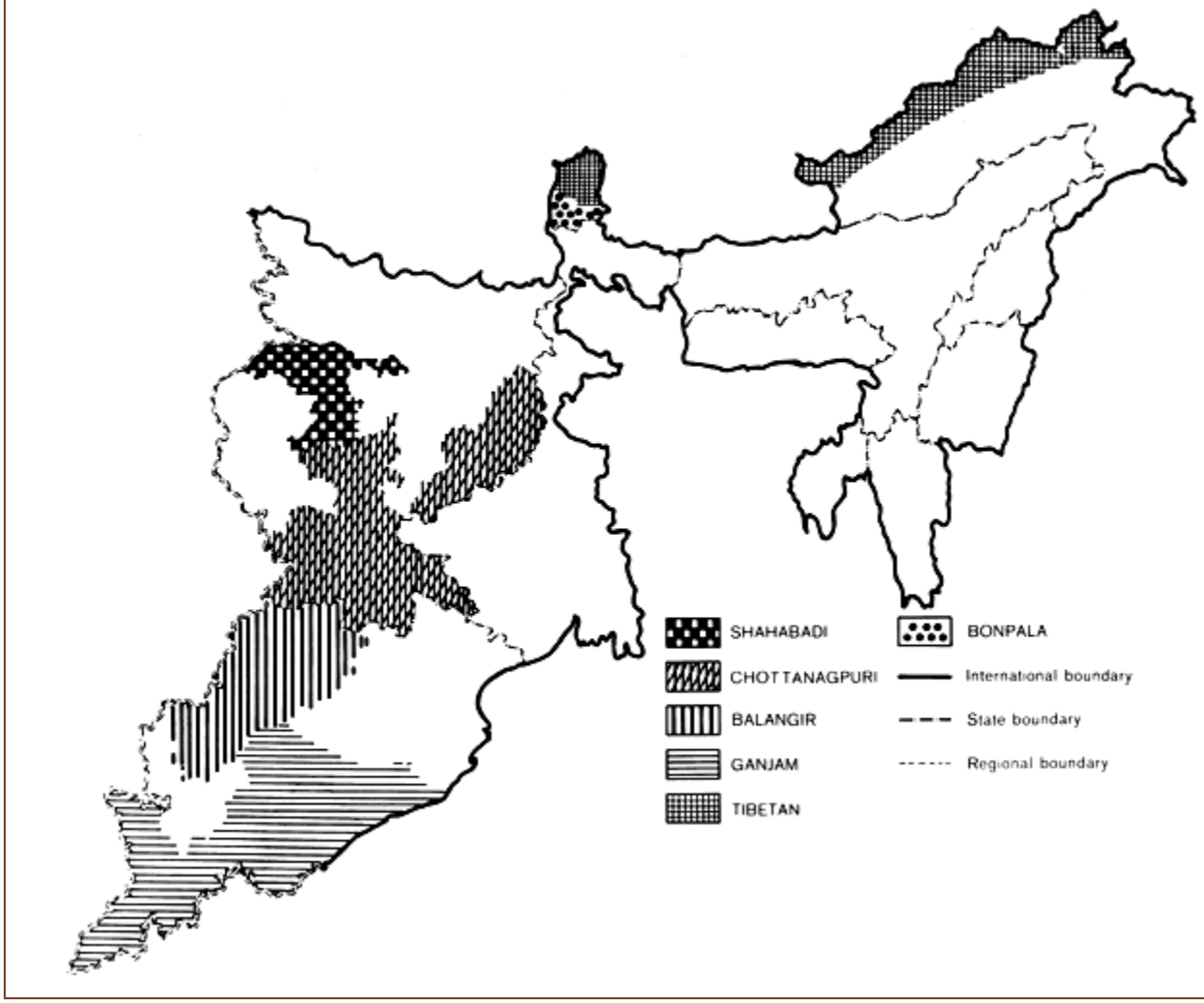
Sl.NO	CHARACTERISTICS	SHEEP	GOAT
1	Tail	Generally long, hanging and fairly broad	Short, Thin and upright.
2	Presence of beards	No beard	Beard is present
3	Face glands	Present just below the eyes of most sheep	Absent

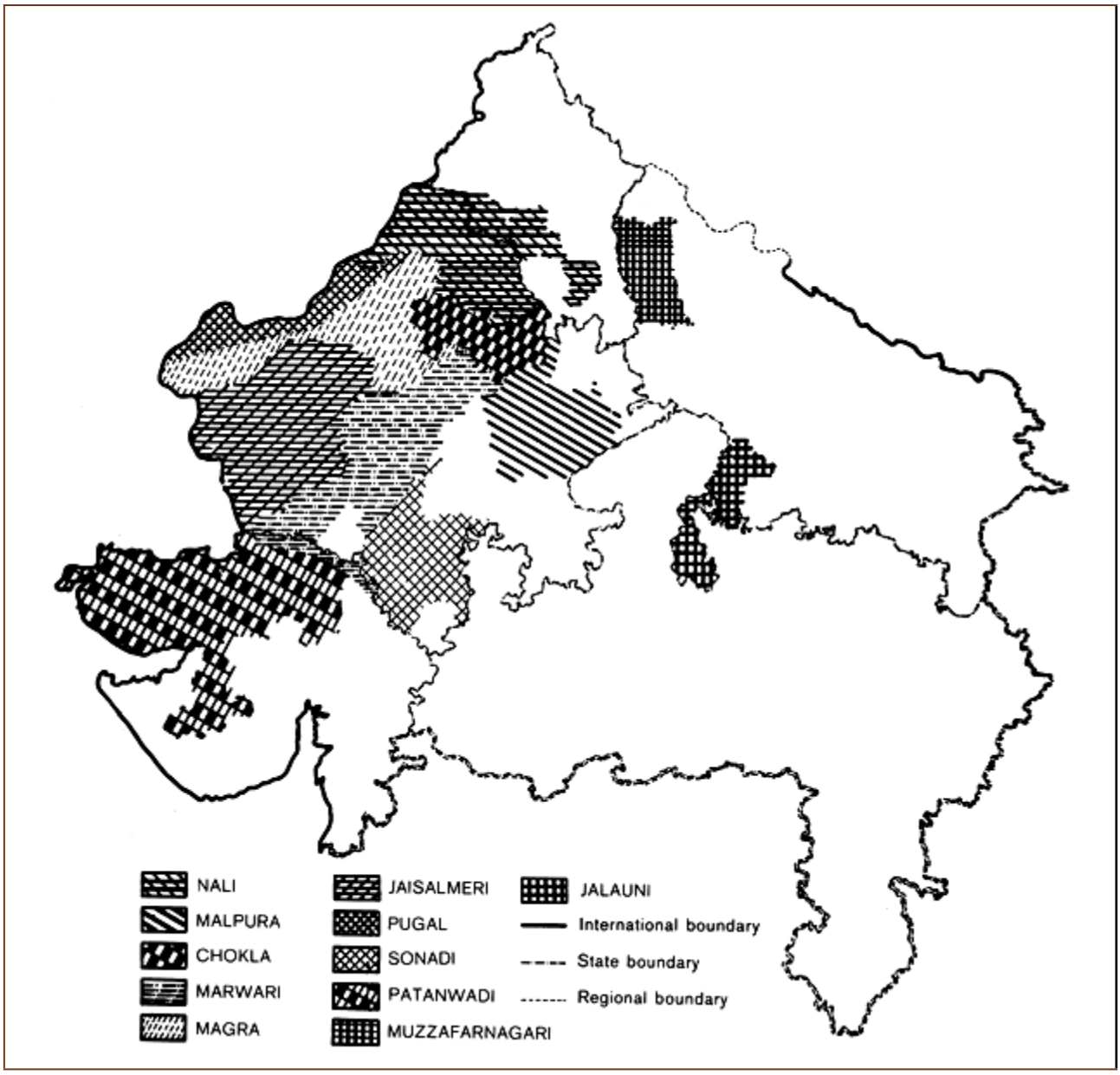
4	Foot Glands in hind feet	Present on each foot above the split between the toes	Absent
5	Nature of horns	Mostly homogenous	Heterogeneous in nature
6	Activity	Walk shorter distance	Bipedal stance and walk longer distance
7	Feeding pattern	Grazing less selective	Browsing, more selective
8	Variety in feeds	Preference is lesser	Preference is greater
9	Dehydration in Faeces	Relatively higher water loss	Less water loss
10	Urine	Less concentrated	More concentrated
11	Water in take	Higher	Lower
12	Chromosome number	54	60
13	Length of oestrus cycle	16-17 days	19-21 days
14	Duration of oestrus	24-36 hours	34-38 hours
15	Time of ovulation	25-30 hours after the onset of oestrus	30-36 hours after the onset of oestrus

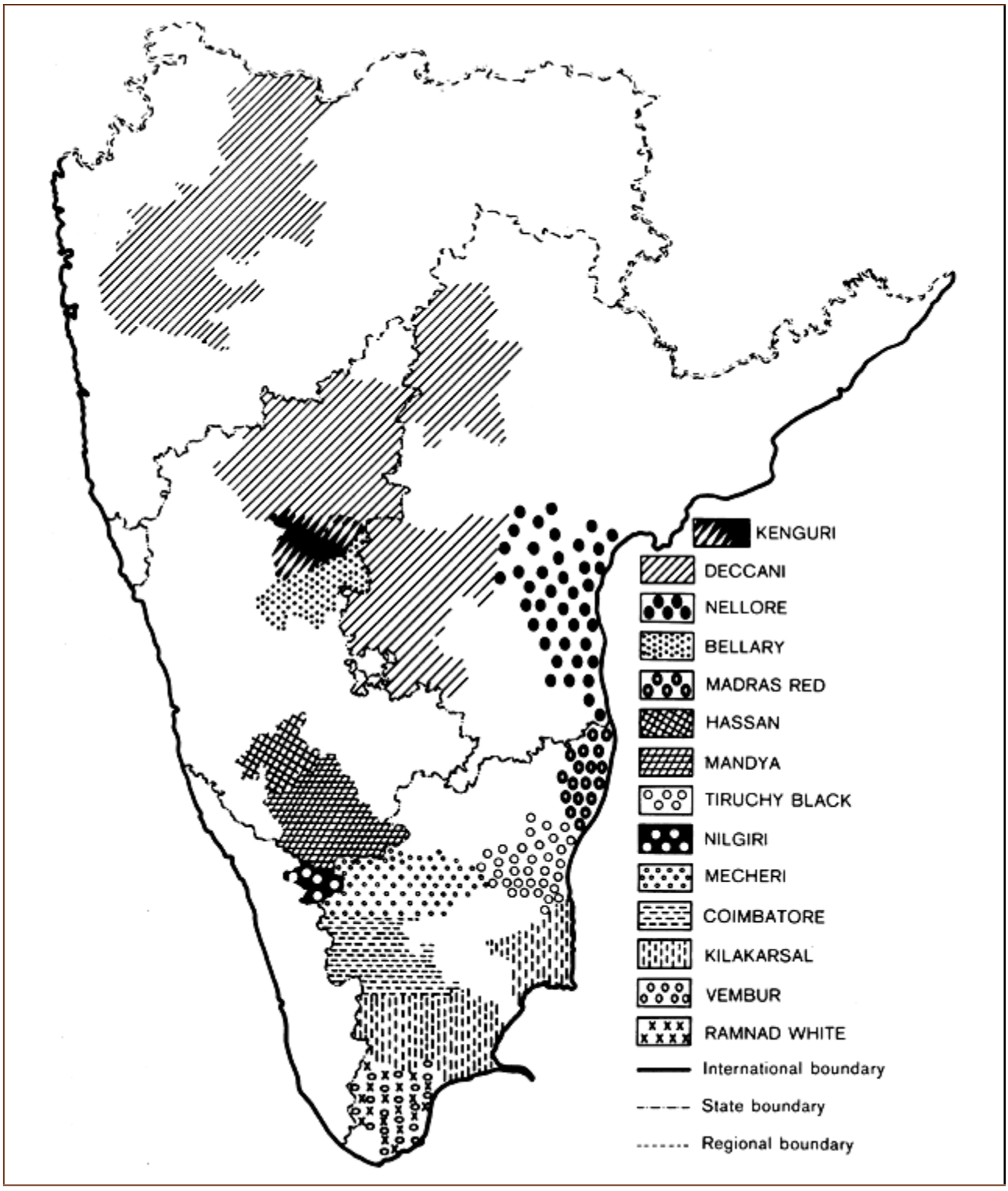
CLASSIFICATION OF SHEEP BREEDS BASED ON AGRO-ECOLOGICAL REGIONS IN INDIA (Animation)

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

	Hissardale	Tiruchi Black	
	Munjal	Kenguri	
	Avivastra		
	Bharat Merino		




NALI
MALPURA
CHOKLA
MARWARI
MAGRA
JAISALMERI
PUGAL
SONADI
PATANWADI
MUZZAFARNAGARI
JALAUNI
International boundary
State boundary
Regional boundary


KENGURI
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MADRAS RED
HASSAN
MANDYA
TIRUCHY BLACK
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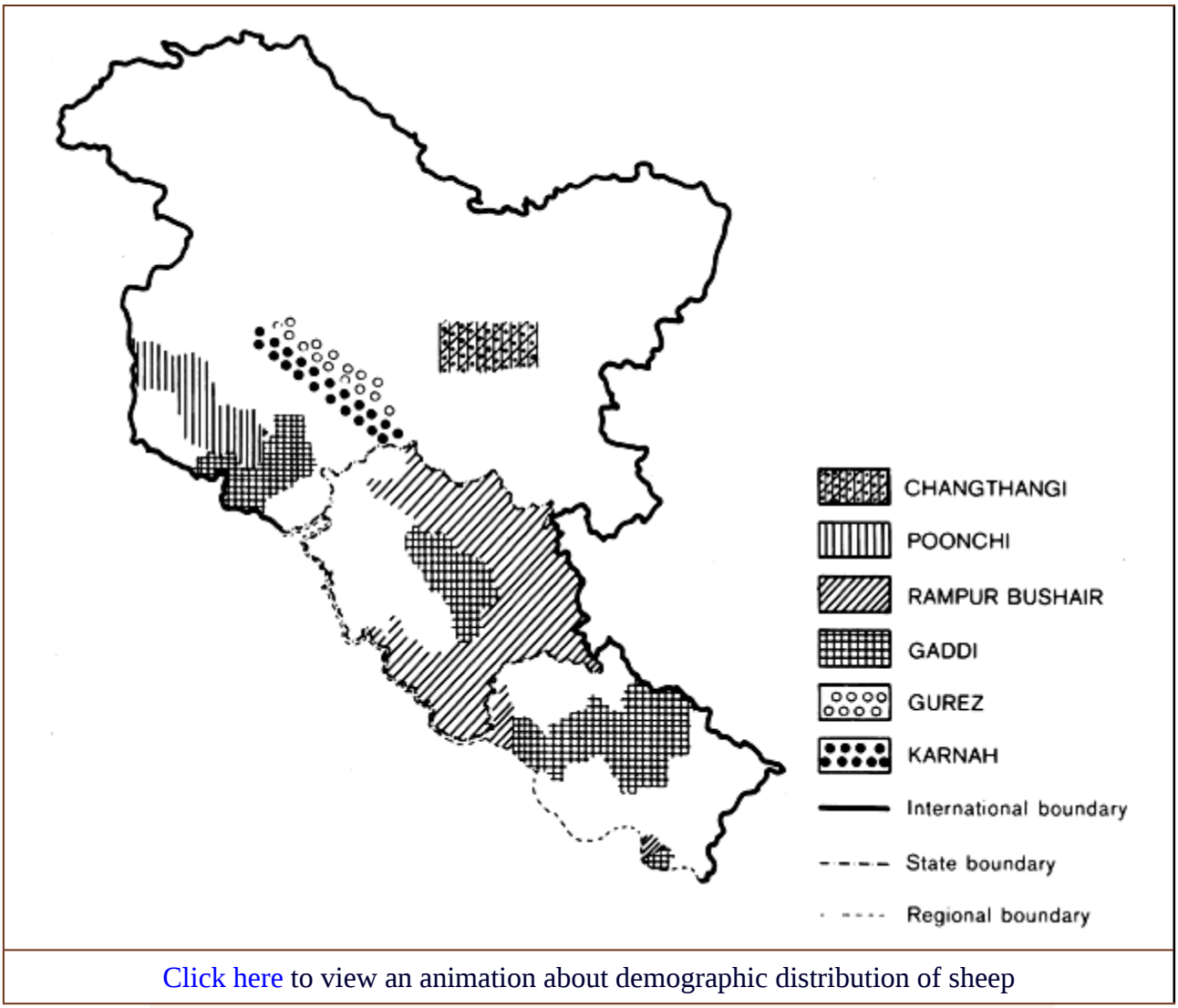
COIMBATORE
KILAKARSAL
VEMBUR
RAMNAD WHITE
International boundary
State boundary
Regional boundary



Click here to view an animation about demographic distribution of sheep

CLASSIFICATION OF INDIGENOUS BREEDS BASED ON UTILITY

Apparel wool breeds	Superior carpet Wool breeds	Coarse carpet Wool breeds	Hairy Meat breeds
Hissardale	Chokla	Malpura	Nellore
Niligiri	Nali	Sonadi	Hassan
Kashmir merino	Marwari	Muzzafarnagri	Mecheri
Avivastra	Magra	Jalauni	Kilakarsal
Bharat Merino	Jaisalmeri	Deccani	Madras Red
	Pugal	Bellary	Trichy Black
	Pattanwadi	Coimbatore	Kenguri

	Tibetan	Chottanagpuri	Mandya
	Bonpala	Balangir	Vembur
	Gaddi	Ganjam	
	Rampur Bushari	Bhakarwal	
	Poonchi	Shahabadi	
	Karnah		
	Gurez		
	Changthangi		

Exotic breeds

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

BREEDS OF GOATS (Animation)

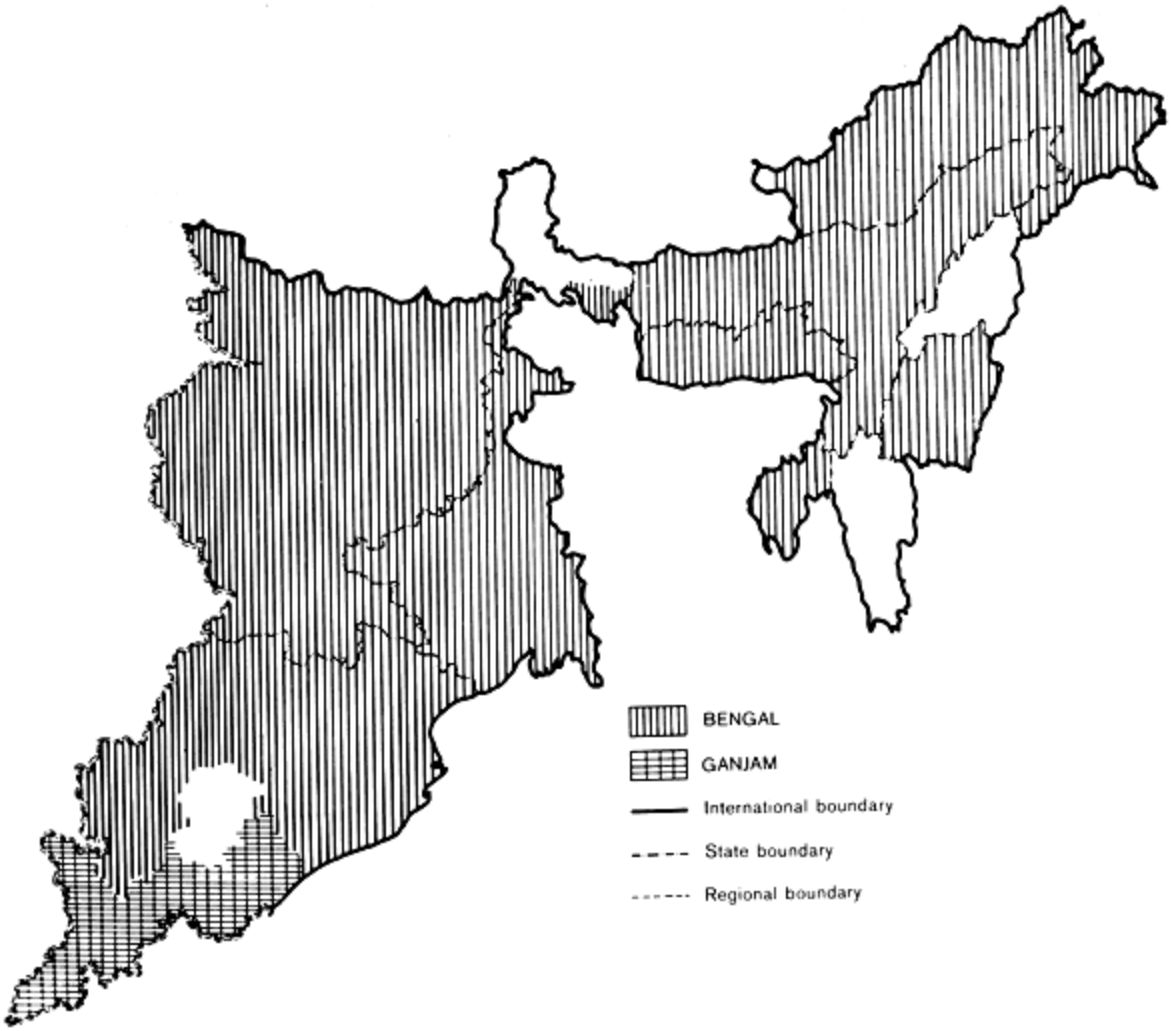
Indigenous Goat Breeds

Classification Indian goat breeds based on utility

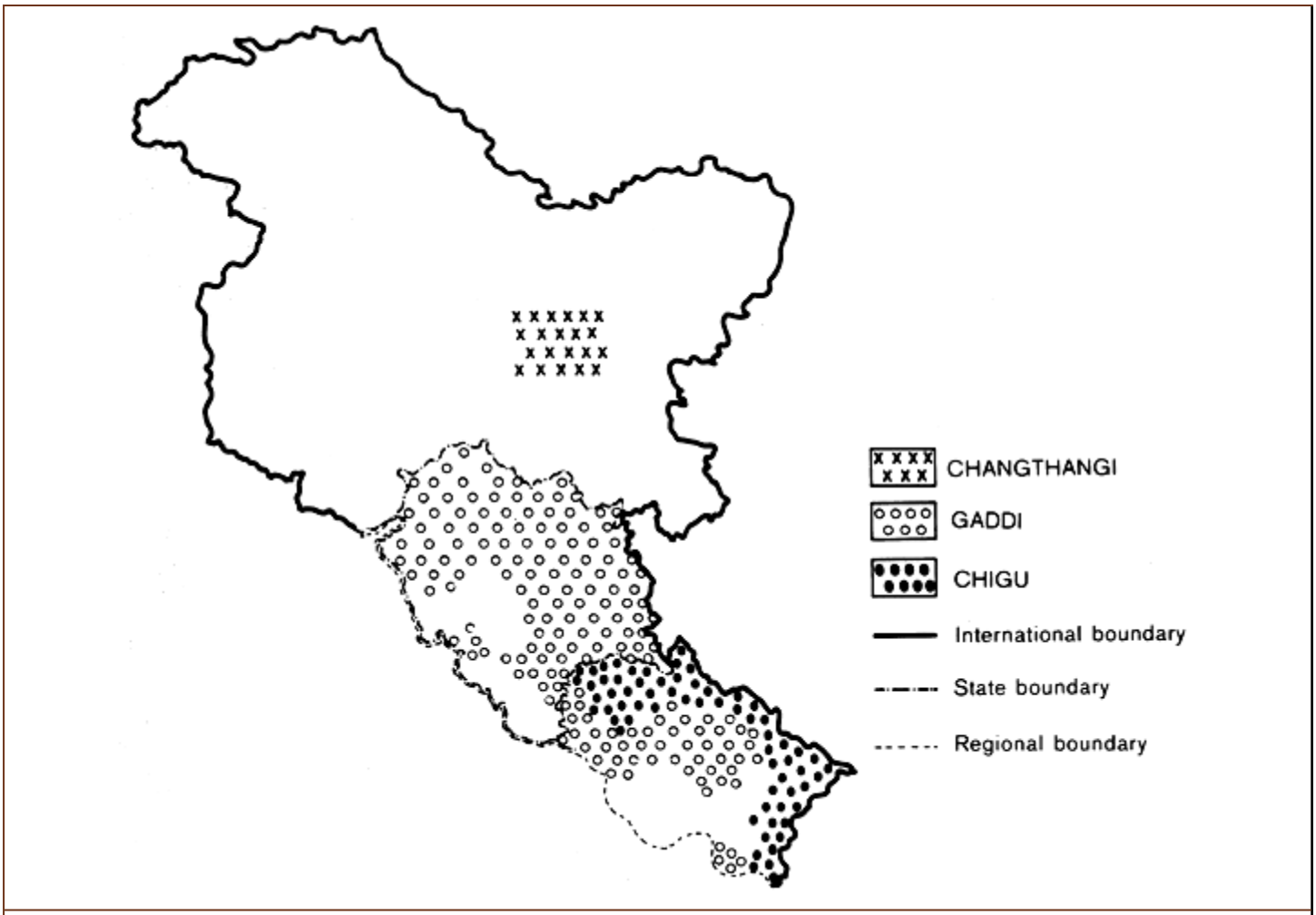
Meat & Skin	Meat, Milk & Skin	Meat, Hair & Skin	Meat, Pashmina & Skin	Milk, Meat & Skin
Black Bengal	Barbari	Bakharwal	Chegu	Beetal
Ganjam	Tellicherry (or) Malabari	Gaddi (Chamba)	Changthangi	Jamnapari (Etawah)
Kannai Adu	Osmanabadi	Gohilwadi		
	Sirohi	Kangan		
	Surti	Kutchi		
	Mehsana	Marwari		
	Zalawadi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

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

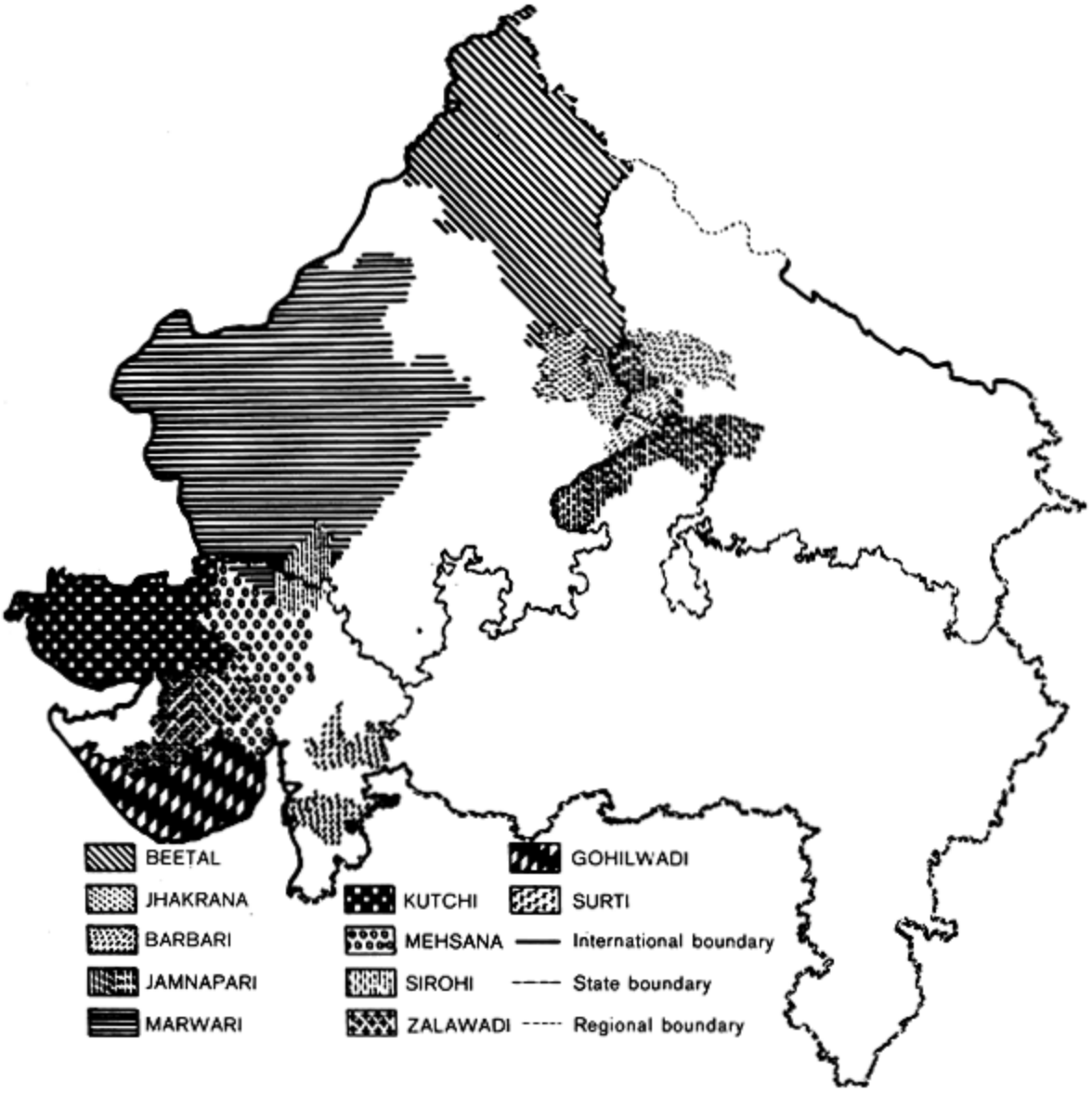
Northern temperate region	North-western, central arid and semi arid region	Southern region semi arid centralpeninsular area and hot and humid along the coast	Eastern region
Gaddi	Sirohi	Sangamneri	Ganjam
Changthangi	Marwari	Malabari	Bengal
Chigu	Beetal	Osmanabadi	
	Jhakrana	Kannaiadu	
	Barbari		
	Jamnapari		
	Mehsana		
	Gohilwadi		
	Zalawadi		
	Kutchi		
	Surti		
Goat breeds in Eastern region			



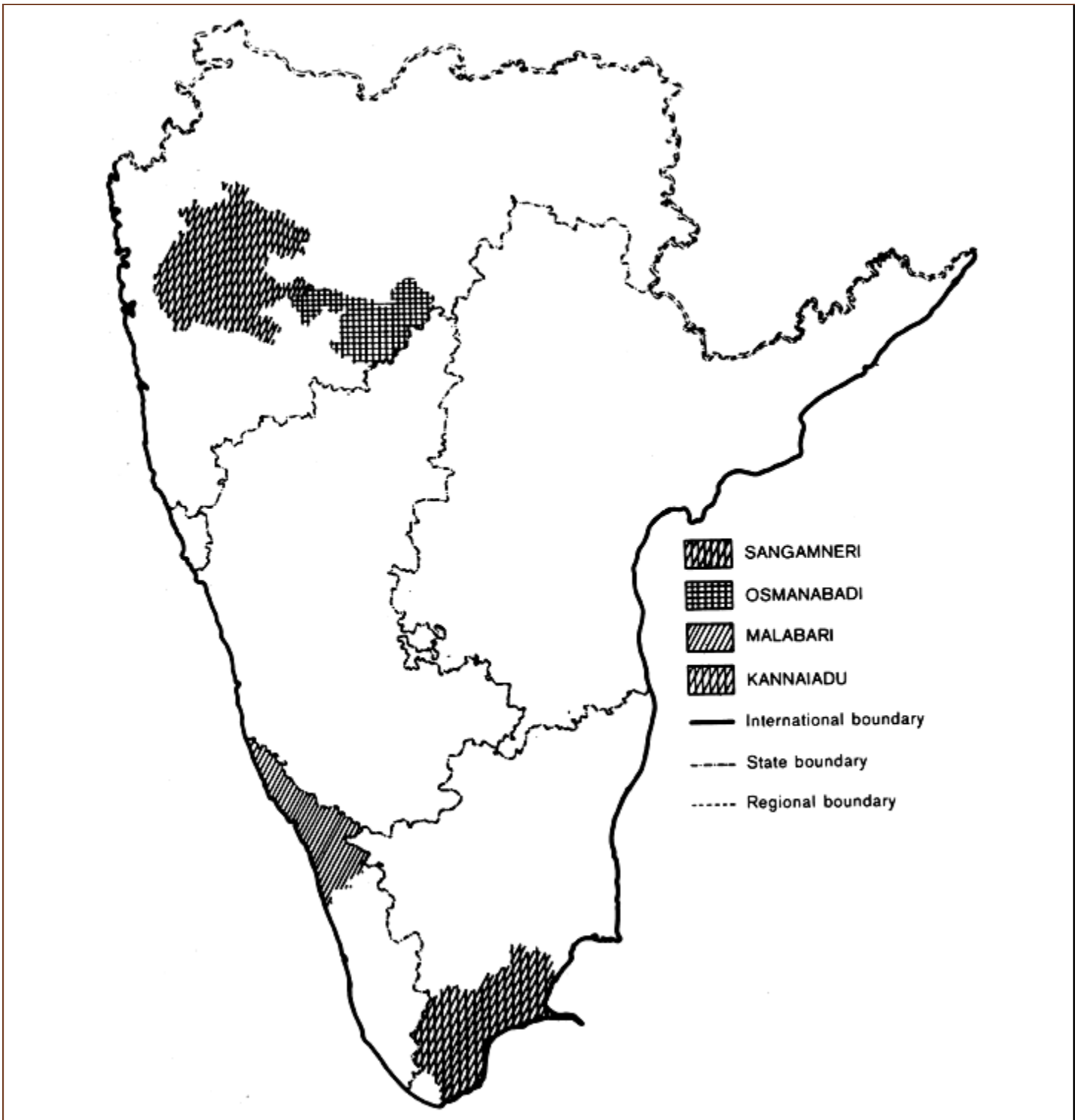
Goat breeds in northern region



Goat breeds in north western region



Goat breeds in southern region



Click here to view an animation about demographic distribution of goats

MODULE-34: SHEEP BREEDS AND BREED DESCRIPTORS

Learning outcomes

- At the end of this module, the learner will come to know distribution of different breeds of sheep, their imporatance, utility etc. This module also covers the details of sheep breed descriptors, for the purpose of understanding the capabilities of sheep to contribute mutton production in India.

NORTHERN TEMPERATE REGION

- Comprises of Jammu & Kashmir, Himachal Pradesh and hilly regions of Uttar Pradesh.
- This region has 8 of the total sheep population.
- The largest population of cross bred sheep primarily developed for apparel wool is in this region.
- In Jammu and Kashmir cross bred sheep with variable level of Merino inheritance constitute 50 of the population.
- The important breeds are Rampur Bushair, Gaddi, Gurez, Kamah, Poonchi and Changthangi.
    - *Bhakarwal*
        - The name of the breed is derived from the nomadic tribe which rears these sheep.
        - They have no specific home tract and the animals are entirely by migratory.
        - They are of medium size and have typical roman nose.
        - They are generally white, although coloured fleece are occasionally observed.
        - All animals are spotted fawn or grey. Males have horns females polled. Long drooping ears.
    - *Kashmir merino*
        - This breed originated from crosses of different Merino types with predominantly migratory native sheep like Gaddi, Bhakarwal and poonchi the level of Merino inheritence varies from 50-75. Annual wool yield: 2-8 kg.
    - *Rampur Bushair*
        - Found in Shimla District of Himachal Pradesh, Dehradun and Nainital of Uttar Pradesh.
        - Animals are medium sized. Fleece is predominantly white. Ears are long and drooping.
        - Face line convex, giving a typical roman nose. Males homed. Most females are polled.
        - Wool is absent in face belly and legs. Body weight : 22-28 kg.
    - *Gaddi*
        - Distributed in states of Jammu and Kashmir, Himachal Pradesh and Uttar Pradesh.
        - Medium sized animals, usually white, although tan, brown and black mixtures are also seen.
        - Males horned: 10-15 of the females are also horned. They can be milked upto 3 months . Average weight ranges from 21-30 kg.
    - *Gurez*
        - Found in Gureze of Kashmir. These are the largest of the sheep breeds in Jammu and Kashmir.
        - Generally they are white although some are brown or black or have brown or black spots.
        - Tail is thin and short. Ears long, thin and pointed. Wool yield in 1-1.5 kg/annum.
    - *Karnah*
        - Karnah tehsil in northern Kashmir. The animals are large. Rams have large curved horns and a prominent nose line.
        - The fleece is generally white. Body weight ranges from 28-38 kg. Annual wool yield- 1 to 1.5 kg.
    - *Poonchi*
        - Poonchi district of Jammu. Animals are similar to Guddi but of smaller size.
        - Predominantely white including the face and also seen with brown to light black spots.
        - Tail short and thin. Legs short-giving low set conformation.
        - Weight ranges from 25-30 kg. Both sexes are polled. Average wool production 1.5 kg/year.
    - *Changthangi*
        - Found in changthang region of Ladakh.
        - Animals are strongly built, large framed with good fleece cover.
        - Weight ranges from 28-36 kg. Wool good for apparel making.
        - Annual wool yield 1 to 1.5 kg. Fleece has extra ordinarily long staple.

- *Bhakerwal*
  - Udampur and Rajouri districts of Jammu and Kashmir heavy animals.
  - Body weight ranges from 28-35 kg. Males horned. Ewes are polled.
  - Wool is white sometimes coloured. Annual wool yield 1.5 to 2 kg.
- *Biangi*
  - Found in Kangra and Lahul of Jammu Kashmir.
  - It resembles Gaddi - shorter in size.
  - Have very high tolerence for cool climates.

NORTH-WESTERN, CENTRAL ARID AND SEMI-ARID REGION

- This region comprises Punjab, Haryana, Rajasthan, Gujarat and plains of Uttar Pradesh and Madhya Pradesh.
- This region has the second largest sheep population (37.44%). This region is most important for carpet wool production.
- Chokla and pattanwadi produce good quality carpet / medium quality apparel wool. Malpura and sonadi have extremely coarse and hairy fleece and are to some extent used for milk.
- Other breeds produce medium to good quality carpet wool.

Important breeds in this region are Chokla, Magra, Wall, Pugal, Marwari, Malpura, Sonadi, Jaisalmar, Pattanwadi, Muzzaffanagri, Jalauni and Hissardale.

Chokla Home tract

- Churu, Sikar, Bikaner and Jaipur - Dist. of Rajasthan.
- Light to medium sized, face devoid of wool, reddish brown in colour - Ears medium sized - Both sexes polled.
- Tail thin and of medium length. The coat is dense and fine covering entire body including belly.

Magra

- Churu, Nagaur, Jaisalmer and Bikaner Dist. of Rajasthan Medium to large animals.
- White face with light brown patches around the eyes, characteristic of this breed.
- Both sexes polled. Fleece - carpet quality.

Nali

- Ganaganagar and Jhunjhunu Dist. of Rajasthan and Southern Hissar and Rohtak Dist. of Haryana.
- Medium sized animals. Face colour is light brown. Both sexes polled ears long and leafy.
- Wool is white / pale yellow in colour. Annual wool yield 2-3 kg Average staple length is 7.4 cm

Marwari

- Marwari region of Rajasthan and Jeoria region of Gujarat medium sized animals.
- Black face colour extending to lower part of neck. Ears very small and tubular.
- Both sexes are polled fleece white not so dense.
- Product-carpet wool of superior quality wool yield 1.8 kg/annum.
- Average body weight male 30 kg female 26 kg.

Pugal

- Pugal region of Bikaner and in northern parts of Jaisalmar district.

- Fairly well built animals. Black face with small light brown stripes on either side above the eyes.
- Lower jaw typically light brown. Short and tubular ears.
- Both sexes polled. White fleece of medium carpet quality. Male 31 kg female 27 kg.

Malpura

- Jaipur, Touk, Ajmer, Bhilwara and Bundi district of Rajasthan.
- Fairly well built animals with long legs. Average adult body weight for male: 47 kg female: 25 kg.
- Face light brown, ears small and tubular. Both sexes are polled. White fleece extremely coarse and hairy.
- A sheep may yield 21 kg milk in a lactation period of 3 ½ months.

Pattanwadi

- Found in Kutch, Jamnagar, Bhamagar and Janapura districts of Gujarat.
- Medium to large animals with relatively long legs. Typical roman nose.
- Face brown and spotted tan. Ears medium.
- Tubular white fleece of medium carpet quality. Adult male 33 kg female 25 kg.

Sonadi

- Udaipur district of Rajasthan and Northern parts of Gujarat.
- Fairly well built animals some what smaller than Malpura.
- Light brown face with colour extending to middle of the neck.
- Large, flat and dropping ears. Both sexes polled.
- Udder fairly well developed hence it is milked to some extent.
- White fleece extremely coarse and hairy. Belly legs devoid of wool.
- Body weight of adult male: 36 kg female: 21 kg.

Jaisalmeri

- Jaisalmer district of Rajasthan.
- Tallest breed of Rajasthan.
- Tall and well - built animals. Black or dark brown face, the colour extending up to the neck.
- Long drooping ears. Both sexes polled. White fleece of medium quality.

Muzaffarnagri

- Muzaffarnagar, Saharunpur, Meerut and Dehradun districts of Uttar Pradesh and parts of Delhi and Haryana.
- Medium to large animals. Face and body white with occasional patches of brown or black. Both sexes polled.
- Males may have rudimentary horns. Long and drooping ears, tail extremely long and reaches fetlock.
- Fleece white, coarse and open. Belly and legs devoid of wool adult male 49 kg female 33 kg.

 Click here to view animation of the breed

Jalauni

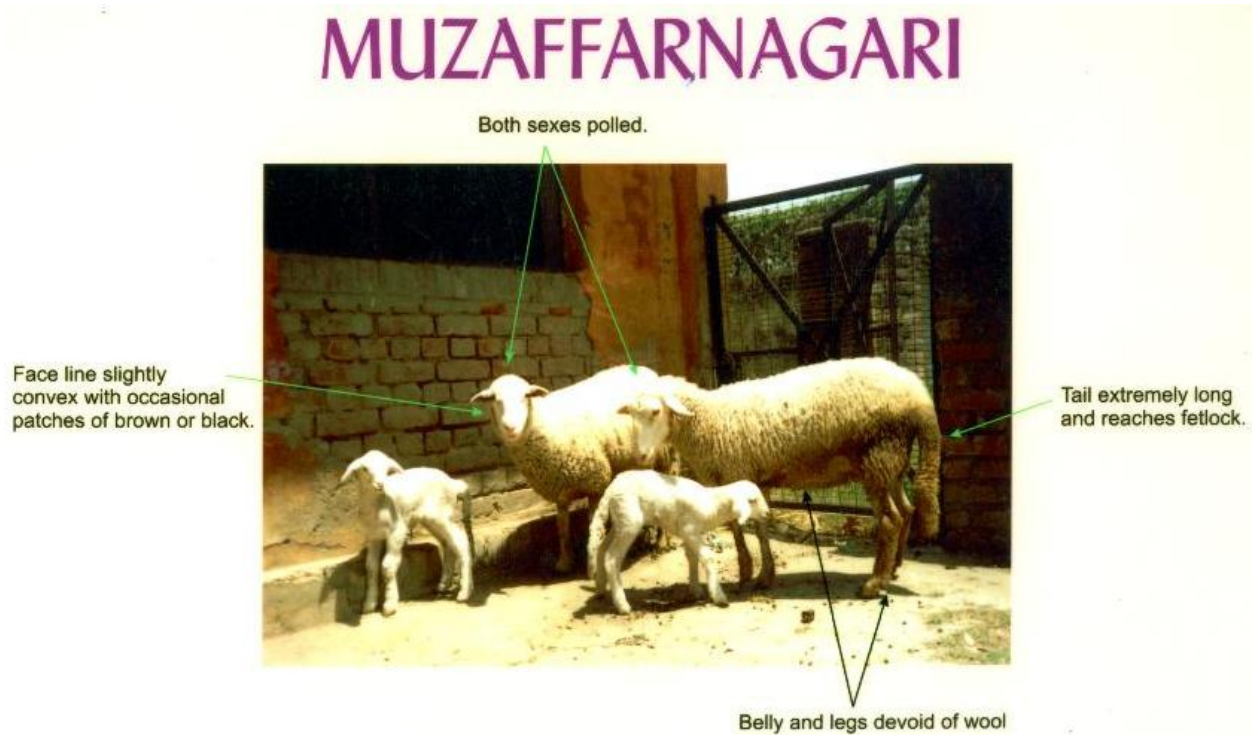
- It is found in Jalaun and Jhansi district of Uttar Pradesh.
- Medium sized animals. Large, flat and drooping ears. Both sexes polled.
- Fleece short coarse and white in colour.

- Belly and legs devoid of wool. Male weight : 39 kg Female weight: 29 kg.

Hissardale

- Hissar and hilly regions of Kalu in Harayana.
- Evolved by crossing. Bikaneri with Merino rams.
- Average body weight of Rams and ewes are 54 and 34 kg respectively most animals are polled.
- Colour predominantly white, although some brown or black patches may be observed.
- Wool is of superior quality yield 2-3 kg per annum.


CHOKLA



SOUTHERN REGION

- This region is semi arid in the central peninsular area and hot and humid along the coast.
- It comprises the states of Maharastra, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.
- This region has the largest sheep population in India (40 percent of total population) more than 50 of the sheep in this region do not produce any wool.
- The rest produce, extremely hairy, coarse coloured fleece. Hence most of the breeds are maintained for mutton except Nilgiris, which produce fleece of good quality.

- Important breeds in this region are Deccani or Bellary, Nellore, Madras Red, Mandya, Trichi black, Mecheri, Ramnad white, Nilgiri, Coimbatore, Kilakarisal, Kenguri and Bargur.
- The Nellore is the tallest breed and Mandya shortest (also known as Bannur or Bandhur) among Indian breeds has the best meaty conformation. Majority of breeds in Tamil Nadu, Andhra Pradesh, Karnataka except Deccani, fall within the range of height and colour of Nellore and Mandya.

Deccani

- Maharastra, Andhra Pradesh and Karnataka; medium sized; colour is black with white marking; flat, medium sized drooping ears; fleece coarse hairy and open.
- Wool is of inferior quality and used for making blankets.

Nellore

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

Bellary

- Bellary district of Karnataka. Medium sized animals. Body colour ranges from white to various combinations of white and black.
- 1/3 of males horned ewes polled. Flat, medium, drooping ears.
- Fleece extremely coarse, hairy and open. Adult male: 35 kg female: 27 kg

Hassan

- Hassan district of Karnataka. Small animals white body with light brown or black spots.
- Medium sized drooping ears. 40 of males horned. Ewes polled fleece white, extremely coarse and open.

Mandya

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

 Click here to view animation of the breed

Mecheri

- Salem and Coimbatore districts of Tamil Nadu. Medium sized light brown in colour. Both sexes polled.

- Body covered by very short hairs. Adult male: 35 kg, female: 22 kg

Kilakarsal

- Ramnad, Madurai and Tanjore districts of Tamil Nadu Brown/ dark tan in colour with black spots on head, belly and legs.
- Medium sized ears. Males have thick twisted horns. Most animals have wattle.

 Click here to view animation of the breed

Vembur

- Tirunelveli districts of Tamil Nadu. Tall animals colour is white with irregular red and fawn patches all over the body.
- Medium sized drooping ears. Males horned. Ewes polled. Body covered with short hairs. Adult male: 34 kg, female: 27 kg.

 Click here to view animation of the breed

Coimbatore

- Coimbatore and Salem districts of Tamil Nadu. Medium sized animals white with black or brown spots.
- 30 of males polled. Fleece white hairy and open. Adult male: 24 kg, female: 20 kg

Ramnad White

- Ramnad districts of Tamil Nadu. Medium sized predominantly white.
- Ears medium sized and directed outward and downward.
- Males have twisted horns. Ewes polled short and thin tail. Adult male: 31 kg, female: 22 kg

 Click here to view animation of the breed

Madras Red

- Madras and Chengalpet district of Tamil Nadu. Body colour predominantly brown the intensity varying from light tan to dark brown.
- Some animals may have white markings on forehead, inside the thigh and lower abdomen.
- Medium sized drooping ears. Tail short and thin. Rams have strong, corrugatal and twisted horns.
- Ewes polled. Body covered with short hairs. Adult male: 35 kg, female: 23 kg

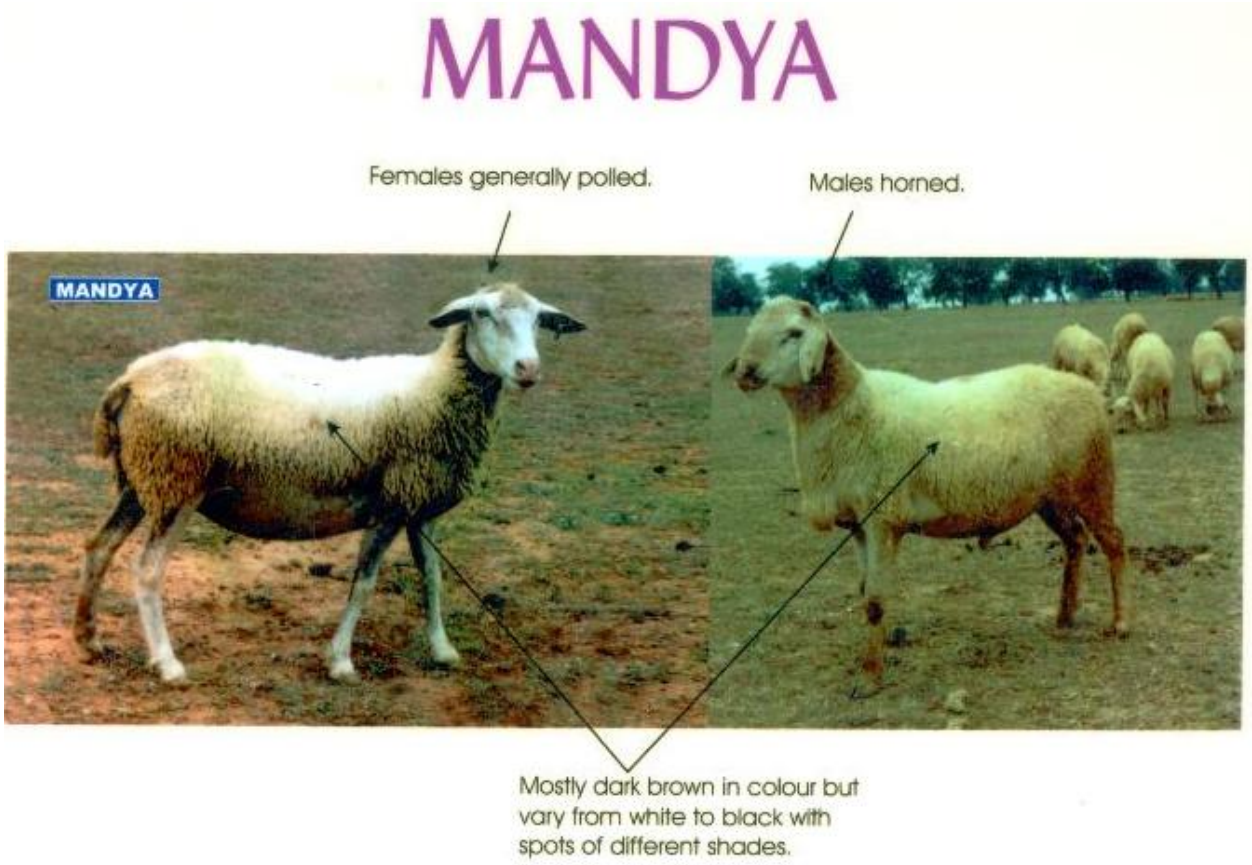
Click here to view animation of the breed

Trichy black

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

Kenguri

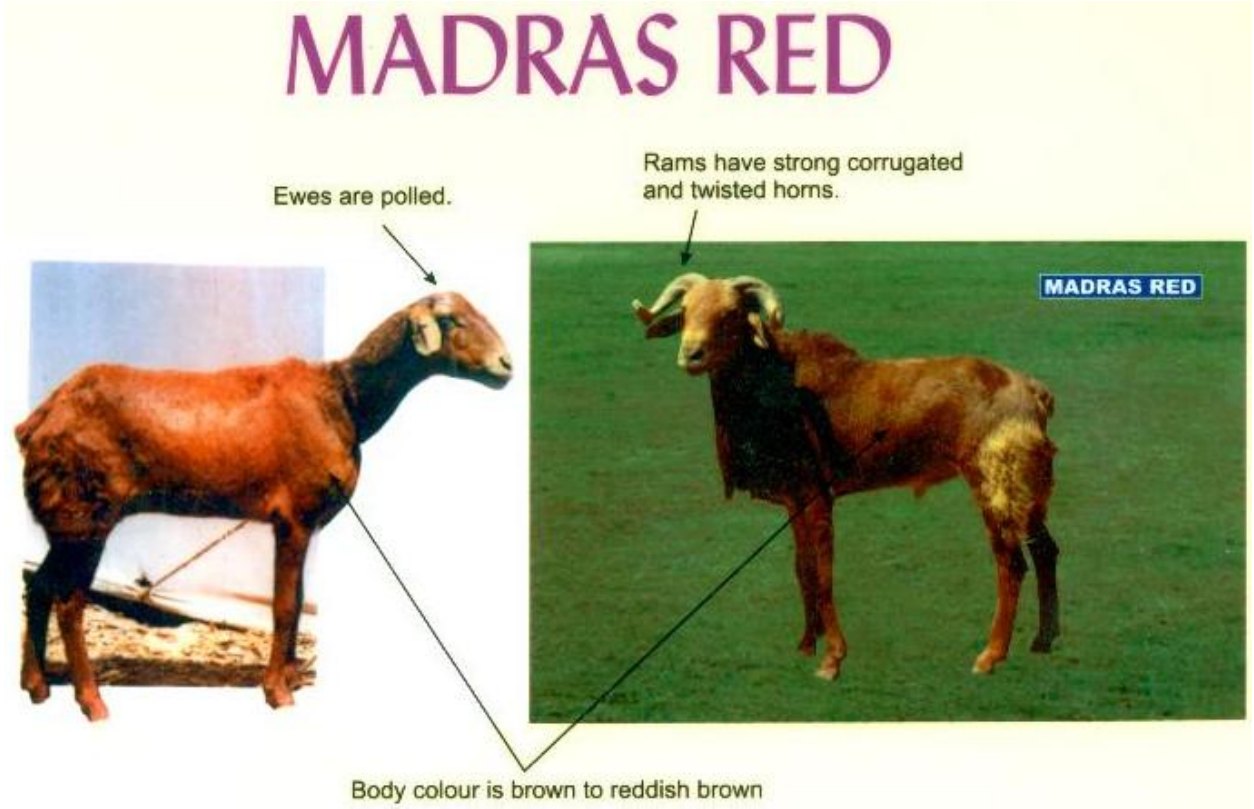
- Raichur district of Karnataka. Medium sized body colour dark, brown, but colours ranging white to black with spots of different shades are also observed.
- Males horned. Ewes polled. Adult male: 32 kg, female: 26 kg




NELLORE


DECCANI

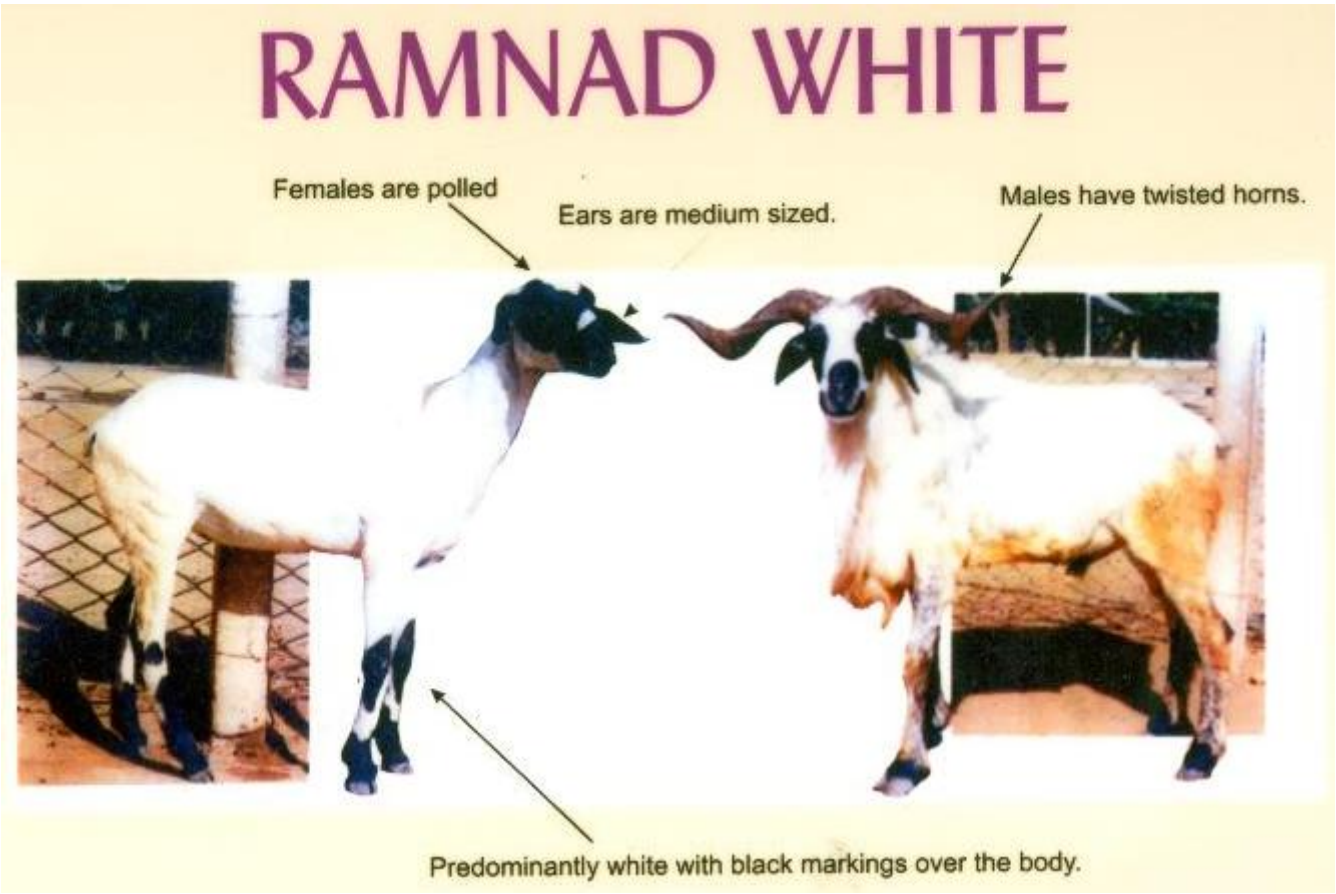

NILGIRI



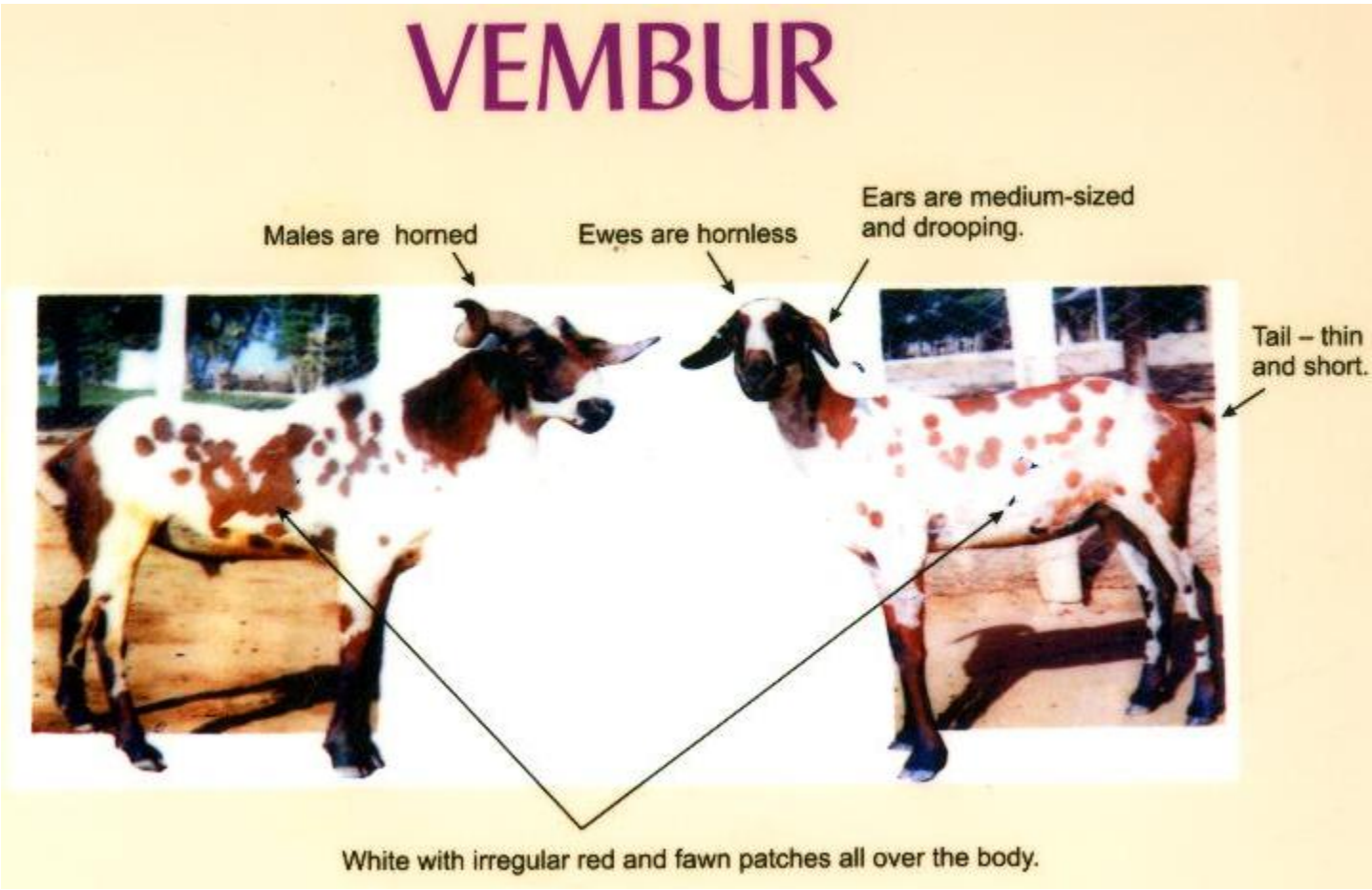
- **Coimbatore**

COIMBATORE

- **Ramnad white**


RAMNAD WHITE
Females are polled
Ears are medium sized.
Males have twisted horns.
Predominantly white with black markings over the body.

- **Vembur**



- **Kilakarisal**

EASTERN REGION

- This region consists Bihar, West Bengal, Orissa, Assam, Meghalaya, Arunachal Pradesh, Mizoram, Manipur, Tripura, Nagaland and Sikkim.
- It is hot and humid except for some parts of eastern states which are sub temperate and humid.
- This region has 10 of the sheep population. Most of the wool produced in this region are suitable only for coarse carpets, blankets and kumb.hes.
- The important breeds are Shahabadi, Chhottanagpuri, Ganjam, Balangir, Bonpala and Tibetan.

Chottanagpuri

- Chottanagpuri, Ranchi districts of Orissa and Bankura district of West Bengal.
- Small breeds (15-20 kg) short thick tails - small ears.
- Both sexes are polled. Wool is rough inferior and brown/grey in colour.

Ganjam

- Found in Koraput, Phulbani and Puri districts of Orissa.

- Animals are medium sized with coat colour ranging from brown to dark tan. Males horned females polled.
- Fleece hairy and short and not shorn Weight : 20-28 kg .

Shahabadi

- Found in Shahabad, Patna and Gaya districts of Bihar state medium sized leggy animals.
- Fleece mostly grey sometimes with black spots. Medium sized drooping ears.
- Tail is extremely long and thin. Both sexes are polled.

Balangir

- Balangir, Sambalpur and Sundargarh districts of Orissa.
- Medium sized, white or light brown or of mixed colours. Ears small a stumpy.
- Males are horned, females polled. Body weight 18-20 kg.

Bonpala

- Native of Sikkim. They are very high weigh 33 to 66 kg.
- Face white or black in colour. Wool is white. Annual wool production 1.5 kg
- **Ganjam**

EXOTIC BREEDS

Merino

- Native of Spain - origin for most of the wool breeds in the world. Noted for their hardiness, longevity and banding instinct. Colour-white.
- Head and legs are generally covered by wool. Rams have heavy spiral horns, whereas ewes are polled.
- Mature rams weigh 75 kg and ewes 65 k g. Fleece yield male: 4-5 kg and ewes 3-4 kg/annum. Merinos have large number of skin folds

Click here to view animation of the breed

Rambouillet

- Developed from Merinos in France. They are large, rugged, fast growing sheep and are good wool producers.
- Rams have horns. Ewes are polled mature rams weigh from 100-125 kg and ewes from 60-90 kg.

- Head large with white hair around the nose and ears. Face and legs are white. Skin is pink. Ewes are good mothers, and prolific.
- Rambouillets imported from Texas (USA) to India have performed better as pure and crosses with Indian breeds than Russian Merinos. Average wool yield 4 5 to 5.5 kg.

Polworth

- It is evolved by crossing Lincoln ewes and Merino Rams in U.K. They may be horned or polled.
- They have level frame, clear eyes, soft face and pink nose wool quality is comparable to that of Merinos.

Suffolk

- Native of U.K. large animals with black face, ears and legs. Head and ears entirely free from wool.
- Both rams and ewes are polled though rams sometimes have scurs. Average wool yield 2-3 kg.
- Mature Rams weigh 100-135 kg and ewes from 70-100 kg. Ewes are very prolific and excellent milkers.
- Suffolks imported to India have performed poorly than Dorsets .

 Click here to view animation of the breed

Dorset

- Native of U.K two types polled and horned Dorsets. Face, ears and legs white in colour and free from wool.
- Wool yield 2.75 to 3.25 kg produce mutton of superior quality.
- Rams weight 80-110 kg and ewes weigh - 50 to 80 kg.
- It is a hardy breed and capable of performing well under most conditions.

South down

- Native of U.K have very good mutton conformation. Animals are low set compact, with legs set wide apart with broad head and a wool cap just below the eyes.
- Face, ears and legs are light brown and skin is pink. Both sexes are polled. Wool yield 2.25 to 3.25 kg. mature Rams weigh 80 to 100 kg ewes: 55 to 70 kg.

Corriedale

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

Karakul

- Pelt sheep are maintained for their lamb pelts which are used for garments. They are of poor mutton quality and fleece is also very coarse.
- Karakul is mainly raised for their pelts.

- Mainly found in USSR, Afghanisthan , Iran, Iraq and parts of Africa. Lamb pelts are produced through slaughtering of lambs within 24-48 hours of birth.
- Mature animals are angular upstanding of poor mutton conformation.
- Well adapted for extreme climatic conditions and very sparse vegetation.
- Rams have horns. Ewes are polled face, ears and legs are black or brown. The ears are drooping.

Other exotic breeds

Awassi

- Native of syria and Isarel and also found in Iraq. Heavy breed used for mutton and milk production. Have fat tails.
- Face is black or brown and the body is white dull white in colour. Males have horns, females are polled.

Ossimi

- Native of Egypt. Have fat deposits in the hump. White or brown in colour.
- Adult sheep weight between 45 and 55 kg. Annual average wool yield 1.5 kg.

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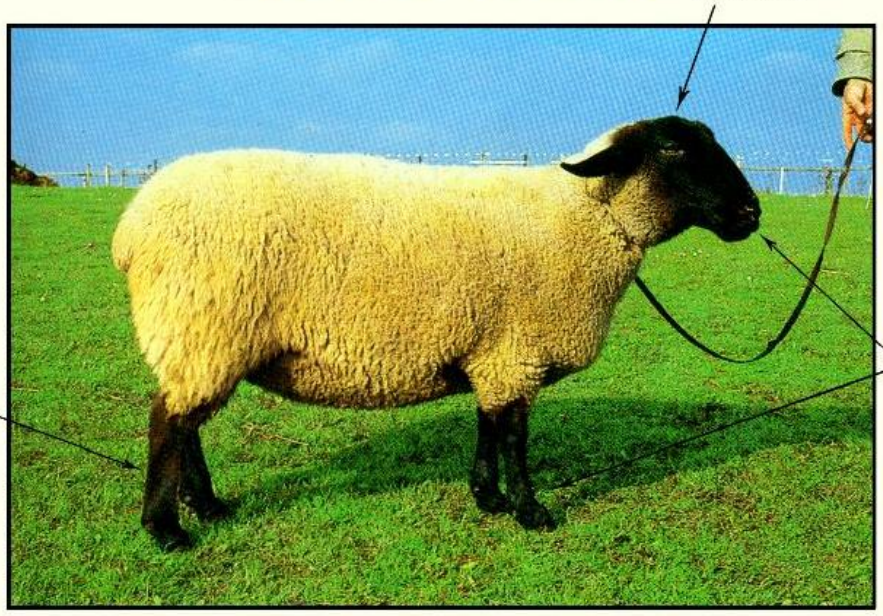
SUFFOLK

Males and females are hornless.



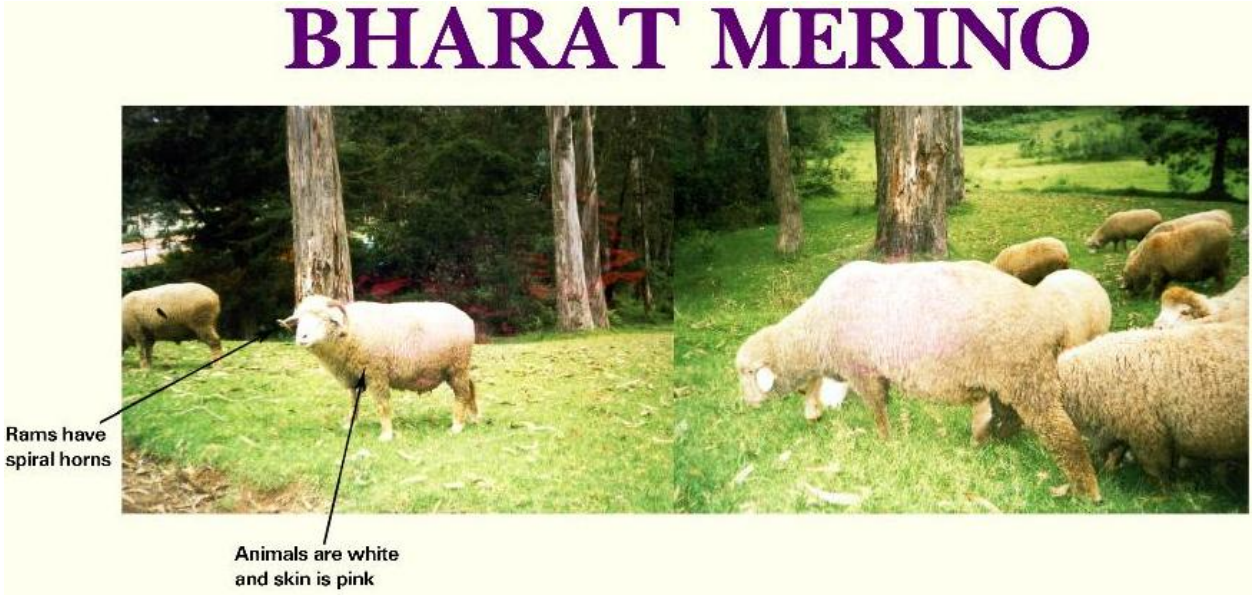
Face, ears and legs are black in colour.

Legs are short and straight.

KARAKUL

Rams horned

The colouration ranges from dirty brown to dark grey and blue/grey to black/brown shades.



- **Avikalin**

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MODULE-35: GOAT BREEDS AND BREED DESCRIPTORS

Learning outcomes

- The best pictures available for goat breeds are given in this module. At the end of visualizing this module the reader will get an experience of seeing the national and international goat breeds.

INDIGENOUS GOAT BREEDS

Jamunapari

- *Coat Colour:* White with tan or black markings at neck and ears; t: beard in both sexes; tuft of long hairs in the buttocks.
- *Body and legs:* Largest and most elegant of the long-legged goats of India; average body length, height and heart girth 87, 96 and 80 cm in bucks; and 75, 82 and-75 cm in does, respectively; pronounced Roman nose having a tuft of hair which results in parrot mouth appearance.
- *Ears:* Long and pendulous (26-28 cm), tubular and tube opening is towards the front.
- *Horns:* Short and flat horns (10-15 cm), horizontally twisting backward. Live weight: Average, buck 75 and doe 55 kg. Average birth weight up to 4 kg.
- *Kidding:* The major kidding season spring (February - March), minor season autumn (October-November); Kid, once a year, single or twins. Average age at first kidding is 20-25 months.
- *Meat:* Good flavoured meat; skin good.
- *Milk:* Large udder and big teats: average yield is 280 kg / 274 days; highest recorded 4 kg a day and lactation yield 575 kg: average lactation length 188 days; fat 5.2 to 7.8; dry period 108 days.

 Click here to view animation of the breed

Beetal

- *Coat Colour:* Predominantly black; red, tan or black, heavily spotted on white also occur; males usually possess beard.
- *Body and legs:* Resemble Jamunapari but smaller; face convex, lips black, eyes blue-black with white or brownish corneal surround ings: average body length, height and heart girth 86, 92 and 86 cm in bucks and 70, 77 and 74 cm in does respectively.
- *Ears:* Long pendulous drooping, beetal leaf shaped pinna.
- *Horns:* Horizontal with backward and outward twisting.
- *Live weight:* Mature buck 70 and doe 46 kg: birth weight 3 kg.
- *Kidding:* Age at first kidding 20-22 months; kidding once a year. Single or twins, rarely triplets.
- *Meat:* Good quality with desirable flavour.
- *Milk:* Average lactation yield 150 kg; highest 5.2 kg a day. 834 kg in 287 days recorded in a doe at NDRI Karnal; fat 4.5. dry period 144 days. Other qualities: Good quality skin.

 Click here to view animation of the breed

Sirohi

- *Coat Colour:* Brown, white, and admixture (common): off colours in typical patches; hair coarse and short.
- *Body and legs:* Compact and medium sized: tail twisted and carries coarse pointed hair; nostrils short and pointed; wattles often present. Average body length, height and heart girtn 80, 86 and 80 cm in bucks and 61, 68 and 62 cm in does respectively.
- *Ears:* Long and flabby.
- *Horns:* Small and pointed, curved upward and backward.
- *Live weight:* Average, buck 50 and doe 23 kg; birth weight 2.0 kg.
- *Kidding:* Once a year, twins common: average age at first kidding 19 months. Meat: Good meat.
- *Milk:* Average lactation yield 71 kg; lactation length 175 days.

 Click here to view animation of the breed

Jhakhrana

- *Coat Colour:* Predominantly black; spotty white characteristic ears and muzzle; forehead slightly bulged.
- *Legs:*Large sized; average body length, height and heart girth 84, 90 and 86 cm in bucks and 78, 79 and 79 cm in does respectively. Ears: Resembles that of Beetal though smaller in size.
- *Horns:* Horizontal backward outward and twisting. Line weight: Average, buck 58 and doe 45 kg. Kidding : Once a year, singles and twins, rarely triplets. Meat: Good.
- *Milk:* Lactation yield 122 kg; lactation length 115 days.

 Click here to view animation of the breed

Surti

- *Coat Colour:* Predominantly white but often black and brown hair in different parts of the body.
- *Body and legs:* Medium sized; average body length, height and heart girth 65, 74, 71 cm in bucks and 66, 70 and 72 cm in does respectively; tail is short.
- *Ears:* Medium sized and hanging.
- *Horns:* Small, running backwards and slightly curved.
- *Live weight:* Average, buck 35 and doe 32 kg; birth weight 2.1 kg.
- *Kidding:* Once a year, single or twins. Average age at first kidding 21 months.
- *Meat:* Good.
- *Milk:* Average lactation yield 150 kg; lactation length 150 days.

Kutchi

- *Coat Colour:* Predominantly black, white or speckled at ears, neck and face.
- *Body and legs:* Medium sized, nose slightly Roman; average body length, height and heart girth 77, 86 and 75 cm in bucks and 75, 82 and 76 cm in does respectively.
- *Ears:* Broad, long and drooping.
- *Horns:* Corkscrew type, pointed upwards. Live weight : Average, buck 44 and doe 39 kg.
- *Kidding:* Once a year, single or twins; age at first kidding 17 months.
- *Meat:* Good.
- *Milk:* Average lactation yield 80-90 kg in 130 days.

Barbari

- *Coat Colour:* Varies greatly but white with red or tar spots considered typical.
- *Body and legs:* Small goats; legs short, bones fine and body wedge shaped; udders large well-shaped; the body length, height and heart girth 70, 71 and 76 cm, in bucks and 59, 56 and 64 cm in does respectively.
- *Ears:* Small tubular, erect, pricked, upwards and outwards.
- *Horns:* Medium and slightly twisted, directed upwards and backwards. Live Weight: Average, buck 38 and doe 23 kg; average birth weight 1.0 kg.
- *Kidding:* Twice in 14 months, two kidding seasons: twins or triplets (CIRG, Makhdoom recorded 5 kids born. Annual Report. CIRG 1988); prolific breeder; the age at first kidding 15-16 months.
- *Meat:* Very good.
- *Milk:* Average lactation yield 125 kg/227 days; highest 2.7 kg a day and 350 kg/lactation. Average lactation length 152 days.

 Click here to view animation of the breed

Black Bengal

- *Coat Colour:* Predominantly black, brown/grey (30) and white (10) exist; soft, glossy and short hairs.
- *Body and legs:* Dwarf in size, legs short, straight back; beard m both sexes. The body length, height and heart girth 54, 50 and 59 cm in bucks and 55, 49 and 59 cm in does respectively; udder, well set and nicely developed.
- *Ears:* Short and neatly upright.
- *Horns:* 5-8 cm long in both sexes, slightly tilted upwards or straight.
- *Live weight:* Average, buck 15 and doe 12 kg.
- *Kidding:* Most prolific among Indian breeds. Multiple births common, two, 3 or 4 kids born at a time. Kidding twice a year. Average litter size 2.1. Average age at first kidding 9-10 months,
- *Meat:*Excellent and palatable, quality chevon.
- *Milk:* Hardly sufficient for kids. Average lactation yield 53 kg. Lactation length 90 to 120 days. The milk is rich and contains 15-16 total solids, 56 protein, 4-5 fat, 4.1-4.8 of lactose and 0.8 minerals.
- *Other Qualities:* Fine skin. Great demand for high class shoe-making.

 Click here to view animation of he breed

Ganjam

- *Coat Colour:* Brown, black and grey. White rare. Small hair. Beard often lacking in does.
- *Body and legs:* Compact, tall and leggy. The body length height and heartiirth 76, 85 and 83 cm in bucks and 68, 77 and 75 cm in does respectively.
- *Ears:* Medium sized (16-18 cm in length), relatively straight and horizontal.
- *Horns:* 12-15 cm, pointed backward, upward and straight.
- *Live weight:* Average, buck 44 and doe 32 kg. Average birth weight 2.2 kg.
- *Kidding:* Once a year, two kidding seasons and twins mostly. Litter size 1.8. Average age at first kidding 24-25 months.
- *Meat:* Good. Dresseing percentage 45.
- *Milk:* Average lactation yield 50 kg/ 120 days.

Chegu

- *Coat Colour:* Predominantly white but greyish red and mixed colours seen. Long hair below which under coat of delicate fibre (cashmere or pashm).
- *Legs:* Medium sized. Face and muzzle tapering. The body length height and heart girth 76, 69 and 81 cm in bucks and 69, 60 and 74 cm in does respectively.
- *Ears:* Small. Horns: Bent upward backward and outward, one or more twists.
- *Live weight:* Average, buck 39 and doe 26 kg. Birth weight 2.0 kg.
- *Kidding:* Once a year and mostly single.
- *Meat:* Good quality,
- *Milk:* Average lactation yield 69 kg and lactation length 187 days.
- *Other Qualities:* Used for draught (pack) to carry salt and small loads.

 Click here to view animation of the breed

Changthangi

- *Coat Colour:* Predominantly white (50) and rest brown, grey and black. Undercoat white/grey; yields warm delicate fibre, pashmina (cashmere, pashm).
- *Body and legs:* Small size, strong body and powerful legs. The body length, height and heart girth 50, 49 and 63 cm in bucks and 52, 52 and 65 cm in does respectively.
- *Ears:* Small, pricked and pointed outwards.
- *Horns:* Large turning outward, upward and inward forming a semicircular ring.
- *Live weight:* Average, buck 20 and doe 20 kg; average birth weight 2.1 kg.
- *Kidding:* Once a year, normally single; average age at first kidding 20 months.
- *Meat:* Good.
- *Milk:* Produce enough milk for kid.

 Click here to view animation of the breed

Gaddi

- *Coat Colour:* Predominantly white, but-grey and red occur; hair 17-19 cm long and lustrous; one clip weighs 1/2 to 1 kg.
- *Body and legs:* Well built and sturdy, tapering muzzle, prominent and alert eyes and Roman nose; the body length, height and heart girth 70, 61 and 72 cm in bucks and 65, 58 and 69 cm in does respectively. Ears: Drooping and pointed ears, 12 cm in length.
- *Horns:* Long, pointed, bending upwards and backwards, one or two twists.
- *Live weight:* Average, buck 27 and doe 25kg.
- *Kidding:* Once a year, single (rarely twins); average age at first kidding 18-19 months.
- *Meat:* Coarse and devoid of fat.
- *Milk:* Udder is small, pointed leafs; the average milk yield 1.5 kg per day.
- *Other Qualities:* She-goats are used to provide milk for lambs; the hairs are used for ropes, snow-boots and coarse rug making.

 Click here to view animation of the breed

Khasi

- *Coat Colour:* White with silver or grey shades; bearded and long-haired.
  Body and legs: Short legged, long bodied.
- *Ears:* Short, 13 to 14 cm, erect.
- *Horns:* Turned backward and slightly curved in bucks; short in does, 8 10 cm.
- *Live weight:* Average, buck 27 and doe 23 kg. Birth weight 0.8 to 1.2 kg.
- *Kidding:* Commonly once a year, two kidding seasons and twins: the age at first kidding 18 months.
- *Meat:* Good quality and desirable flavour.
- *Milk Yield:* Milk yield 15-18 kg/lactation; lactation period 100-120 days.

Marwari

- *Coat Colour:* Predominantly black, long shaggy haircoat; hair jet black, lustrous and growth 10-12 cm/year; skin greyish red.
- *Body and legs:* Medium sized, small muzzle and short nasal bone; neck heavy; thick beard in bucks: the body length, height and heart girth 71, 75 and 72 cm in bucks and 64, 69 and 69 cm in does respectively.
- *Ears:* Medium, drooping.
- *Horns:* Short, twisted and pointed, running upwards and backwards.

- *Live weight:* Average, buck 33 and doe 26 kg. Average birth weight 2.3 kg.
- *Kidding:* Once a year. Single, twins with advancing age; age at first kidding 20 months.
- *Meat:* Good. Milk : Average lactation yield 92 kg., Other qualities : Resistant to diseases.

Bakharwal

- *Coat Colour:* White, brown or black with white markings; fine silky hair (about 10-12 cm long).
- *Body and legs:* Very hardy large-sized goats; average yield of hair per annum 1.5 kg.
- *Ears:* Long ears.
- *Horns:* Long curved horns, upwards and outwards. Live weight: 65-70 kg in bucks.
- *Kidding:* Once a year, single; average age at first kidding 22 months.
- *Meat:* Coarse.
- *Milk:* Low.
- *Other Qualities:* Hair used for ropes, Namada, etc; skins locally used to make sacks.

Mehsana

- *Coat Colour:* Black with white spots at the base of the ear, hair coarse having admixture of grey and white; staple length 8-10 cm; small heard and greyblack skin.
- *Legs:* Medium sized, Roman nose and broad muzzle: tail short and abrupt; the body length, height and heart girth 71, 80 and 77 cm in bucks and 68, 74 and 73 cm in does respectively.
- *Ears:* The ears are white, leaf like and drooping.
- *Horns:* Slightly twisted and curved upwards and backwards.
- *Live weight:* Average, buck 37 and doe 32 kg; birth weight 2.2 kg.
- *Kidding:* Once a year, single and twins occur as age advances.
- *Meat:* Average quality.
- *Milk:* High yielders; 5 kg a day quite common in the area.

Osmanabadi

- *Coat Colour:* Predominantly black; white, brown and spotted occur; long and short-haired type, based on presence or absence of long hair on the thighs and hind quarters.
- *Body and legs:* Tall and large size; the body length, height and heart girth 69, 78 and 72 cm in bucks and 68, 75 and 72 cm in does respectively. Ears: Long, pendulous, about 20 cm in length. *Horns:* Long 12 to 15 cm in bucks and in 50 does. Live weight : Bucks fO-50 kg; birth weight 2.4 kg.
- *Kidding:* Once a year; two kidding seasons; twins, litter size 1.8: average age at first kidding 19-20 months.
- *Meat:* Good.
- *Milk:* Good yielders produce up to 3.5 kg a day: milk yield 170-180 kg per lactation.

Malabari

- *Coat Colour:* Varies from white to complete black; black and white, black and brown, and white with coloured patches occur; both long and shorthaired varieties available.
- *Body and legs:* Head medium sized, face Hat and sometimes with Roman nose; bucks bearded; wattles present, the body length, height and heart girth 70,72 and 74 cm in bucks and 64, 63 and 67 cm in does respectively.
- *Ears:* Medium in size, directed outward and downward. Horns ; Mostly horned; small, slightly twisted and pointed. Liveweight : Average, buck 39 and doe 31 kg; birth weight 1.6 kg. Kidding : Once a year, twins and triplets; litter size 2.1; average age at first kidding 19- 21 months.
- *Meat:* Average.
  Milk: Average milk yield 65 kg/lactation: average lactation length 172 days.
- *Other Qualities:* Good skin.

 Click here to view animation of the breed

Zalawadi

- *Coat Colour:* Black with white spots. Skin pinkish blue; hair long, coarse black and lustrous; the staple length 10-12 cm.
- *Body and legs:* Large sized; broad nostrils; neck long and throat carries lobular appendages; tail short and curved; the body length, height and heart girth 76,83 and 77 cm in bucks and 72, 79 and 74 cm in does respectively.
- *Ears:* Long, wide, leaf like and drooping.
- *Horns:* Long and straight, twisted and screw-like.
- *Live weight:* Average, buck 39 and doe 33 kg; birth weight 3 kg.
- *Kidding:* Once a year; the age at first kidding 23-24 months.
- *Meat:* Good.
- *Milk:* Peak yield up to 3 kg a day; average lactation yield 154 kg in 150 days.

Gohilvadi

- *Coat Colour:* Black coarse and long hairs.
- *Body and legs:* Medium sized; nose line slightly convex; the body length, height and heart girth 73, 81, 75 cm in bucks and 72, 80 and 75 cm in does respectively; birth weight 2.8 kg.
  Ears: Tubular and drooping.
- *Horns:* Slightly twisted and turn backwards.
- *Live weight:* Average, buck 37 and doe 36 kg.
- *Kidding:* Once a year, single; age at first kidding 22-23 months.
- *Meat:* Good.Milk : Peak yield 3.2 kg a day; average lactation yield 80 kg.

Sangamneri

- *Coat Colour:* Highly variable; white, brown and black with spots of 3 colours.
- *Body and legs:* Medium size; long hairs; the body length, height and heart girth 70, 77 and 76 cm in bucks and 63, 68 and 71 cm in does respectively, birth weight 1.9 kg.
- *Ears:* Medium size and drooping.
- *Horns:* Medium directed backward and upwards.
- *Live weight:* Average, buck 38 and doe 29 kg.
- *Kidding:* Once a year; single or twins; average age at first kidding 18 months.
- *Meat:* Good.
- *Milk:* Average lactation yield 83 kg; lactation length 157 days.

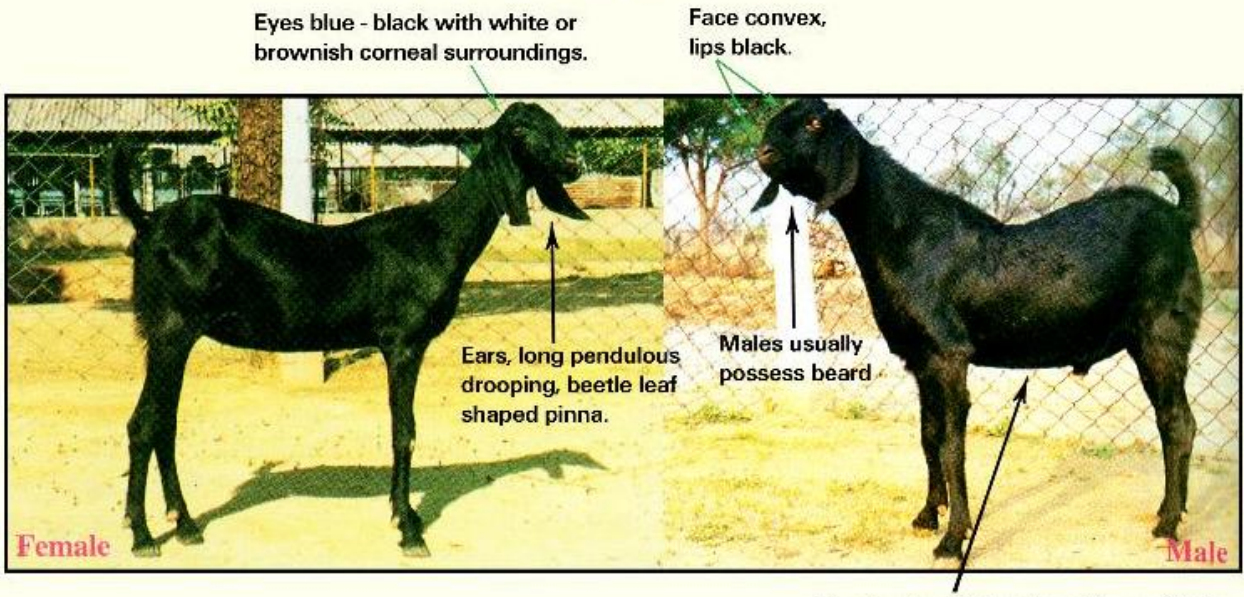
Kanniadu

- *Coat Colour:* Predominantly black or black with white spots.
- *Body and legs:* Tall and stout. The body length, height and heart girth 71, 84 and 78 cm in bucks and 67, 76 and 71 cm in does respectively. Ears: Medium.
- *Horns:* Bucks horned and does polled.
- *Live weight:* Average, buck 36 and doe 29 kg.
- *Kidding:* Twice in 18 months, single or twins; age at first kidding 15 months.
- *Meat:* Good.
- *Milk:* Enough for kids.

Click here to view animation of the breed

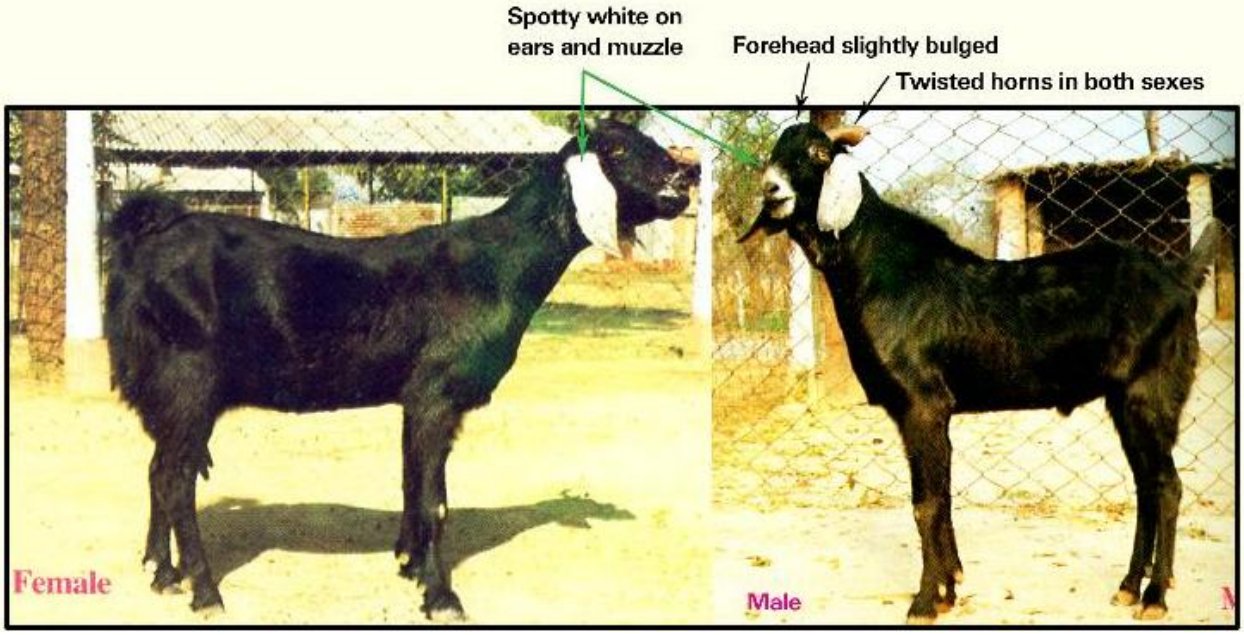
TELLICHERRY

BEETAL

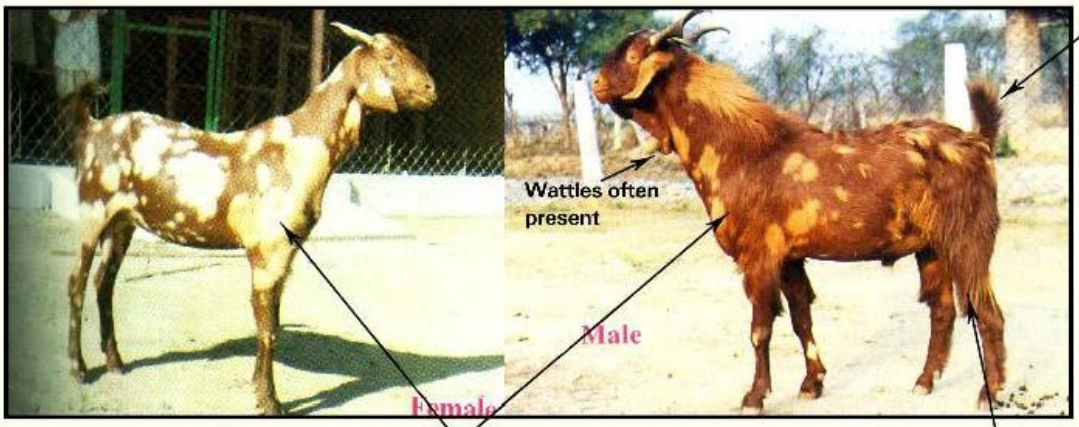


OSMANABADI

JHAKRANA



SIROHI



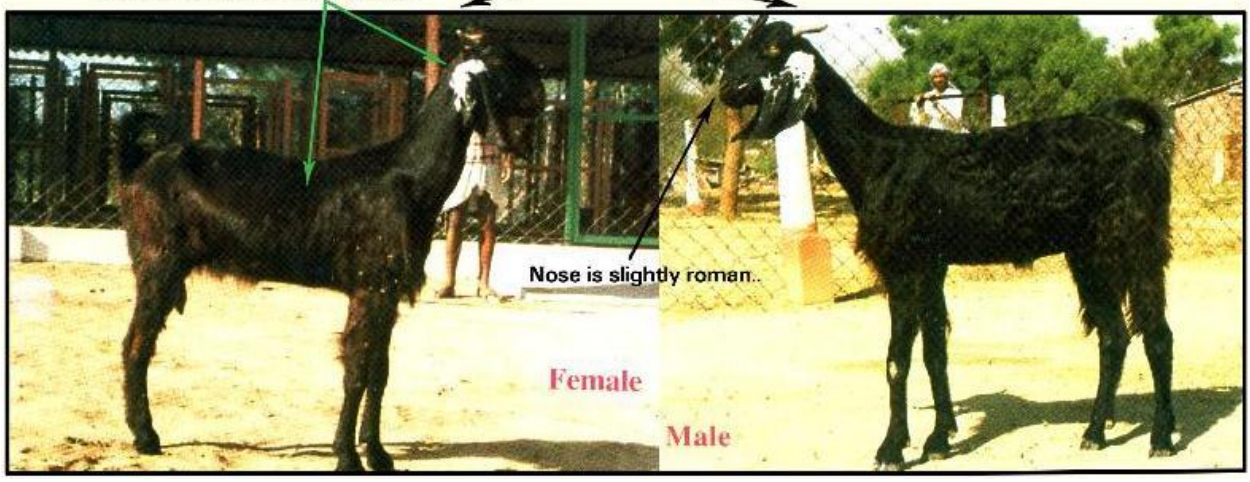
Brown, white and admixture (common). off colours in typical patches.

Hair is coarse and short.

KUTCHI

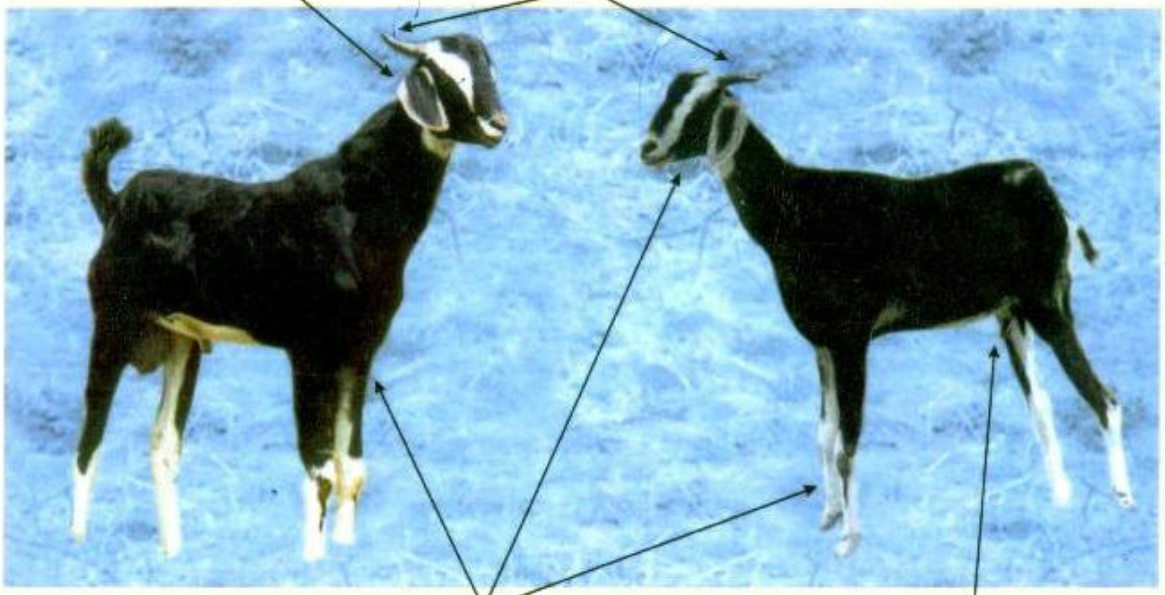
Horns are corkscrew type, pointed upwards.

Predominantly black, white or speckled at ears, neck and face.



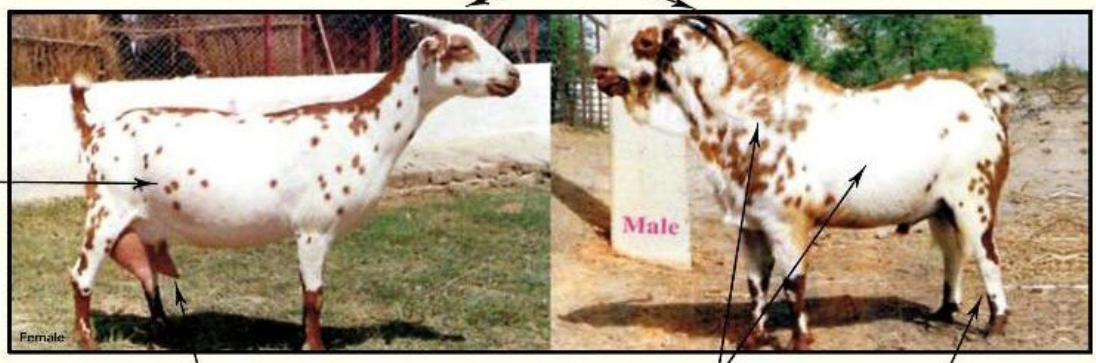
JAMNAPARI

KANNI ADU



BARBARI

Both sexes horned



Body is wedge shaped

Udder large well shaped.

Coat colours vary greatly but white with red or tan spots considered typical.

Short legs.

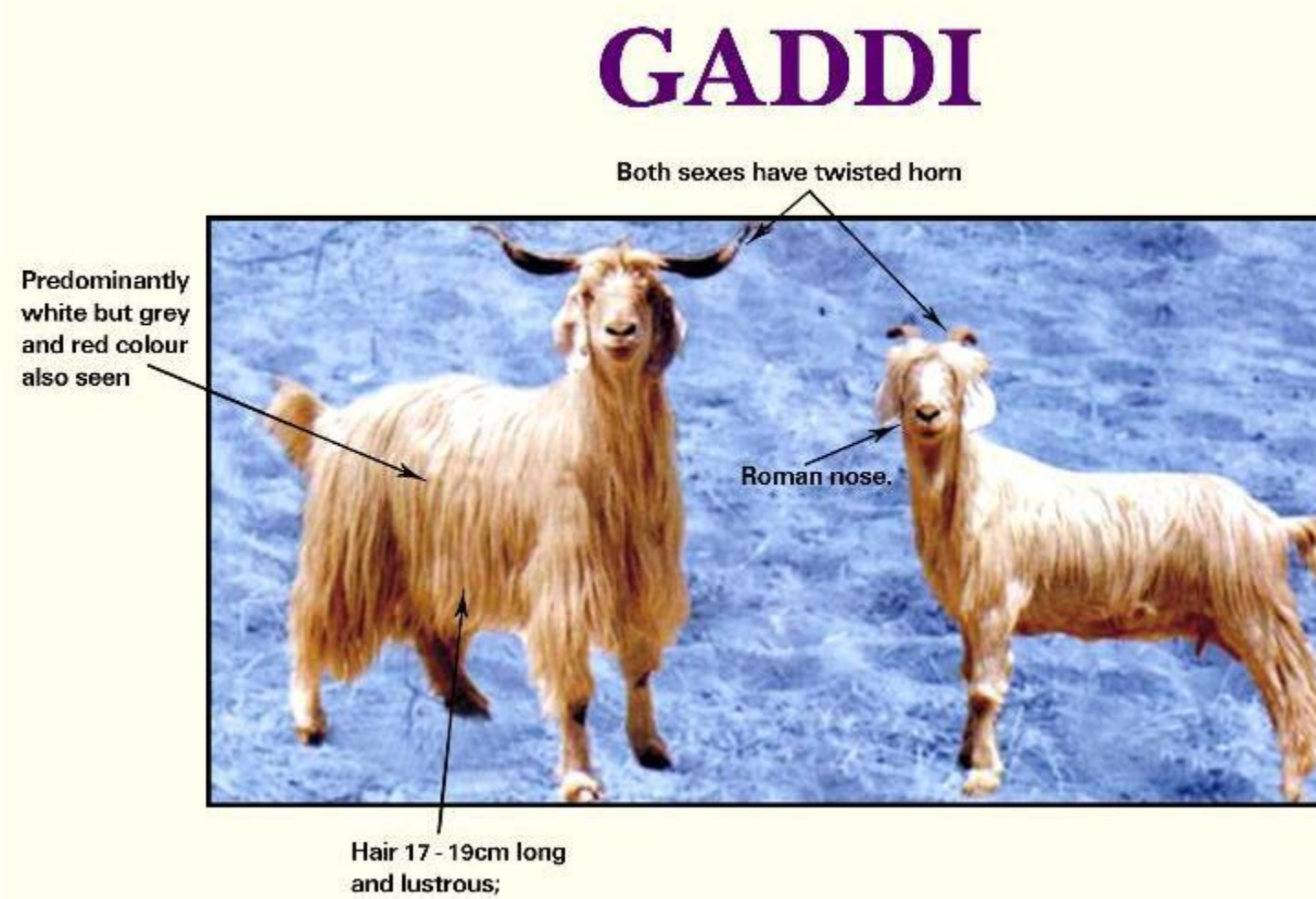
BLACK BENGAL

Both sexes have small to medium horns.

The hair coat is short and lustrous.

Beard is observed in both sexes.

Predominant coat colour is black; brown, grey and white are also found.



PASHMINA GOATS

Chegu

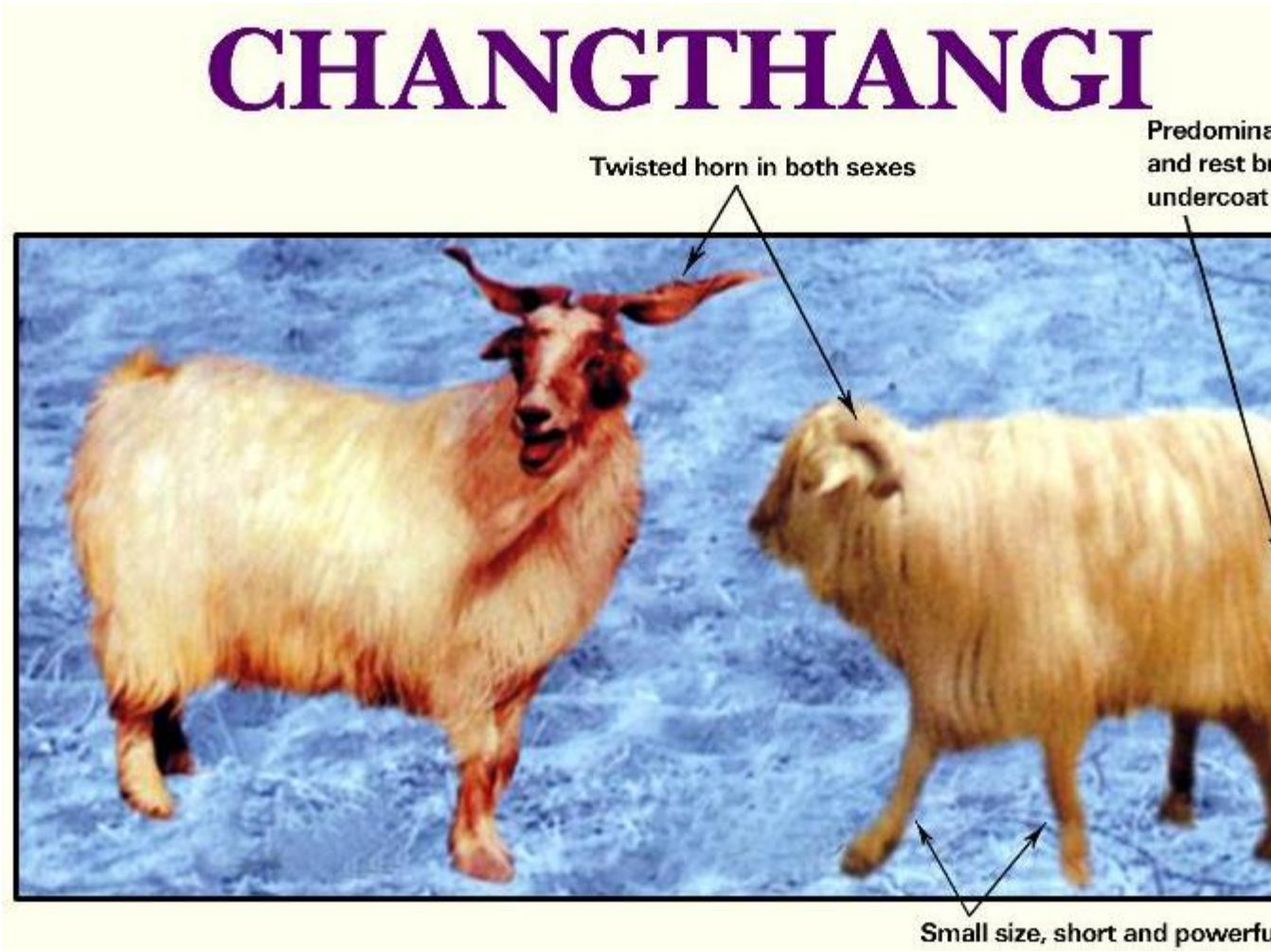
Coat colour

- Predominantly white but greyish red and mixed colours seen. Long hair below which under coat of delicate fibre (cashmere or pashm).
- *Legs:* Medium sized. Face and muzzle tapering. The body length height and heart girth 76, 69 and 81 cm in bucks and 69, 60 and 74 cm in does respectively.
- *Ears:* Small.
- *Horns:* Bent upward backward and outward, one or more twists.
- *Live weight:* Average, buck 39 and doe 26 kg. Birth weight 2.0 kg.
- *Kidding:* Once a year and mostly single.
- *Meat:* Good quality,
- *Milk:* Average lactation yield 69 kg and lactation length 187 days.
- *Other qualities:* Used for draught (pack) to carry salt and small loads.

Changthangi

Coat colour

- Predominantly white (50) and rest brown, grey and black. Undercoat white/grey; yields warm delicate fibre, pashmina (cashmere, pashm).
- *Body and legs:* Small size, strong body and powerful legs. The body length, height and heart girth 50, 49 and 63 cm in bucks and 52, 52 and 65 cm in does respectively.
- *Ears:* Small, pricked and pointed outwards.
- *Horns:* Large turning outward, upward and inward forming a semicircular ring.
- *Live weight:* Average, buck 20 and doe 20 kg; average birth weight 2.1 kg.
- *Kidding:* Once a year, normally single; average age at first kidding 20 months.
- *Meat:* Good.
- *Milk:* Produce enough milk for kid.



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EXOTIC GOAT BREEDS

- The principal exotic dairy breeds of goat are Toggenberg, Saanen, French Alpine and Nubian.
- They are well known throughout the world on account of their high milk yield.
- They are being tried in India for evolving, by crossbreeding, new breeds with more milk or for improving the non-descripts.
- Their breed characteristics are briefly mentioned here.

Toggenberg

- This is a hardy and a productive breed. It originated in the Toggenberg Valley in north-eastern Switzerland.
- It is an important milch goat and is adaptable to a wide variety of climates. The head is of medium length and size.
- The male usually has longer hair than the female, giving it a very rugged appearance. The skin of the doe is very soft and pliable.
- The udder is well attached and carried high. The breed is usually, but not always, hornless.
- The doe should stand at least 68 cm at the withers and weigh more than 80 kg.
- The average milk production is 5.5 kg per day; the butter-fat content of milk is 3.4 per cent.
- A doe produced 2,211 kg milk and 76 kg butter-fat in 10 months.

Click here to view animation of the breed

Saanen

- This breed originated in the Saanen Valley of Switzerland. It is famous for high production and persistency in yield.
- The goats of this breed are white or light cream. The face is straight or slightly dished, and the ears point upward and forward.
- The does are graceful. The breed is normally hornless, but occasionally horns do appear.
- The does stand at least 76 cm in height at withers and weigh 65 kg. Bucks stand 89 cm at withers and weigh 95 kg or more.
- The average milk yield ranges from 2 to 5 kg per day during a lactation period of 8 to 10 months.
- The average butter-fat content of milk is 3.5 per cent. They are reliable winter milkers.

 Click here to view animation of the breed

Alpine

- This breed originated in the Alps. It was probably derived from French, Swiss and Rock Apline breeds.
- Size and production, rather than colour pattern, have been stressed in its development.
- No distinct colour has been established. Mature female stands 73 to 90 cm at the withers and normally does not weigh less than 85 kg.
- French Apline females are excellent milkers and have horns.
- The butter- fat content of milk is 3 to 4 per cent.
- A pure-bred doe, during 10 months of lactation, produced 2,316 kg milk and 66 kg butter-fat.

Nubian

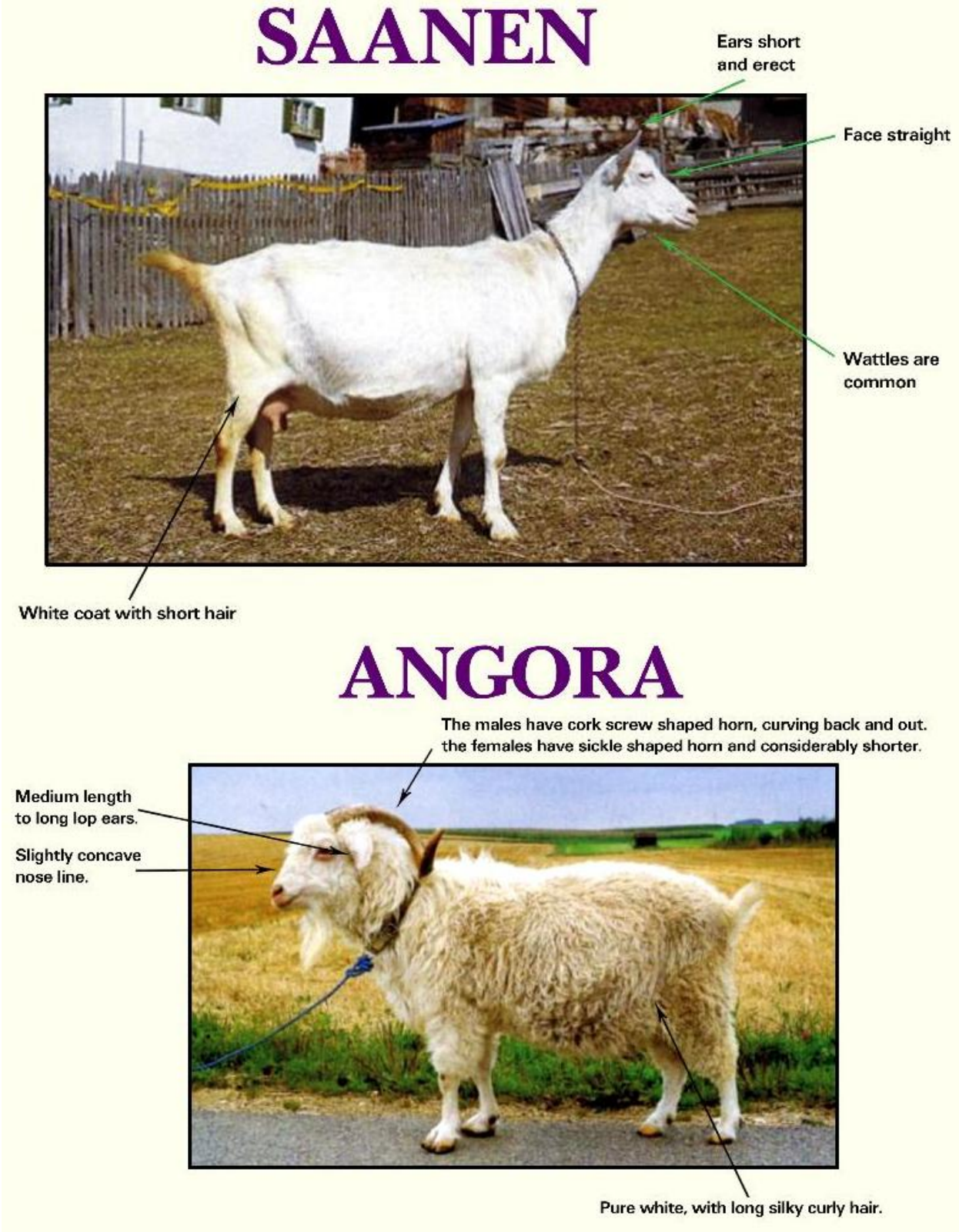
- This breed originated in Nubia (north-eastern Africa), but is also found in Egypt and Ethiopia. It is a long-legged and hardy goat.
- In Britain the native goats were small, short-legged and long-haired with no fixed co lour.
- Use of pedigreed males of Swiss breeds to improve the milk yield resulted in almost total disappearance of the native type and development of the Anglo-Nubian breed.
- This is a cross between the Nubian of Egypt and the Jamunapari from India, with English parentage.
- Anglo-Nubian is a big animal with fine skin and glossy coat, pendulous ears and Roman nose.
- There is no fixed colour. When horns appear they lie flat over the head.
- The milk yield is not as high as that of Swiss breeds, but butter-fat percentage is decidedly higher. Anglo-Nubian is known as the *Jersey cow* of the goat world.
- The udder of the Nubian is capacious but pendulous; teats are large.
- Bucks weigh 65 to 80 kg and does 50 to 60 kg. The peak milk production in a day is more than 6.5 kg.
- The breed average for butter-fat content of milk is 4.5 per cent.
- The breed record for Nubian female in California was 2,124 kg milk and 92 kg butter-fat in 305 days of lactation.

Angora

- This breed originated in Turkey or Asia Minor. This is not a milch goat but produces valuable textile fibre commercially known as mohair.
- It was believed that this goat was originally indigenous to Himalayas.
- The soft, silky hair cover the white body and most of the legs with close-matted ringlets.
- If not shorn in spring the fleece drops off naturally as summer approaches.
- The average weight of fleece is about 1.2 kg. A good specimen yields up to 6 kg.
- The Angora is small in size and its legs are much shorter.
- Horns are grey, spirally twisted and inclined backward and outward. Tail is short and erect.

BOER

TOGGENBURG



MODULE-36: IMPORTANT TRAITS FOR MEAT, MILK AND FIBRE

Learning outcomes

- At the completion of this module, the learners are able to understand the different traits of economic importance regarding sheep and goats and analyze the same using the records.

TUPPING PERCENTAGE

Number of ewes covered to the number of ewes put to a ram

- It is one among the measures of flock performance. A higher tupping percentage is needed for higher productivity. The tupping percentage was influenced by
    - Environment – High environmental temperature cause reduction in breeding performance of the females.
    - Most of the animals will not exhibit the oestrus signs or in anoestrus condition in hot climate
    - Nutritional status – Animals in good nutrition will come to heat at regular interval
    - Identification of animals in heat – Identification of animals in heat is also a major problem .
    - The method of teasing and the performance of the teaser will influence the tupping percentage.

LAMBING PERCENTAGE

No of ewes lambed to the number of ewes put to a ram (or) Number of ewes lambed to the number of ewes covered

- This is an indicator of flock fertility. This is influenced by
    - Age of the female: Generally the fertility rate will be increased as the age advances. Increase in fertility will be noticed from maiden year to 5 years of age
    - Nutritional status: Animals in good nutritional status will come into heat, conceive and give young ones at regular intervals. Flushing of animals just before breeding will increase the conception rate considerably.
    - Disease and parasite: This will reduce the conception rate
    - Environment: The mortality rate of embryos is high, if the ewe is subjected to high temperature during the period prior to breeding to 8 days post breeding.
    - Male fertility and activity: Number of spermatozoa present in the ejaculate and libido will have great influence on the conception rate.
    - Time of mating: Proper time of mating will have a great influence on the conception rate.

WEANING PERCENTAGE

Number of lambs weaned to no of lambs born alive (or) Number of lambs weaned to the number of ewes put to a ram

- It is the useful measure of mothering ability of the flock

TWINNING PERCENTAGE

Number of twin births to the total number of births

- This is influenced by
    - *Genetic factors:* Some breeds are more prolific than others
    - *Nutritional status:* Providing good nutrition by flushing the animal will increase the twinning rate

LAMBING RATE

- Number of lambs born to number of ewes lambing

LAMBING INTERVAL

Interval in days between two successive lambing

- The time of weaning will have a great influence on the lambing interval.
- Most of the animals will exhibit oestrus only after separation of the young ones.

BIRTH WEIGHT

Weight of a lamb in kg measured with in 24 hours after birth

- It is the first indication of the growth potential of the lamb. It is medium in heritability.
- The weight of the lamb is approximately 10 % of the body weight of the dam. The birth weight is influenced by
    - Body weight of the ewe
    - Parity of the ewe
    - Type of birth
    - Age of the dam – older ewes tend to have a heavier lambs than young ones
    - Sex of the lamb – males are usually heavier than females
    - Nutrition – Inadequate levels of nutrients to ewes/does reduce the size at birth

WEANING WEIGHT

Weight of a lamb in kg at the time of weaning (90 days)

- This not only provides information on the growth rate of the lambs/kids but also provide information on the milk yield of the ewe. This is medium in heritability. This will be influenced by
    - Sex of the lamb – males are heavier than females
    - Birth weight of the animal
    - Type of birth

Age of the ewe

- The milk yield will be increasing as the parity advances. So this will have influence on the weaning weight.
- Mothering ability of the dam

WEIGHT AT MARKET AGE

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

- Gain from weaning to market is highly heritable and this will provide valuable information to the breeder.
- The six months weight is used as a selection criterion for selection of males and females for improvement of the breed in terms of growth.

GROWTH RATE

Pre weaning weight gain

- Rate of daily gain in weight (gm/day) from the date of birth to weaning period

$$= \frac{\text{weight at weaning - weight at birth}}{\text{90 days}} \times 1000$$

Post weaning weight gain

- Rate of daily gain in weight (gm/day) from the date of weaning to one year

$$= \frac{\text{weight at one year - weight at weaning}}{\text{275 days}} \times 1000$$

MORTALITY PERCENTAGE

Pre weaning mortality

- Number of lambs died during the period 0-90 days to the Number of lambs born alive (as percentage)

Post weaning mortality

- Number of lambs died during the period 90-365 days to the Number of lambs at 90 days (as percentage)

Adult mortality

- Number of adult sheep died to the number started at one year (as percentage)

TUPPING PERCENTAGE

- Number of does covered to the number of does
- put to a buck

KIDDING PERCENTAGE

- Number of does kidded to the number of does put
- to a buck (or) Number of does kidded to the number of does covered

WEANING PERCENTAGE

- Number of kids weaned to the number of does put
- to a buck (or) Number of kids weaned to no of kids born alive

TWINNING PERCENTAGE

- Number of twin births to the total number of births

KIDDING RATE

- Number of kids born to number of does kidding

KIDDING INTERVAL

- Interval in days between two successive kidding

BIRTH WEIGHT

- Weight of a kid in kg measured with in 24 hours after birth

WEANING WEIGHT

- Weight of a kid in kg at the time of weaning (90 days)

WEIGHT AT MARKET AGE

- Weight of the kid in kg at the age of 6, 9 and 12 months of age

GROWTH RATE

Pre weaning weight gain

- Rate of daily gain in weight (gm/day) from the date of birth to weaning period

$$= \frac{\text{weight at weaning} - \text{weight at birth}}{\text{90 days}} \text{ x 1000}$$

Post weaning weight gain

- Rate of daily gain in weight (gm/day) from the date of weaning to one year

$$= \frac{\text{weight at one year} - \text{weight at weaning}}{\text{275 days}} \text{ x 1000}$$

MORTALITY PERCENTAGE

Pre weaning

- Number of kids died during the period 0-90 days to the Number of kids born alive (as percentage)

Post weaning

- Number of kids died during the period 90-365 days to the Number of kids at 90 days (as percentage)

Adult

- Number of adult goat died to the number started at one year (as percentage)

MODULE-37: GENERAL MANAGEMENT AND FEEDING PRACTICES (SMALL RUMINANTS)

Learning outcomes

On completion of this module the learners will able to

- know about common management practices in sheep and goat farm
- understand the feeding requirements and feeding schedule for different age and sex groups

IDENTIFICATION OF ANIMALS

- The following methods are used for identification of sheep and goats:
  - Ear tagging
  - Tattooing
  - Numbering of animals with dyes

EAR TAGGING

- Putting a tag in animal's ear enable to do identification thorough out the life. The procedure for tagging is follows,
  - Dip tag and applicator in disinfectant
  - Write the number on the tag before tagging
  - Restrain the animal in the standing position
  - Clean the ear with methylated spirit
  - Clip tag in to the ear with applicator avoiding ear veins
- The tag should be inserted between the middle and lower cartilage ribs of the ear.
- It is best to place the tag as near to the head as possible to reduce the chances of ripping.
- The number is should be on out side. Placing tags in different ears to the animal's sex can help in sort the animals in large flocks.
- The main disadvantage of applying tag is that they may become snagged and the ear may tear which will lead to open wounds that can become infected.
- Some times the torn ear may be looking ugly and fetches low price in the market.
- To avoid this the tags applied should be neat and small. Initial identification of the animal may be done with ear tagging.

TATTOOING

- Animals can be tattooed on any part of the skin that can be seen but the ear is the most popular place.
- Marking ears avoids damaging the skin, which may be used in leather production.
- Their process involves making a series of pierced marks through the ear and rubbing in Indian ink.
- The material required for tattooing is
    - Letters A to Z and 0 to 9· Indian ink
    - Tattooing pliers
    - Methylated spirit
- Procedure is as follows
    - Place the letter or figures in the tattooing pliers and test on paper
    - Clean the wax and dirt of the ear with methylated spirit
    - Smear ink on the inside of the ear and on the numbers
    - Line up pliers between ear blood vessels in the middle of the ear
    - Squeeze pliers with quick, firm movement to penetrate skin
    - Remove pliers and rub more ink in the holes using stick brush.
    - The dyes should be the ears between cartilage ribs or bare skin on the inside of the hind flank.
    - The skin tags will take one to three weeks to heal. To read any tattoo it is necessary to catch the animal
- The tattooing is carried out at sixth to ninth month of age.
- For animals with tubular ears, tattooing is carried out in the skin and inside of the hind flank.
- Initially the animals are identified with ear tagging and tattooing is made at sixth to ninth month.

NUMBERING OF ANIMALS WITH EYES

- The lambs, kids and adult animals could be numbered in the sides of the body by using dyes of potassium permanganate (or) other dyes used for garments.
- This is used for temporary identification of animals.
- The dyes should be of non corrosive and should not cause any wound in the skin.
- It is better to avoid paints for marking.

HANDLING AND RESTRAINING A SHEEP OR GOAT

- The easiest way to catch an animal is bring it with food.
- If this fails a group of animals can be herded to a pen or enclosure from which the individual animal can be caught.
- This is done by approaching from the side and catching the horns, legs or neck usually succeeds.
- The sheep or goat can be man handled to a sitting position by reaching under the belly and gently holding the hind leg.
- In general it is always easier to catch one in group than an isolated individual.
- The lamb or kid alone in a pen is usually very nervous and may become berserk and injure itself by running in to the fences.
- The best way to hold the animal is by grab the loose skin in the right hind flank if you are a right handler and vice versa if you are a left handler.
- Hold the skin firmly and lift upward to control the sheep. To move a sheep hold it by the skin under the throat and place the other under the dock.
- Lift up on the dock and the sheep will move. Carrying a lamb and letting her follow can usually accompany moving an ewe and her lamb into a lambing pen

Restraining adult sheep

HOOF TRIMMING

- If the animals are maintained under intensive system of management their hooves have to be trimmed regularly.
- Feet that are not kept properly trimmed can became deformed and may cause lameness and it will affect the performance of the animals.
- In general trim the feet once in six months. An adequate care should be taken while trimming the hoof. They are
    - Cut the hoof once in six months
    - First cut off any bent over portion of the hoof
    - Then cut from the heel towards the toe
    - When you see pink colouration, this means you are nearing the blood supply and should not go any deeper

DIPPING

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

FEEDING

- Sheep are dependent for most of their diet on pasture and forage crops and goats are dependent on tree leaves.
- Feed intake is generally measured in dry matter basis. Dry matter is the matter devoid of water.
- Generally sheep and goats will take up dry matter to the equivalent of 3 – 4 per cent of the body weight depends on their production level.
- The goats have a much better digestibility capacity for forage than sheep of a similar size.
- In general young animals will consume more than older ones because of their rapid growth.
- Pregnant and lactating animals consume more than the non-pregnant and non-lactating animals.
- The following periods are important ones to consider
    - Males and females one month before mating
    - Females in the final month of pregnancy
    - Females in the first two months of lactation
    - Growing lambs/kids especially after weaning

FEEDING OF LAMBS/KIDS

- *Immediately after birth:* Feed the young ones with colostrum
- *Up to 3 days of birth:* Keep dam and young ones together for 2-3 days for frequent access of milk.
- Since the colostrum is secreted by the female for the first 2-3 days only.
- *After 3 days & up to weaning:* Feed the lambs/kids with milk at 2 to 3 times a day
- *At about 2 weeks of age:* The young ones should be trained to eat green roughages
- *At one month of age:* The young ones should be provided with the concentrate mixture (Creep feed)

Creep feeding for lambs/kids

- The main purpose of creep feeding is to give more nutrients for their rapid growth.
- The general quantity to be given to the lambs/kids is 50 – 100 gm/animal/day.
- This contains 22 per cent protein . Antibiotics like oxytetracycline or chlortetracycline may be mixed at the rate of 15 to 25 mg/kg of feed.
- This creep feed may be given up to 2-3 months of age

3 MONTHS TO 12 MONTH OF AGE

- Grazing in the pasture for about 8 hours per day
- Supplementation of concentrate mixture @ 100 – 200 g/animal/day with protein of 16-18 per cent.
- Dry fodder during night in summer months and during rainy days

Deworming

- Deworming is removal of internal parasites by giving anthelmintic drugs.
- Periodical and regular deworming is necessary to maintain the growth rate of animals
- The production and reproduction efficiency improves by regualr deworming
- See a video clip on deworming of goats.

ADULT ANIMALS

- In general , if the availability of pasture is good there is no need to supplement concentrate mixture.
- In poor grazing condition animals may be supplemented with concentrate mixture @150 – 350 g of concentrate / animal/day depending up on the age, pregnancy and lactation.
- The digestible crude protein level of concentrate mixture used in the adult feed is 12 per cent.

NON PREGNANT, PREGNANT AND LACTATING ANIMALS

- If the availability of pasture is good no need to supplement with concentrate mixture.
- In poor grazing condition animals may be supplemented with 150 – 200 g of concentrate / animal/day.

Pregnant animals

- For the first 4 months of gestation pasture is usually the best source of feed for ewes and does. During initial months of pregnancy the foetus will grow slowly.
- But during the last 20 to 40 days, fetal growth increases 60 – 80 per cent until parturition. So during this period in addition to grazing, animals should be fed with
    - Concentrate mixture @ 250 –350 g/animal/day
    - Adequate amount of leguminous roughages
    - Dry fodder during night in summer and during rainy days

Lactating animals

- Immediately after lambing/kidding if you feed high amount of concentrates stimulates milk flow and may cause feverishness.
- It is usually preferable to feed lightly on the day of parturition, but allow plenty of clean, cool water.
- In addition to this the animals may be provided with bran and leafy hay.
- The concentrate level may be increased gradually. For lactating animals in addition to grazing, supplement with
    - Concentrate mixture @ 250- 350 g/day/animal for 2 months
    - Adequate amount of leguminous green fodder

MODULE-38: BREEDING SCHEDULE AND MANAGEMENT OF RAM AND BUCK

Learning outcomes

- At the completion of this module, the learners are able to understand about the complete breeding management of sheep and goats under different systems of rearing.

REPRODUCTIVE PARAMETERS

- The normal heat period in ewes lasts for 6 to 48 hours, with an average of 24 hours.
- The normal oestrous ranges form 16 to 19 days with an average of 17 days.
- Ewes come to heat usually about 2 months after lambing.
- Ovulation occurs 24 to 30 hours after the onset of estrus.
- Therefore, conception is most likely when breeding occurs late in the heat period.
- The length of pregnancy averages 147 days (ranged between 144 and 152 days).

BREEDING SEASON

- Sheep in tropics generally breed throughout the year. Rams of indigenous breeds donate good quality semen under proper management conditions throughout the year.
- However, the rams of temperate breeds if not protected from high temperature, high humidity and high solar radiation will not produce good quality semen during hot dry and hot humid seasons.
- Females of tropical breeds cycles throughout the year. The breeding cycle was affected by hours of daylight in temperate breeds.
- They breed with declining day length. They come in heat in autumn from August to November, although some may bred up to February.
- Indigenous breeds usually bred during nutritionally better time of year, i.e. July to October, or immediately after the onset of monsoon (major breeding season).
- A small percentage of them also bred during March-April (minor breeding season) when they are grazed on stubble in the harvested fields and supplemented with Acacia and Prosopis pods, and thus get flushed. Sheep bred in different seasons depending upon the availability of feed.
- Thus, to some extent breeding season is controlled by the sheep bred on the basis of availability of feed resources and physical environmental condition prevailing both at breeding and lambing, though the consideration would be more in case of lambing as extremes of weather will more seriously affect lamb survival.
- The breeding should, therefore, be arranged in a manner that the lambs are dropped when plenty of vegetation is available and weather conditions are mild.

PREPARATION OF FEMALE

Flushing

- Flushing is feeding of extra concentrate to ewes prior to onset of breeding season, normally 3 or 4 weeks before breeding.
- This increases the ovulation rate of ewes, so that the number of twins and triplets increase.
- In tropical flocks twining and triplets are rate and in extensive rearing twining and triplets are undesirable.
- Flushing will have effect only if the ewes were in declining phase of nutritional availability.
- Ewes in better body condition will produce more lambs thus the flushing of leaner ewes will increase the fertility by way of increase incident of oestrous, increase ovulation rate and decreases the early embryonic mortality by strengthening the fetal membrane integrity.
- Flushing can be done by supplementing 250 g of concentrate daily or 500 g of good quality legume hay per head per day.
- Flushing increases the lambing rate by 10 to 20 per cent.

Tagging

- Ewes sometimes are not bred because wool or tags prevent the ram from making satisfactory copulation, thus tagging makes service by the ram more certain.
- The ram is also trimmed around the sheath.

Eyeing

- To prevent wool blindness in some breeds the excess wool around the eyes should be clipped away regularly. This process is referred to as eyeing.

Ringing

- Before the breeding season starts the wools should be completely removed from all over the body of the ram.
- He should at least be clipped from the neck and from the belly particularly at the region of penis. This process is referred to as ringing.
- This process makes it easier for the ram to have proper mating.

Crutching

- Removal of wool around the perennial region and base of the tail of an ewe is known as crutching. This facilitates better mating.
- This refers shearing the lock of wool and dirt from the dock.

PREPARATION OF MALE

Marking the ram

- For the sake of identification of the ewes which have been bred by the rams, it is essential that rams must have some in their breast, which at the time of mating will mark the particular ewes(marked ewes). For this either lamp black or Venetian red is mixed up with linseed oil to make a paste, which is then applied in the brisket area at least once a week.
- When the ram mounts the ewe during the course of breeding, she will be marked on the rump (marked).
- This makes it possible to record the date when the ewes are bred and also to remove them from the breeding flock.
- The colour of the dye should be changed every 16 to 18days so that the repeaters can be discovered, if the bred ewes have not been removed from the flock.
- This process is termed as marking of ewes by breeding ram and marked ewes considered as bred.

Raddle/raddling

- Marking of ewe by ram can also be done by raddle. Raddle is nothing but a ram harness containing crayon, which is rubbed on the ewe's rump when mating takes place, so that a colour mark is left.
- The process of allowing the ram to run along with raddle is termed as raddling.

SELECTION OF EWE AND RAM FOR BREEDING

- Breeding ewe of indigenous breeds should be 18to 24 months depending upon their body condition.
- Breeding too young ewes result in more weakling and thus results in higher lamb loss.
- As a guideline, females should be mated only when they reach 70 per cent of the average adult body weight.
- The ewes should possess a long preferably low set body, roomy hind quarter, well-formed pliable udder, active foraging habit and good mothering instinct.
- The ewes having poor milking capacity, over short or undershot jaw, broken mouth, blind teat and meaty udder should be disqualified form the breeding programme.
- Body weight of an ewe at breeding should normally less than the adult body weight of that breed.
- Wide roomy hind quarter with good space between inner aspects of two thighs gives an indication about future development of udder.
- The libido of the ram is very important to achieve desirable breeding. Poor libido may result from inadequate feeding, extreme heat stress or ill-health.
- When there is more than one ram with a flock of ewes, larger and older ram dominate the smaller, younger ones.
- Rams, which are strangers, are aggressive and fight to decide which is strongest.
- hey may seriously dame one another unless put in a confined place where they cannot gather speed to charge each other.
- Breeding ram should be in good body condition, masculine, legs should be stronger and free from defects. It should show good libido.
- The animal should be examined thoroughly for presence of both the testicle intact in the scrotum.

SEX RATIO

- In temperate zone the male female ratio is 1 : 40.
- In temperate condition under extensive husbandry the ewes may be very dispersed and where rams and ewes may be undernourished, the number of ewes per ram must usually be severely curtailed.
- In India the rams are usually turned out in the flock during mating season at the rate of 2 to 3 per cent of the ewes all through day and night under optimum breeding conditions.
- Young males can be put in to experienced older ewes and older rams to younger ewes will help in better mating.
- To avoid inbreeding the sire and dam of the males and females has to be verified and the males should be allowed to breed females in such a way that they are not closely related to each other.
- Normally in farmers flock the males should be replaced or exchanged once in two years to avoid inbreeding.

ESTROUS CYCLE AND SIGNS OF OESTRUS

Estrous cycle

- Ewes and does will exhibit estrous or heat at regular interval during the breeding season.
- Estrous is the fertile period and if the female does not conceive, it is repeated every 16-17 days on average in ewes (range 14-19 days and 19-21 days in does (range 17-24 days, though 8-10 per cent of animals may have shorter cycle of 6-10 days). These intervals may be 1-2 days shorter in young animals.

Estrous/signs of estrous

- Estrous is the period of the estrous cycle when the female display a behavioral sexual activity and it is the only time she will accept the male.
- It is the period during which females are receptive to male. The estrous period lasts for about 24-36 hours in ewes and 34-38 hours in does.
- The number of ova shed has an influence on the length of period. Ewes and does with multiple ovulations are probably in heat longer than those with only one ovum shed.
- Generally ewes do not shoe visible signs of estrous if a ram is not present.
- When a ram is present, the ewe in heat will exhibit mating behaviour by rubbing against the ram, circling him, sniffing his genitalia and wagging her tail.
- The signs of estrous are much more marked in the doe than in the ewe. The outward signs are:
    - Reddening of the vulva and discharge from vulva
    - Tail wagging
    - Mounting other animal
    - Seeking male
    - Frequent bleating
    - Push her back
    - Standing for mating (standing reflex)
    - Generally the young females don't show aggressive estrous behaviour
- The males are attracted by smell, sight and sound and exhibit following behaviour
    - Sniff the vulva
    - Extending neck with Curling of upper lip
    - Biting the side of the ewe/doe and wool pulling
    - Paw the ewe – raising and lowering of one front leg in a stiff legged striking motion
    - Mount and mate

IDENTIFICATION OF SHEEP AND GOAT IN HEAT

- One of the problems in scientific manipulation of breeding programme is the detection of sheep and goat in heat.
- It is difficult to find out ewes/does in heat by physical signs. The techniques generally followed are

Using an intact male

- However, there is a chance the buck or ram will mate the doe or ewe if is not controlled properly.

Use of intact male fitted with aprons

- In this case an apron is tied on the abdomen of the male to cover the penis.
- The apron is made of a soft piece of cloth measuring 60x45 cm with strings on four sides to tie it properly.
- This prevents mating. The apron should be washed daily and checked for holes or tears to avoid unwanted mating.
- There are two distinct disadvantages to the use of this method.
- The first there is a risk of fertile mating if the apron is not securely fastened and checked frequently.
- Secondly inflammation, irritation and infection of penis and prepuce area can occur, resulting in inhibited sexual desire and mounting behaviour.
- The ram/buck are apronized and allowed in to the flock for identification of animals in the morning and evening for about 15 to 20minutes.
- Teasure ram/buck detects the females in heat, which are marked and separated out for breeding with desired ram.

Vasactamised ram

- Vasactamised rams can be prepared by doing surgical intervention.
- In this method an intact buck or ram is let in to the flock. The buck or ram follows the doe/ewe in estrous.

SYSTEM OF MATING

- Natural mating
  - Hand mating
  - Pen mating
  - Flock mating or pasture mating
- Artificial mating
  - Artificial insemination
  - Embryo transfer technology

NATURAL MATING

Hand mating

- In this system teaser ram or buck detects the ewes or does in heat, which are mated and separated out for breeding with desired ram or buck.
- The females are allowed to mate on by one. In this system a ram or buck may no be allowed to mate more than three ewes/does a day.
- This method of hand mating ensured the expected time of lambing. This system allows the farmer to know that the animal has actually bred.
- Hand mating reduces the risk of injuries to animals and is beneficial when mating older male with a younger female.
- Hand mating also improved the breeding efficiency of the male, resulting in an increased number of females that can be bred in a shorter period of time.

Pen mating

- In this mating system the ewes / does are divided in to batches varying from 20-25 ewes/does.
- Males are turned into the flock only during the night time and separated during day time. Which gives enough rest form the male and they can be fed properly.
- This system of mating also prevents the disturbance ewes by the male during grazing hours.

Flock mating

- This system of mating was practiced normally by the farmers.
- In this system males are allowed to run along with the females through out the day and night.
- This system has its own demerits. The ram may lost its most of its body reserve in chasing the ewes and they may lose their body condition.
- Some time the ram or buck may develop attraction for particular ewe or doe in heat and serve it a number of times while other remain unattended resulting in empty ewes/does and low fertility rate.
- More over the ram/buck some time exhaust itself overnight by serving more than a dozen times and the last served ewes or does not receive optimum number of spermatozoa and remain unconceived.

ARTIFICIAL BREEDING

Artificial insemination

- Artificial insemination offer the best means of distributing germ plasm from nucleus breeding flock to may small flocks within each eco system.
- Fresh as well as frozen semen is used. The speculum method of insemination is used for ewes and does.
- Generally artificial insemination leads to lower reproductive rate than natural service and frozen semen gives even much low pregnancy rate that is around 40 per cent.
- Cervical insemination is generally followed for better conception rate.

Embryo transfer technology

- Embryo transfer requires surgery in sheep, therefore it may not become practical in production, but it offer great promise in enhancing genetic progress.

MANAGEMENTAL METHODS TO OPTIMIZE BREEDING

Oestrous stimulation

- A helpful practice for stimulating and to some extent synchronizing breeding is to put vasectomised males with females about ten days to two weeks prior to the beginning of breeding.
- The same effects can be result from fence line contact that is turning a ram or buck into an adjoining shed.
- As a result of this a large portion of the ewes will ovulate and conceive during the early part of the breeding season.

Oestrous synchronization

- Oestrous cycle of the ewe is synchronized so that large numbers of them come in heat at one time.
- This would help in reducing the cost of artificial insemination or natural breeding and subsequent care at lambing.
- It gives a uniform flock of lambs, which will facilitate their disposal and fetch more prices.
- It can also gainfully be employed in breeding of sheep in spring.

Ram effect

- Sudden introduction of ram in the ewes flock after prolonged separation bring more number of ewes into oestrous. This is known as ram effect.

Telescoping

- The telescoping is done by introducing ram in the flock after keeping it away for 2 to 3 months.
- Sudden introduction of ram into the ewes flock will bring 70-80 per cent of ewes in heat in the first oestrous cycle.

Hormonal method

- Synchronization of oestrous is initiated with the simultaneous administration to the ewes of progesterone hormones or their analogues through feed, as implant or as impregnated vaginal sponges.
- After the administration for 14 days the hormone is withdrawn.
- The animal comes into heat within three days. Since the reproductive females are still under the influence of the progesterone hormone the conception rate varies from 30-40 per cent.
- Whereas it varies from 70-90 per cent during the subsequent cycle.
- Prostaglandin $F_2\alpha$ or its synthetic analogues, causing lysis of corpus luteum, are also being used for the purpouse.

- Two intramuscular injections of 10 mg each at interval of 10 days bring all the animals in heat within 72-96 hours.

PREGNANT, PARTURIENT AND LACTATING EWES/DOES

- Careful management of pregnant, parturient and lactating ewes will have a marked influence on the percentage of lambs dropped and reared successfully.
- The following steps for proper attention are recommended.
    - The pregnant ewes should not be handled frequently.
    - The ewes/does in advanced stage of pregnancy should be separated from the flock and effective care should be taken in their feeding.
    - Extra feed during the later part of pregnancy (3-4 weeks before parturition) will be beneficial for the condition of the pre-parturient ewes which will help in improving milk production of ewes and birth weight and growth of lambs.
    - Inadequate and poor nutrition may result in pregnancy toxaemia, abortion and premature birth of weak lambs.
    - Ewe/doe in advanced stage of pregnancy should be kept in a separate lambing corals or shed 4-6 days before partition and maximum comfort like soft clean bedding and individual lambing pen should be provided.
    - The ewe/doe should be protected from chilly weather condition.

MODULE-39: WEANING AND FATTENING OF LAMBS AND KIDS

Learning outcomes

At the completion of this module the learner will able to

- know about the care of lambs, weaning and post weaning care
- fattening of lambs for mutton production

CARE AT LAMBING/KIDDING/PARTURITION

- A ewe/doe about to lamb prefers to leave the flock if she is restless.
- The udder is often distended and external genitals are in flushed and flaccid condition.
- Generally in a healthy ewe partition is normal. Following precautions may be taken during and after parturition.
    - Vigilant eye should be kept for dystokia or difficult birth.
    - Maiden ewes in poor condition or small-framed ewes mated to big rams will generally have difficulty in parturition and will have to be assisted.
    - New born lambs after being licked by the mother generally stand on their leg and star seeking for teats and suckle milk.
    - If they are not able to do so after sufficient time, provide help to them in suckling colostrums, the first milk, which is very essential for health and survivability of lambs.
    - The new born should be protected from cold, wind and rain.
    - Artificial milk feeding or arrangement of foster mother should be done for disowned or orphan lambs.
    - Goats can serve as excellent foster mother, but ewes which have lost their lambs early after birth may also be utilized.
    - Legate, sever and antiseptically dress the naval chord or the lamb.
    - Give a teaspoonful of castor-oil or liquid paraffin preferably mixed with little milk curd/butter milk to lamb to facilitate defecation and passing out of meconium easily and prevention of *E.coli* infection.

- The lambs/kids should not be handled too frequently immediately after birth and let the dams lick and recognize them properly.
- The first 1 to 2 hours after birth is the vital period for establishment of bond between the newborn and the mother.
- Hence the dam should be kept in a calm place with out disturbance from stray dogs and other animals.
- Allow newborn lambs to be with their mother all the 24 hours for first week or so.
- Feed sufficient quantity of good quality hay and concentrate to the lactating ewes for meeting nutritional requirements for early lactation.
- Provide plenty of clean fresh drinking water as the lactating ewes drink surprisingly higher amount of water during lactation.

CARE OF LAMBS

- The lambs should be taken care to the maximum extend during early period of life. This also ensures better survival and growth.
- The following steps may be taken for ensuring better growth and survival.
  - kid/lambs should be ensured of taking sufficient colostrum with in 1 hour after birth to more resistance against diseases.
  - Ensure proper suckling of lambs. Examine the udders for blindness of teats or mastitis.
  - Take care of indifferent mothers and arrange suckling of lambs by restraining such type of ewes.
  - Provide creep feed (good quality hay with or without concentrate mixture) to suckling lambs in addition to suckling of milk form tenth day to weaning age.
  - If possible, make available green leguminous fodders or fresh tree leaves to lambs to nibble during sucking period.
  - Lambs may be ear-tagged or tattooed on the ear for identification.
  - Tail docking and castration may also be done in first week or so by placing elastrator at inter vertebral space and not on the vertebra.
  - Alternatively use of sterilized and clean knife for castration docking and restore to proper ligation and antiseptic dressing at the root of scrotum with testicles before it.
  - During castration keep the lambs on perfectly dry, clean and hygienic site so as to minimize the risk of losses from tetanus and other infection.
  - Normally kids are playful, hence sufficient space should be there for movement.
  - Salt lick or mineral block should be kept in the lamb pen to avoid licking of soil/floor.

WEANING AND CARE OF WEANERS

- The management of weaners plays an important part in good sheep husbandry.
- The following steps are important in proper care and management of weaners.
  - Weaning should preferably be done at 90 days, although in breeds with low milk production or where re-breeding is desired it can be done around 60 days.
  - Supplementary feeding and good clean pasture for growing weaners should be provided.
  - Weaned lambs should be drenched against gastro-intestinal parasites by first moth and vaccinated against enterotoxaemia and sheep pox.
  - Weaners should not be grazed on poor burry and thorny types of pasture since it could cause skin irritation, injury to the eyes and dame to wool.
  - They should be protected against vagaries of climate and predation.

MODULE-40: HOUSING SYSTEMS, LAYOUT AND DESIGN OF

DIFFERENT BUILDINGS FOR SMALL RUMINANTS

Learning outcomes

On completion of this module the learner will be able to

- explain the housing systems, lay out and design of various buildings for small ruminants
- prepare a model housing plan for the given number of animals

HOUSING OF SHEEP AND GOATS

- Provision of simple shade with low cost housing materials is enough for sheep and goat for its optimum production efficiency.
- In our country small ruminant production system itself is characterized by low in put-low out put system.
- Majority of the farmers are not affordable to go for a pucca house for their animals.
- So in this chapter the points to be pondered in designing the low cost housing for a semi intensive system of rearing and intensive system of rearing are given

Optimal environmental conditions

- The zone of thermonuetrality for sheep and goats may be taken as a climatic environment having an air temperature of 13-27^0 C, relative humidity of 60-70 percent, wind velocity of 5-8 km/hour and a medium level of solar radiation.
- Sheds with mud floor are suitable for most of parts of the country except where high rainfall is observed.

Type of shed

- It depends on the system of rearing.
- Open type housing with a covered area and run space is generally enough.
- The run space should be covered by chain links.
- The covered area is used for shelter of animals during night and adverse climatic conditions.

Orientation

- The structure with long axis north and south will help to dry up the urine and faeces and to improve the sanitation.
- However east - west orientation will provide a cooler environment than north –south orientation.
- For a comfortable house east-west orientation with generous provision for ventilation /air movement to dry the floor will be suitable one.

Roofing materials and pattern

- In Indian conditions thatched roof is best suited one for its cheaper cost and durability.
- How ever corrugated asbestos sheets can also be used for organized farms to minimize the recurring costs and longer durability.
- Gable roofing is generally preferred . For small sheds lean to type roofing is advisable.

Floor of the shed

- · Sheds with mud floor are suitable for most of parts of the country except where high rainfall is observed.

Floor space

- The provision of optimum floor space, which includes closed space and open space is highly essential for optimum growth of animals.
- Following are the recommended space requirements for Indian conditions.

AGE GROUPS	COVERED SPACE(Sq.m)	OPEN SPACE(Sq.m)
Up to 3 months	0.2-0.25	0.4-0.5
3 months to 6 months	0.5-0.75	1.0-1.5
6 months to 12 months	0.75-1.0	1.5-2.0
Adult animal	1.5	3.0
Male, Pregnant or lactating ewe/doe	1.5-2.0	3.0- 4.0

- When the animals are taken for grazing during the day time and sheltered only during night the covered space will be enough.
- When the animals are housed intensively the pen and run system of housing is suitable

Dimensions of the shelter

- There is no restriction for the length of the shelter , however breadth of shed should not exceed 12 meter and optimum breadth of shelter is 8 meter Height of eave should be 2.5 meter and height at ridge should be 3.5 meter.
- The height of chain link used for open space should be 4 feet. The length of the over hang should be 75cm – 1 meter.

ORGANISED OR LARGE FARMS

- A farm meant for keeping sheep for wool and meat production and goats for meat production may have the following units,
    - Sheds
    - Shearing and storeroom
    - Shepherd's house.

Sheds

- The sheds of the following types are required for housing the animals,
    - Flock shed
    - Ram or buck shed
    - Lamb or kid shed
    - Lambing or kidding shed
    - Sick shed

Flock shed

- The flock shed shall be used for housing ewes or nannies kept for breeding purpose.

- The shed shall be 15 x 4 x 3 m high and accommodate not more than 60 ewes or nannies.

Ram or buck shed

- The ram or buck shed shall be used for housing rams or bucks kept for breeding purpose.
- The shed shall be 4 x 2.5 x 3 m high and accommodate not more than three animals.
- The shed shall be partitioned lengthwise to form three equal compartments.
- The partitions may be either of wooden planks or half-cut ballis.
- The partition shall be not more than one metre high from the floor.

Lamb or kid shed

- The lamb or kid shed shall be used for housing lambs until they attain maturity and are weaned and also those animals, which are weaned but have not attained maturity.
- The shed shall be 7.5 x 4 x 3 m high accommodate not more 75 animals.
- The shed shall be partitioned breadth wise dividing it into two compartments.
- The compartment having the dimensions 5 x 4 m wide shall be used to keep the unweaned animals and the other compartment having dimensions 2.5 x 4 m wide shall be used for keeping the weaned but immature animals.

Lambing or kidding shed

- The shed shall be used as maternity room for ewes or nannies.
- The shed shall be 1.5 X 1.2 X 3 m high.
- A manger for holding feed, hay and a bucket for keeping water shall be provided in the shed.

Sick animal shed

- There shall be a sick animal shed for segregating ailing and disabled animals.
- The shed shall be 3 X 2 X 3 m high.
- The lower half of the door may be made of wooden planks and the upper half of wire-netting.
- There may also be a window 0.7 m broad and 1.2 m high with a wire net covering.

Shearing and storeroom

- The shearing and storeroom consist of two compartments with a dividing wall.
- One room may be exclusively meant for storing wool and shearing equipment and the other for keeping feed and medicines.
- The room may be 6 x 2.5 x 3m high. There shall be a door one metre wide and two metres high in the front side of the room.
- The door leaf may be made of wooden battens. It may also have two windows, one on each side of the long sides of the room.
- Each window may be 0.7 m wide and 1,2 m high. The windows may DC covered with wire netting.

Shepherd's House

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

CONSTRUCTIONAL DETAILS OF UNITS

Floor

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

Roof

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

Gate

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

Manger

- The manger may be either of cement concrete or of wood with two compartments for providing feed and hay.
- A separate hay rack may also be provided by fixing at level or slightly below the heads of the animals.
- With the help of clamps, the manger may be raised within the height ranging between 450 and 600 mm from the ground.
- The water trough may be of cement concrete or galvanized steel pails or buckets and may be fixed or hung from a hook fixed to the walls
- The manger may also be of portable type. The number of mangers and water troughs in each shed may vary according to the number of animals.

Dipping Tank

- The dipping tank, to protect the animals from infection, may be made either of galvanized steel sheets or constructed of stone or brick in cement mortar, whichever is likely to prove economical, according to local conditions.
- If a galvanized steel tank is used, it shall be well bedded down and the soil rammed tight against it to prevent the sides of the bath from bulging when it is filled.
- If the base of the soil is unstable, the tank may be bedded in cement concrete.
- The dipping tank may be at one side of the yard.

Footbath

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

HOUSING FOR GOATS KEPT FOR MILK PRODUCTION

- The type of housing for goats may have the following units,
    - Sheds
    - Milk room.
- The following four types of sheds are required for housing goats exclusively kept for milk production,
    - Dairy goat shed
    - Buck shed
    - Kid shed
    - Kidding shed
    - Milk room.

Dairy goat shed

- The shed shall consist of stalls for keeping milking nannies.
- The stalls may be arranged in two rows with a passage in them.
- The dimensions of each stall meant to keep a single milking between length of may be 1.2 m wide and 1.4 in long.
- The length of the milking shed shall depend upon the number of milking nannies kept.
- There shall be partitions separating one stall from the other.

Buck shed

- The shed shall be meant to keep bucks.
- There shall be partitions made of either wooden planks or half-cut ballis to divide the shed into two equal compartments for housing two bucks.
- The buck shed shall be away from the milk room and the kidding shed.

Kid shed

- A shed used to accommodate young goats or kids.

Kidding shed

- A shed used as maternity room for nannies.

Milk room

- A room where the excess of milk is kept for disposal, and sometimes also used for milking nannies.

Constructional details of the shed and the milking room

- Floor
  - The floor may be either made of cement concrete or of movable or immovable slatted wooden platform raised 4.5 cm above the ground.
  - The floor shall have a slope of 2.5 cm for every one metre. For each row of stalls, there shall be a brick masonry drain 4.5 cm wide and 3.0 cm deep.
- Walls
  - The walls may be of brick in cement mortar up to 1.2 m in Height and the rest of the portion shall be covered with wire – netting supported by angle irons of suitable section or wooden posts.
  - The walls of the stalls adjoining the passage shall be 1.5 cm (doubt) high and they shall be of brick in cement mortar.
- Roof
  - The roof may be of gabled type and it may be made either of galvanized steel sheets or asbestos cement sheets and where the rainfall is not heavy it may be of thatch.
- Partitions
  - The partitions separating one stall from the other may be either simple wooden planks, galvanized steel or asbestos sheets.
  - The partition shall be at least 15 cm above the floor level.
- Manger
  - The manger may be constructed as a raised wooden frame with openings to fit galvanized steel pail for keeping feed and water for goat.
  - It may be constructed in the partition wall and be supported on iron or wooden bracket. These shall be raised at least 45 to 60 cm from the ground.
  - The place to keep hay and other greens may be in the form of a rack fixed in the front wall from where the animals could pull out the green when they require.

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- **A model sheep and goat shed**

- **Front view of the shed**

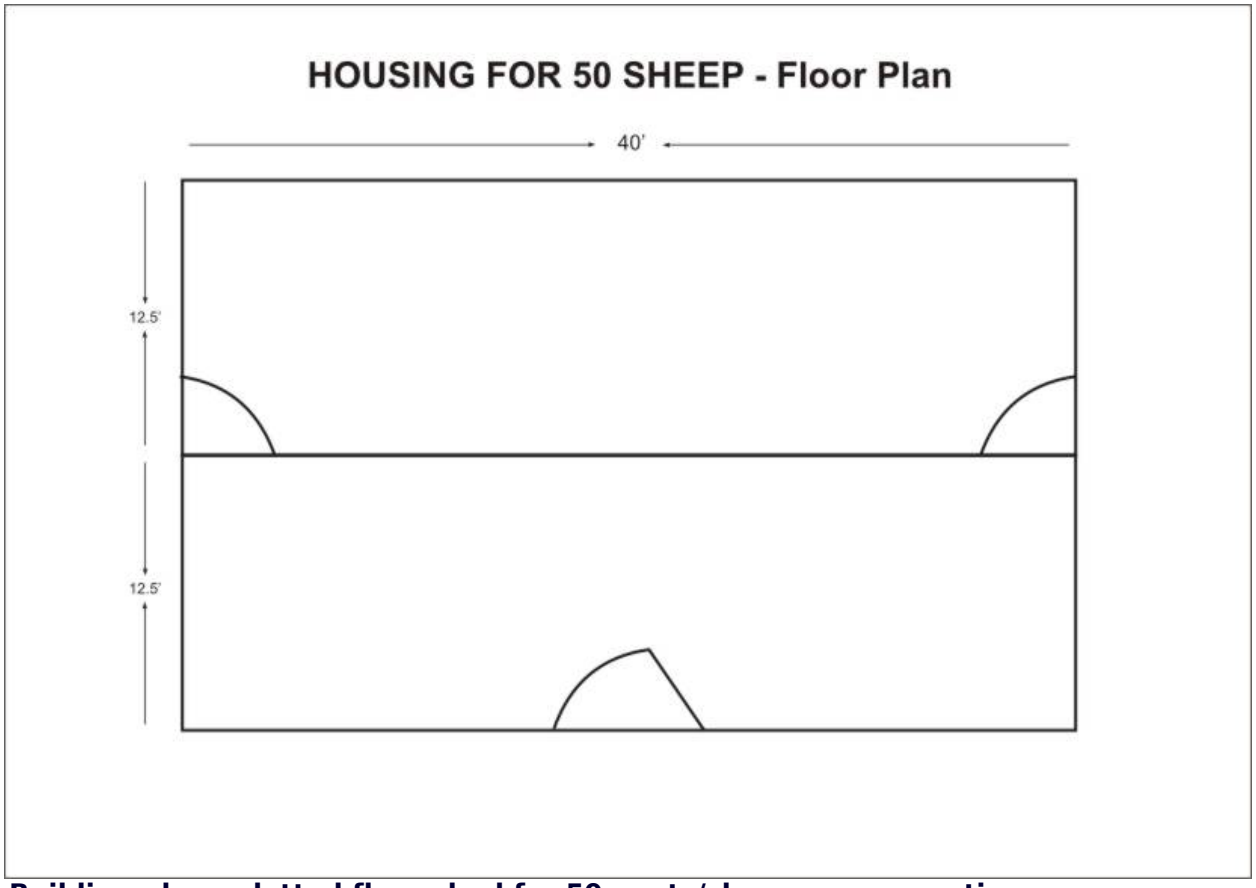
- ▸ **Dipping tank**

- **A graphic model of sheep shed**

- **Slatted floor goat shed - inner view**

- **Watering arrangement**

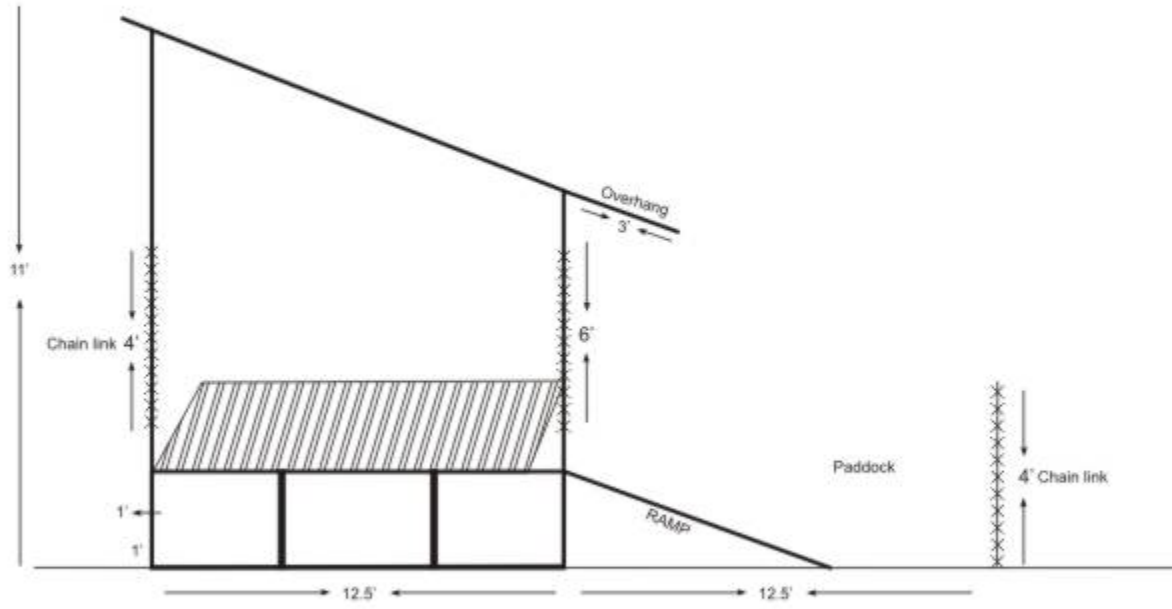
- **Weighment platform with cage**

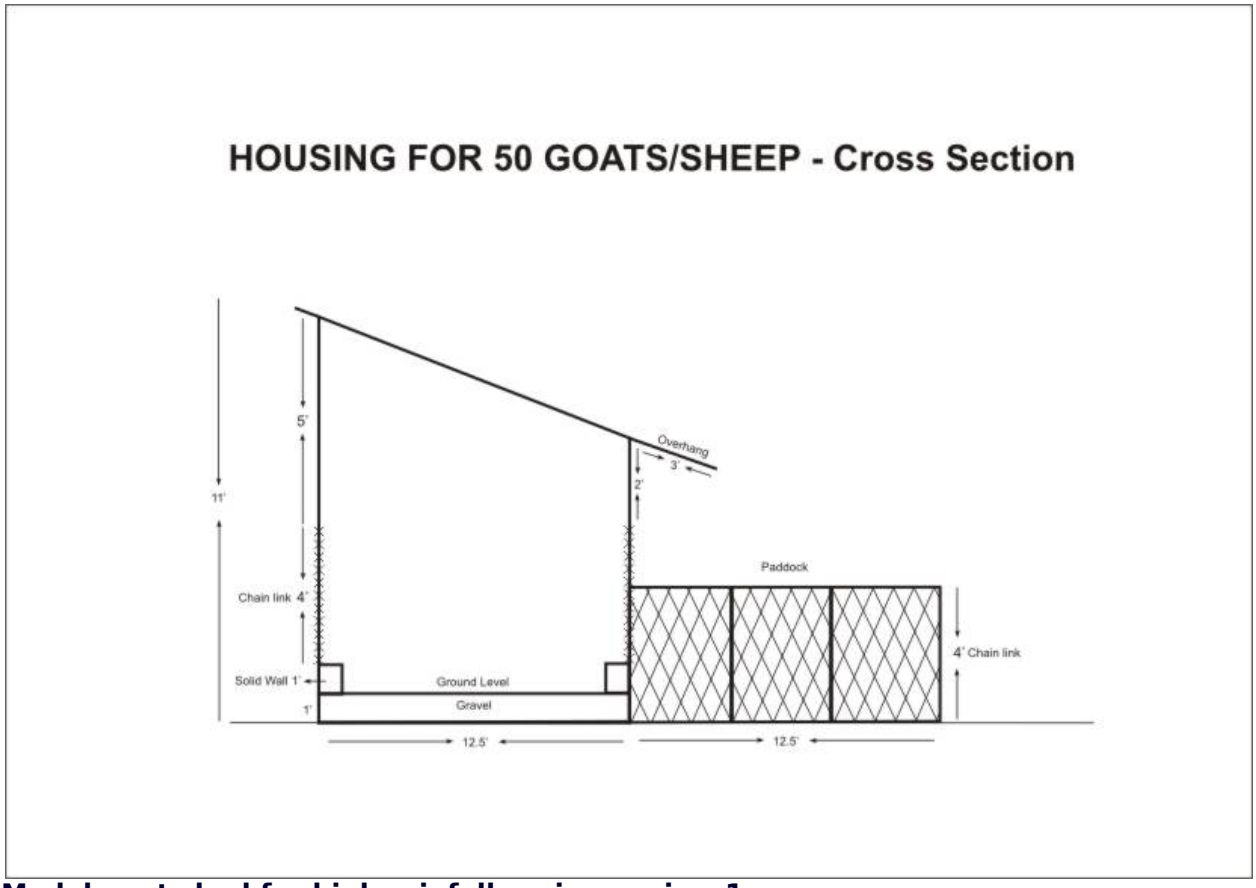


- **Building plan - slatted floor shed for 50 goats/sheep - cross section**

HOUSING FOR 50 GOATS/SHEEP - Cross Section

(SLATTED FLOOR)





- **Model goat shed for high rainfall regions - view 1**

- **Model goat shed for high rainfall regions - view 2**

- **Model goat shed for high rainfall regions - view 3**

- **Manure pit**

- **Feeding arrangement in slatted floor shed**

- **A model cement-concrete feeder for sheep and goat**

MODULE-41: HOUSING OF SHEEP AND GOATS

Learning outcomes

At the completion of this module the learner will be able to

- know the floor space requirement for different age and sex groups
- know the facilities and appliances required for sheep and goat farm

HOUSING OF SHEEP AND GOAT

Introduction

- Normally sheep do not require elaborate housing facility, but minimum provisions require to increase productivity especially protection against inclement weather conditions (sun, rain, winds).
- Shed could be built along the wall of the house. Further protection could be provided with gunny bags, or temporary or removal protection made of thatched material and bamboos.
- The roof should be made of asbestos sheet supported by tubular or angular steel. The wooden rafters and thatching material could also be used.
- Housing instinct is widely prevalent in the animal kingdom and goats are no exception.
- Since the species have lived in diverse micro-climates of the Indian sub-continent - mean - maximum temperature 30^0 C, minimum - 40^0 C in the western Himalayan region and mean maximum temperature of 49^0 C and minimum temperature of 2^0C in the trans Gangetic plains and relative humidity ranging from 20 to 95% in different seasons, they have exhibited remarkable ability to adapt to varying climatic conditions.

Orientation of sheds

- Sheds with long axis running East – West provide a cooler environment underneath than the one with a North - South orientation.

- The latter however, keeps the shed dry and promotes sanitation (because the sun rays falling inside the shed for longer period) though this orientation may impose a greater stress on the animals, if left inside the shed during daytime in hot arid climate.
- A North - East to South-West orientation is expected to give maximum comfort in hot arid environment.

Ventilation

- The efficiency of ventilation is greatly affected by the summer and winter directions of the prevailing wind at any place.
- The air inlets should, therefore, be provided at the height of the goat breeds to prevent the drought. An attempt to cover sheds from all sides to protect the animals from low air temperatures may result in an increase of humidity up to 90% and ammonia concentration to 20ppm.
- Good ventilation in the shed is very important in hot dry and warm humid climate to promote heat loss from animals with increased convection and radiation.
- In tropics, the long sides of the goat shed should not be provided with solid wall above 1m from the floor.
- The open area should be kept uncovered when the ambient climatic condition is warm – humid or hot-humid and should be partially covered when it is hot dry.
- Protection from hot-winds in the hot-arid zone needs special consideration.
- During the winter in uncertain climates and for most part of the year in temperate zone, the sides may be closed but cross ventilation space is left at the roof height.
- Panels of thatch or fireproof thatch made from locally available grasses are very cheap and convenient for adjusting the ventilation at will from two long sides.

Height and shape of roof

- The height at centre in ‘A’ shaped roof is suggested to vary from 3 to 3.5 m. A height of less than 3m interferes with proper ventilation resulting in reduced convective heat loss from animals.
- In temperate and hot-humid climate, where more height does not provide any additional benefit, a height of 3 m is expected to suffice.
- The heat loss through radiation from goats to cool sky is curtailed in low roof sheds. ‘A’ shaped roof is better for hot climatic regions because one side of ‘A’ shaped roof saves the other half from direct solar radiation by casting its shadow.
- This helps in cutting down heat gain from the roof of the shelter. Double roof with both roofs of same or different materials are effective in reducing the heat.
- But additional cost restricts its use.

Floor type and space

- The surface upon which an animal lies may potentially be a source of thermal and physical discomfort, injury, and infectious diseases.
- The ideal bed, therefore, needs to be hygienic, dry, resilient and reasonably temperature resistant.
- The relative importance of these 4 criteria differs markedly for different species and classes of farm animals.
- Deep, clean, dry straw can provide an ideal bed for weaners and growers during the cool period but a thin layer of straw is likely to be more suitable during warm or hot weather conditions.
- The floor space for different age groups should be slightly more in hot weather conditions in comparison to cool weather.
- This helps in radiant heat losses and convective removal of heat and water from the animal's body.
- In tropical climates, huddling is disadvantageous for health of the animal and their productivity.
- Exotic animals should be provided with 0.9-1.1m^2 and native and indigenous cross breed sheep 0.8 - 0.9-m^2 floor space per sheep.
- Sheds measuring 18m x 6m can accommodate about 120 sheep.
- A chain link fencing or thorny bush enclosure of 12m x 6m can be provided for night paddocking of sheep on each side of the shed.

MINIMUM FLOOR SPACE REQUIREMENT PER ANIMAL (BIS STANDARD)

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

DIFFERENT TYPES OF SHEDS REQUIRED IN A SHEEP/GOAT FARM

Ewe/doe shed

- shall be 15 m x 4 m x 3 m. high and can accommodate not more than 60 ewes used for breeding.

Ram/buck shed

- shall be with a dimension of 4 m x 2.5 m x 3 m high and can accommodate about 3 rams.
- The shed shall be partitioned lengthwise to form 3 equal compartments.
- The partition between each animal should not exceed 1m.

Lambing/kidding shed

- These sheds shall be used as maternity rooms for ewes or doe.
- The shed shall be 1.5 x 1.2 x 3.0 m high, a manger for holding feed and hay and a bucket for keeping water shall be provided in the shed.

Lamb/kid shed

- The shed shall be with a dimension of 7.5m x 4m x 3m high to accommodate not more than 75 animals.
- The shed shall be partitioned breadth wise dividing into 2 compartments.
- The compartment having dimension of 5m x 4m x 3m high shall be used to keep the unweaned animals and other compartment with dimension of 2.5 x 4m shall be used for keeping the weaned animals.

Sick animal shed

- There should be a sick animal shed for segregating ailing and diseased animal.
- The shed shall be with a dimension of 3 x 2 x 3m high.

Shearing room / Store room

- This may consist of 2 compartments with a dividing wall.

- One room may be exclusively for storing the wool and shearing equipment, and the other for keeping the feed and medicine.
- The room may be with a dimension of 6m x 3.5m x 3m.
- These shall be in the front side of the room.

Attendant's room

- This is meant for the caretaker, which shall be located at a convenient place in the farm.

ESSENTIAL APPLIANCES REQUIRED

Feeders

- The wastage and contamination of feed with faeces and urine have been the major problem in existing feeders in goat farms.
- The rectangular and hexagonal feeder has been developed with provision of feeding green roughages, straws as well as concentrates.
- It has been possible to drastically reduce the wastage of all 3 types of feed with use of these feeders.
- For goats it is better to feed the stall fed animals above ground level.
- Feed racks can be used for this purpose, which can also minimize the feed wastage also.

Water troughs

- Contaminated water is an important source of infection.
- The water tanks or troughs should be covered and require regular cleaning.
- Water troughs of 3-4cm in length per goat, when raised in groups are sufficient.
- Water tanks with flat valves may be suitable for large-scale intensive goat production.
- Availability of water in goat house round the clock will be beneficial for attaining optimum productivity under any system of production.
- Feeding and watering space requirement for sheep and goat and feeding and water trough dimensions are (all in cm]:

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

Shed hygiene

- The shed management includes constant vigil to general cleanliness, timely repairs and renovations.
- The sheds would require seasonal spraying to protect the flock from ectoparasites and disinfection particularly prior to kidding operation.
- The earthen floors, where applicable, may need replacement for every 3 months besides disinfection with carbolic acid, which takes care of snakes and other reptiles.
- Annual white washing with lime prior to winter are suggested. Painting of sheds is recommended prior to monsoon.
- Application of thatch panels to control the excessive airflow during summer and winter through the sheds in the hot-arid environment is expected to improve the shed microclimate.

HOUSING FOR GOATES KEPT FOR MILK PRODUCTION

- The type of housing for goats may have the following units,
  - Sheds
  - Milk room and
  - Store room
- The following four types of sheds are required for housing goats exclusively kept for milk production,
  - Dairy goat shed
  - Buck shed
  - Kid shed and
  - Kidding shed

Types of sheds

- Dairy goat shed
  - The shed shall consist of stalls for keeping milking does. The stalls may be arranged in two rows with a passage in between them.
  - The dimensions of each stall meant to keep a single milking doe may be 1.2 m wide and 1.4 m long.
  - The length of the shed shall depend upon the number of milking does kept for production.
  - There shall be partitions separating one stall from the other. Racks for hay and greens may be provided in the shed.
- Buck shed
  - The shed shall be meant to keep bucks.
  - There shall be partitions made of either wooden planks or half-cut ballis to divide the shed into two equal compartments for housing two bucks.
  - The buck shed shall be away from the milk room and the kidding shed.
- Kid shed
  - A shed used to accommodate young goats or kids.
- Kidding shed
  - A shed used as maternity room for does. Individual spacious pens are essential to house does in late pregnancy.
  - Movable hurdles can also be used for preparing kidding pens.
  - Individual kidding pens are contaminated very quickly, and need frequent cleaning and disinfection otherwise they may constitute an important source of naval infection to kids.
  - Rearing of young kids needs special attention while planning goat housing and a fly proof shed for kids up to 3 months of age will prove worthy.
  - The pens for kidding should be at the warmest part of the goat house complex if the kidding is expected in cool weather.
  - The protection of newborn kids from low ambient temperature is essential to reduce the kid mortality.

Milk room

- A room where the excess milk is kept for disposal.

Store room

- It is provided in the shed for keeping feed and other feeding.

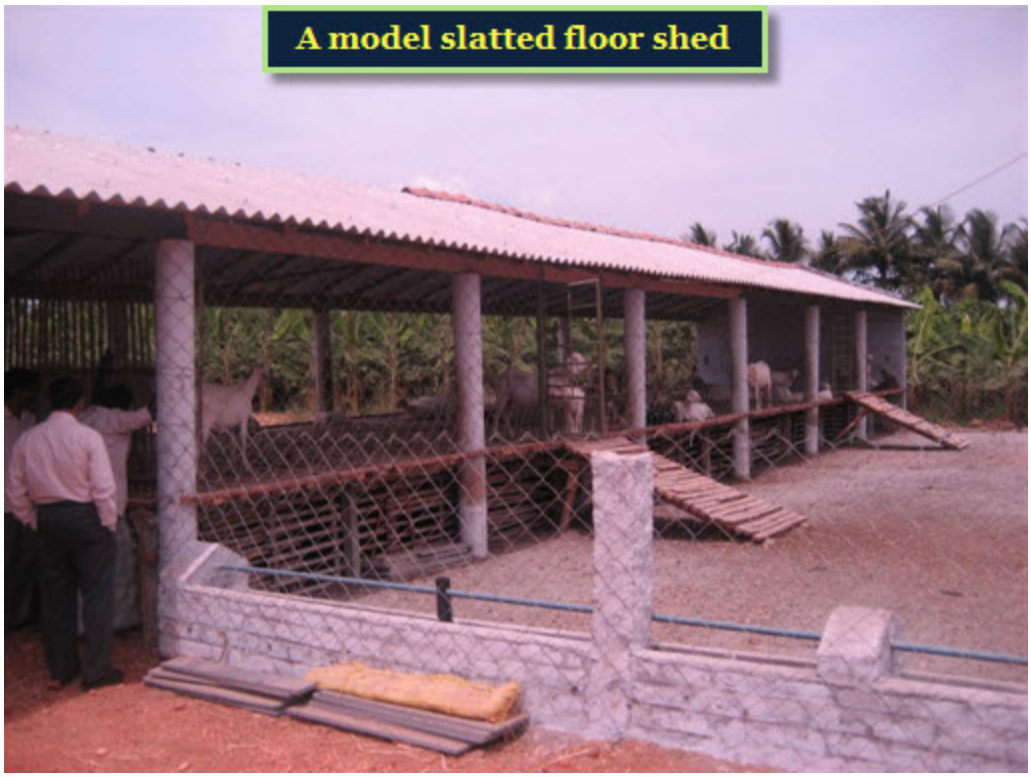
CONSTRUCTIONAL DETAILS OF THE SHED AND THE MILKING ROOM

- Floor
  - The floor may be either made of cement concrete or of movable or immovable slatted wooden platform raised 45 cm above the ground.
  - The floor shall have a slope of 2.5 cm for every one metre.
  - For each row of stalls, there shall be a brick masonry drain 30 - 40 cm wide and 7.5 cm deep.
- Walls
  - The walls may be of brick in cement mortar up to 1.2 m in height and the rest of the portion shall be covered with wire - netting supported by angle irons of size 5 x 5 x 6 cm section or wooden posts of suitable section.
  - The walls of the stalls adjoining the passage shall be 1.5 m high and they shall be of brick in cement mortar.
- Roof
  - The roof may be of lean to type, gabled type and it may be made of plain or corrugated asbestos cement sheets or galvanized steel sheets or aluminium sheets and where the rainfall is not heavy it may be of thatch.
- Partitions
  - The partitions separating one stall from the other may be either simple wooden plank, galvanized steel or asbestos sheets.
  - The partition shall be at least 15 cm above the floor level.

Manger

- The manger may be constructed as a raised wooden frame with openings to fit galvanized steel pails for keeping feed and water for goats.
- It may be constructed in the partition walls and be supported on iron or wooden brackets. These shall be raised at least 45 to 60 cm from the ground.
- The place to keep hay and other greens may be in the form of a rack fixed in the front wall from where the animals could pull out the green when they requires.
- A feed trough may also be used.

A MODEL SLATTED FLOOR SHED

- 

A SIMPLE LEAN TO ROOF WITH SLATTED FLOOR

A THATCHED SLATTED FLOOR SHED

DRY FODDER STORAGE

FEEDER MADE OF PLASTIC DRUM

FEEDER ON SIDES OF THE SHED

FEEDER WITH CHOPPED GREEN FODDER

FEEDING ARRANGEMENTS

GOATS IN FENCED AREA

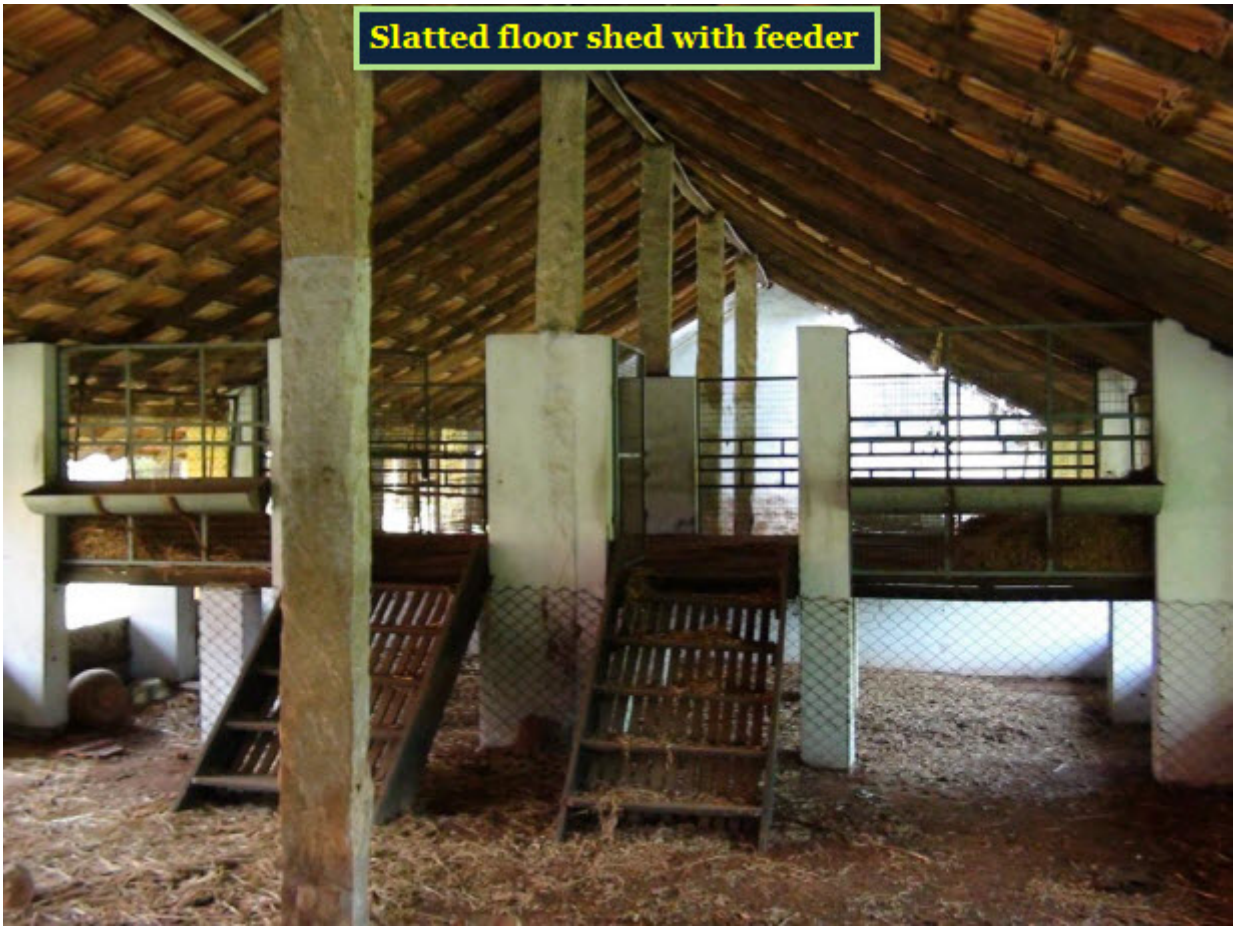
IMPROVISED FEEDER MADE OF PLASTIC TUBES

IMPROVISED FEEDER ARRANGEMENT

METAL SEMI CIRCULAR FEEDER

PRIVATE GOAT FARM

SLATTED FLOOR SHED



WEIGHING MACHINE WITH CAGE

MODULE-42: FEEDING MANAGEMENT OF GOATS

Learning outcomes

- On completion of this module, the learner will be able to understand the nutritional requirements and feeding of goats

FEEDING MANAGEMENT OF GOATS

Introduction

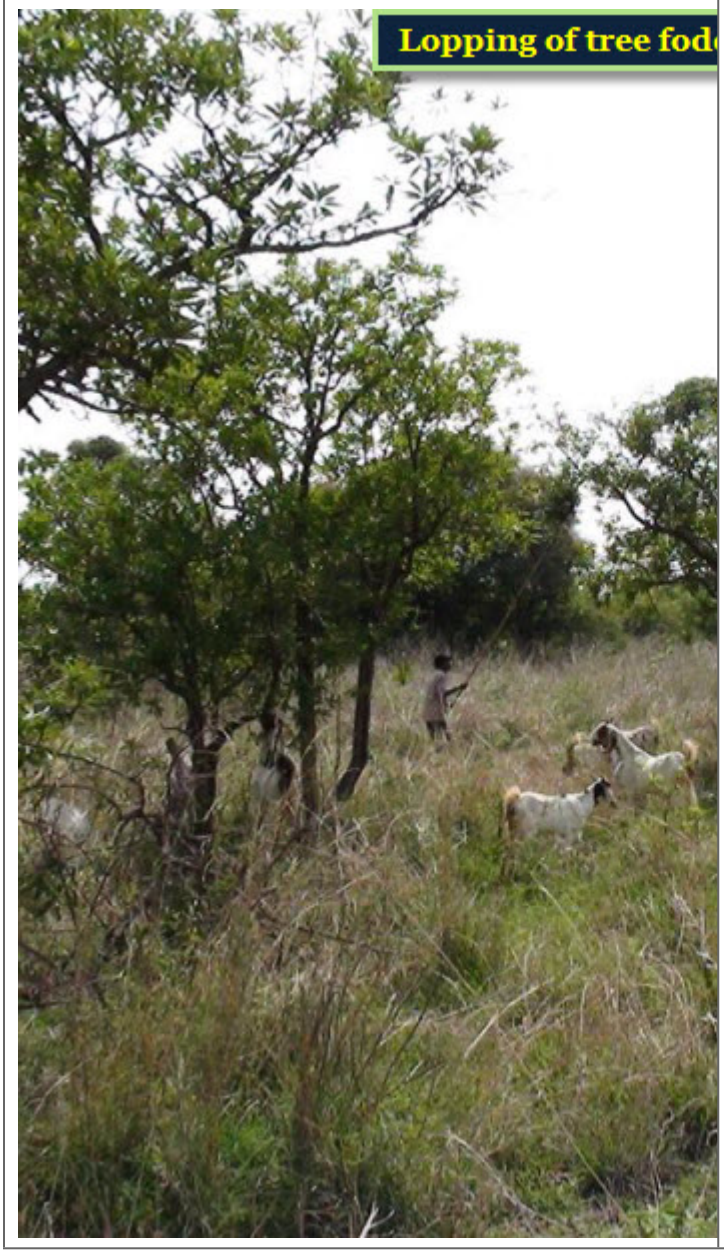
- The majority of the goats kept in villages are seldom given any grain or good fodder; as a result their average milk production is very low.
- Milch goats respond readily to good care and proper feeding, and to ensure best results they should be at tended like other milch animals.

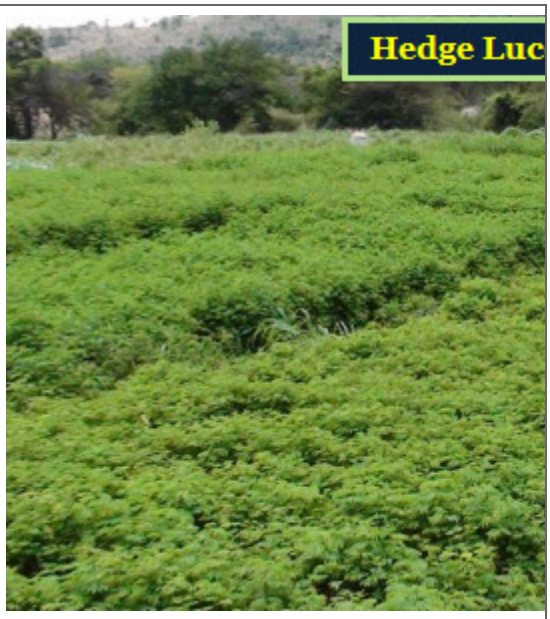
Feeding Habits

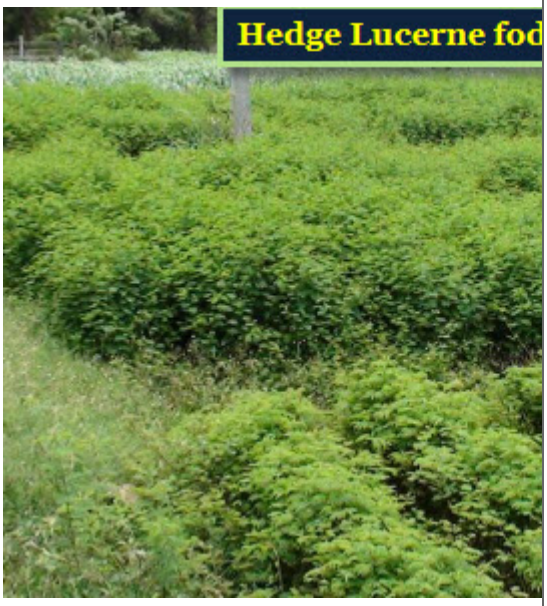
- Goats are sensitive animals with peculiar feeding habits. They are fastidious about cleanliness and like frequent change in the feed.
- Feeds given must be clean and fresh, since goats eat nothing that is dirty or foul smelling.

Grazing of goats

- They dislike wet, stale or trampled fodder. For this reason it is advisable to feed them in hay-racks or hang the feed in bundles from a peg in a wall or from a branch of a tree.
- Double-sided portable hay-racks are the most suitable and convenient for stall feeding.
- It is preferable to serve them small quantities at a time; when served in large quantities at a time, they waste a lot of it by trampling.
- Goats are ruminants. They are very fond of leguminous fodders. They do not relish fodders like sorghum (*sorghum vulgare pers*) and maize (*zea mays* L.), silage or straw.
- Goats do not relish hay prepared from forest grasses, even if cut in early stages, but very much relish hay prepared from leguminous crop.
- Some of the common green roughages liked by the goats are: Lucerne (*Medicago sativa L.*,), berseem (*Trifolium alexandrinum Juslen*.), Napier grass (*Pennisetum purpureum Schum*.), green arhar (*Cajanus cajan (L.) Millsp*.), cowpea (*Vigna sinesis (l.) savi ex Hassk*.), soybean (*Glycine max (L.) Merr*.), cabbage and cauliflower leaves, *shaftal*, *senji*, *methi*; shrubs and weeds of different kinds;
- Leaves of trees such as babul (*Acacia Arabian willd*), neem (*Azadirachta indica L*.) and pipal (*Ficus religiosa L*.). the common dry fodders liked by goats. straws of arhar, urid (*Phaseolus mungo Roxb*.), mung (*Phaseolus aureus Roxb*.), gram (*Cicer arietinum L*.), dry leaves of trees, and Lucerne of berseem hays.
- The last two are popular and constitute the main forage crops for milch goats.







- Nutrients required
  - The nutrients needed may be divided into maintenance, production (for milk, meat and hair production) and pregnancy requirements.
- Maintenance ration
  - The maintenance requirements are related to surface area and basal metabolic rate.
  - Goats have higher basal metabolic rate than cattle; therefore, their maintenance requirements are higher than those of cattle.
  - The requirement by weight is calculated and an additional feed of about 25 to 30 per cent for maintenance is allowed.

- The maintenance requirement thus calculated is 0.09 per cent digestible crude protein (DCP) and 0.09 per cent total digestible nutrients (TDN).
- It will be desirable to point out one interesting aspect. For its size the goat can consume substantially more feed than cattle or sheep, viz. 6.5 to 11 per cent of its body weight in dry matter when compared with 2.5 to 3 per cent for cattle or sheep.
- This means that the goat can satisfy its maintenance requirement and produce milk from forage alone.

- Production ration
  - Requirements for the production of 1 litre of milk with 3.0 per cent fat is 43 g of DCP and 200 g of starch equivalent (SE), whereas for the production of 1 litre of milk with 4.5 per cent fat it is 60 g of DCP and 285 g of SE.
  - The nutritional requirements of a goat weighing 50 kg and yielding 2 litres of milk with 4 per cent fat may be met by feeding 400 g of concentrate mixture and 5 kg of berseem or lucerne. The ration should have 12 to 15 per cent protein content, depending on the amount of protein in their hay and in the milk produced.
  - The following concentrate mixture may be used to feed the goat:
    - (i) 1 part of wheat bran, 2 parts of maize grain and 1 part of linseed-cake; or
    - (ii) 2 parts of maize grain, 1 part of barley, 2 parts of mustard-cake, and 2 parts of gram husk; or
    - (iii) 1 part of wheat bran, 2 parts of barley grain, and 1 part of groundnut-cake; or
    - (iv) 2 parts of gram grain and 1 part of wheat bran. These above mixtures should also contain 2 per cent each of mineral mixture and salt.
- Pregnancy ration
  - The foetal growth in the last two months of pregnancy is rapid and the metabolic rate of the goat rises rapidly.
  - During this period the content of ration should be increased to the level of production ration.
  - A week before she kids, the doe should be provided with more succulent type of food.
  - For three or four days after kidding, the level of diet should be lowered and made more fibrous.
  - This is necessary to minimize the shock to the goat's udder and the metabolism of the sudden flow of milk.
  - After this period the feeding should be done at a normal rate.
- Feeding of young stock
  - Performance of the adult stock depends on how they are reared when young.
  - Therefore, it is very important that utmost care is taken in feeding young stock.
  - Feeding schedule for kids should be such that a weekly growth rate of 0.6 kg is obtained.
  - The kid should be fed 56 to 112 g of colostrums, four to five times a day, depending on its birth weight, for three days.

Hay stack for goats

RATION SCHEDULE FOR YOUNG STOCK

BODY WEIGHT (kg)	MILK		CONCENTRATE MIXTURE* PER DAY (g)	GREEN FODDER: LUCERNE OR BERSEEM (kg)
	Morning (ml)	Evening (ml)		
2.5	200	200	-	-
3.0	250	250	-	-
3.5	300	300	-	-
4.0	300	300	-	-
5.0	300	300	50	Ad libitum.
6.0	350	350	100	Ad libitum.
7.0	350	350	150	Ad libitum.
8.0	300	300	200	Ad libitum.
9.0	250	240	250	Ad libitum.
10.0	150	150	350	Ad libitum.
15.0	100	100	350	Ad libitum.
20.0	-	-	350	Ad libitum.
25.0	-	-	350	1.5
30.0	-	-	350	2.0
40.0	-	-	350	2.5
50.0	-	-	350	4.0
60.0	-	-	350	5.0
70.0	-	-	350	5.5

- The composition of concentrate mixture (in parts) should be: gram, 20: maize, 22; groundnut-cake, 35; wheat bran, 20; mineral mixture, 2.5; and common salt, 0.5.

MINERAL MIXTURE

- Mineral should be given as an essential part of the ration as they contribute to the building of the skeleton, physiological functions and production of milk.
- The more important of these salts are calcium and phosphorus.
- The requirements of calcium and phosphorus for maintenance are 6.5 and 3.5 g, respectively, per 50 kg body weight.
- Goats require slightly larger quantities of calcium than sheep.
- The mineral mixture may be included in the concentrate ration at the rate of 0.2 per cent.

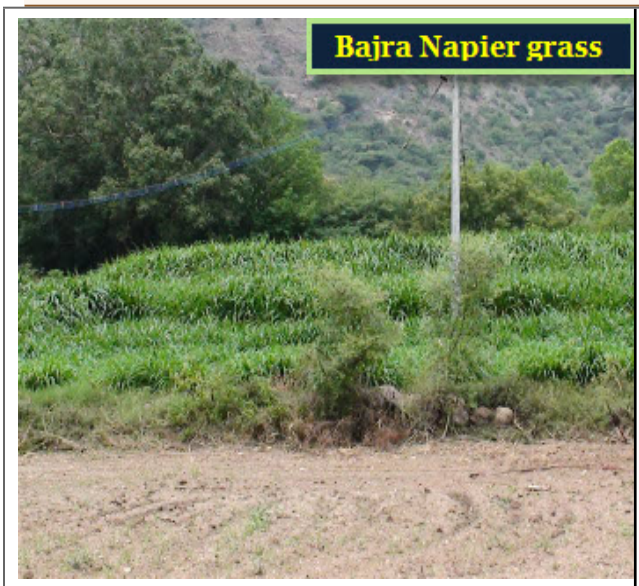
Common salt

- Lumps of rock salt, of fairly good size, should be hung up in some suitable place where goats can easily get at them, or else they may be kept in the manger.
- The provision of salt licks is very important for goats as they secrete a good amount of sodium and chloride ions in milk.
- The salt often helps to tone up the system and may even have some effect in removing worms from the body.
- Salt to the extent of 2 per cent may also be mixed with the daily grain ration of goats.

Vitamins and antibiotics

- Goats need particularly vitamins A, D and E. The microbes in the rumen synthesize most of the other needed vitamins.
- Vitamin A can be supplied by feeding green forage and yellow maize. One kilogram of lush-green fodder will provide 1500 IU of vitamin A.
- Vitamin D can be obtained from sunlight. Vitamin E is present in adequate amount in most of the normal rations.
- Synthetic vitamins A and D may be included in the ration of growing kids.
- Feeding of aureomycin or terramycin increases the growth rate of young kids, and also reduces the incidence of scours and other infectious diseases and improves the general appearance of the kids.

FODDER GRASSES



CHAFF CUTTER

- The chaff cutters are very useful in roughage feeding of animals. They are very much required to reduce the wastage, improve digestion and to make better use of even the stem of the grasses.

CHAFF CUTTER - MOVABLE TYPE

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CHAFF CUTTER - CLOSER VIEW

CHAFF CUTTER - FIXED MODEL

TETHERING OF GOAT IN A PASTURE LAND

- This animated picture depicts the tethering of a goat. This practice is common in pasture rich area.

MODULE-43: FEEDING MANAGEMENT OF SHEEP

Learning outcomes

- On completion of this module, the learner will be able to understand the nutritional requirements and feeding of sheep

FEEDING MANAGEMENT OF SHEEP

- Sheep have small muzzle and split upper lip helping them to nibble small blades of grass on pasture.
- In India, sheep and goats are raised almost entirely on roughages so the cost of production will be lower than that of poultry and pigs.
- At present, extensive grazing on marginal grasslands is widely practiced.
- The animals will graze on crop stubbles, weeds and grasses on fallow as well as rangelands.
- This will meet the requirements of the animals only partially.
- Their diet may be supplemented with cultivated fodders, grains and oil cakes, especially during the critical period of production cycle when the nutrient supply is inadequate.

Feeding the Breeding Ewe

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

- Feeding during breeding,
- Feeding during early and mid-pregnancy,
- Feeding during late pregnancy,
- Feeding at lambing time,
- Feeding lactating ewes and,
- Feeding ewes from the time lambs are weaned and until flushing time.

Flushing ewes

- About 2 to 3 weeks before the onset of the breeding season, nutrition of ewes should be stepped up to promote their body weight.
- This practice will bring ewes into heat earlier in the season thereby giving early lambs.
- It also has the effect of bringing the ewes into heat a more nearly the same time than otherwise, resulting in a more uniform lamb crop.
- Besides, flushing also increases the lambing rate and incidence of multiple births in the flock.
    - Different flushing rations are furnished below and any one method can be followed depending upon the availability of feed resources.
    - A good mixed pasture of legumes and grasses,
    - A grass pasture plus 150 g of wheat bran per head per day,
    - Grass pasture plus 250 g of grains and 450 g of oil cakes,
    - Legume hay full fed plus 100 g of wheat bran and 150 to 200 g of grain and
    - Green fodder at the rate of 10 per cent of body weight and 150-200 g of concentrate per head per day. This period is usually during the latter half of May in India.
- *Over-fat ewes*
    - Over-fattening will result in excessive fat deposition resulting in reduced fertility.
    - A good shepherd should watch for over-fattening at least one and a half to two months before the onset of breeding season.
    - The over-fat ewes may be gradually brought down to the desirable lean condition, by reducing the ration and exercising.
    - The farmer should constantly check and keep the ewes in condition for flushing (rather on the leaner side) by mild reduction in feed and providing exercise.

Feeding during breeding season

- The ration provided during flushing will continue during breeding season also.

Feeding during early and mid-pregnancy

- Good feeding during gestation is the keystone for a healthy strong lamb crop.
- If feeding is inadequate or defective, weak or dead lambs will result.
- A weak lamb at the start is a liability than an asset for the sheep enterprise.
- Moreover, the productive life of an ewe is extended if she receives good feeding during her gestation periods.
- Proper feeding of the ewes is advantageous in that it:
    - increase the number of strong healthy live lambs born,
    - prolongs the productive life of the ewes,
    - increases milk yield by the ewes resulting in healthier weanlings,
    - improves the wool productivity,
    - lessens the incidence of lambing paralysis, and
    - decreases the probability of ewes disowning their lambs as a result of exhaustion and weakness.
- The early and mid-pregnancy period is not very critical nutritionally.

- This does not mean that the ewes do not need properly balanced ration.
- It only means that extra nutritional requirements due to pregnancy are not much during early and mid-pregnancy and that the whole of their needs can be met entirely by grazing.
- Some ration recommended for exotic ewes during this period is as follows:
    - *Grazing:* On a good pasture.
    - *Sorghum silage:* One to two kg. Sorghum silage plus legume hay half to one kilogram per head per day.
    - Ad libitum supply of maize or sorghum fodder plus 50g of oil cakes like groundnut cake, per head per day.
    - Grazing on stubbles and harvested fields supplemented with 100 g of oil cakes per head per day (This period falls from 8 July to 15 September in India).

Feeding during late pregnancy

- The period from 16 September to 1 November is the most critical period nutritionally.
- During the first part of this period (16 September to 1 October) ewes may be allowed to graze on crop aftermaths (crop stubbles), wild grasses and weeds.
- Their ration must be supplemented with available green fodder fed at the rate of 5 kg per head per day.
- During the last one month of pregnancy (2 October to 1 November) the foetus grows rapidly in the uterus.
- Lack of enough energy in the feed can cause pregnancy toxaemia in ewes. Therefore
    - molasses or grains (barley, maize, oats, etc.) may be fed at the rate of 225 g per head per day.
    - Further, ewes should also receive available green fodder at the rate of 7 kg per head per day or
    - 600 g of quality legume hay or 300 g of concentrate with 12 to 14 % DCP and 65 to 70% TDN during last 45 days of pregnancy.

Feeding at lambing time

- As lambing time approaches or immediately after lambing, the grain allowance should be materially reduced but good quality dry roughage be fed free choice.
- After parturition the ration of the ewe may be gradually increased so that she receives the full ration in divided doses six to seven times in a day.
- In general, bulky and laxative feedstuffs may be included in the ration during the first few days.
- A mixture of wheat bran and barely or oats or maize at 1: 1 proportion is excellent. Soon after lambing, the ewe must be given just enough of slightly warm water.
- As soon as first lamb is born, formulate the creep feeders with lamb 'starter' ration.
- An ideal starter ration can be 16 parts groundnut cake and 84 parts barely or maize grain and available green or dry fodder.

Feeding lactating ewes

- Ration for ewes must be supplemented to maintain adequate milk production, which is necessary for rapid growth of lambs.
- If they are provided good pasture, the requirements are more or less met. When supplementary feeding is necessary, the amount of additional feed may be calculated as follows:
    - An average ewe's daily pasture requirements can be replaced by 50 per cent by 450 g of good hay, 1.4 kg silage or 250 g of grain.
    - If they are fed cultivated green fodder, 10 kg per head is sufficient or 400 g of concentrate mixture or 800 g of quality legume hay per day for 75 days after lambing in addition to 8 hours of grazing.

Feeding of ewes from the time lambs are weaned until flushing time

- This is the least critical period with respect to nutrient requirements.
- Ewes may be maintained entirely on pasture.
- Poor quality pastures and other roughages of low quality can be advantageously utilized during this period.
- *Feeding rams for breeding*
    - Rams in normal condition require some additional nutrients during the breeding season.
    - An over-fat ram on the other hand needs thinning before the commencement of the breeding season.
    - This may be gradually done by a combination of feed reduction and vigorous exercise.
    - The common practice is to allow the rams to graze with the ewes, which will allow the rams to get the same ration as the ewes.
    - If separate feeding is practiced for the ram, it may be given 300-500 g of concentrate mixture consisting of three parts oats or barely, one part maize and one part wheat per day.

LAMB FEEDING

Feeding suckling lambs

- This is the early part of a lamb's life in which it is dependent on its mother's milk to a considerable degree for its nutrition.
- This period ends when the lambs are weaned. It will be most economical to put the ewes and lambs on good pasture.
- Grazing on good pasture will sustain milk production of the ewes at a high level.
- Similarly, the lambs also will nibble at succulent green forage. But, the pastures available are often of poor quality and poorly managed.
- Under such circumstances, the rations of these lambs may be supplemented with grains and oil cakes in addition to their mother's milk and pastures.
- Depending on the economic situation and the availability of pasture, decision can be taken to raise or sell the lambs at the time of weaning.

Feeding early-weaned and orphan lambs

- Lambs are usually weaned at three months of age. Similarly, some lambs may be orphaned due to the death of ewe or due to disowning by the mother.
- Young suckling lambs on creep feeding, early-weaners and orphan lambs must be well fed. Up to six weeks age, grains should be cracked before feeding to lambs.
- After this, grains can be fed as such except in the case of hard grains, which may be cracked, crimped or rolled.
- These infant lambs should get good pasture or high quality legume hay preferably in the pelleted form in addition to the grains.
- If legume hay or good quality pasture is not available and if only poor roughage is fed their grain ration should be supplemented with a protein cum vitamin supplement with approximately 12 per cent digestible crude protein.
- Complete pelleted ration consisting of roughage and concentrate, both mixed and made into pellets has been found to be advantageous.
- Lambs had been found to consume more and grow faster.
- The pellets are self-fed and the nutrient intake is controlled by varying the composition of the pellets as the capacity of consuming bulk is more or less fixed.
- To start with, the pellets will have 65 to 70 per cent roughages but decreased gradually to 50 per cent by ten to twelve weeks age.

- A few recommended rations for the creep feeders and early weaners are
  - Maize 40 per cent, oats 30 per cent, barley 30 per cent plus lucerne hay fed *ad libitum*
  - Oats 20 per cent, maize 40 per cent, barley 20 per cent ground-nut cake 20 per cent plus vitamin supplementation
  - Maize 25 per cent, oats 40 per cent, wheat bran 20 per cent, groundnut cake 15 per cent plus vitamins supplements.

Feeding from weaning to market

- The types of feeds used and the methods of feeding will vary with economic and climatic conditions and the feeds available.
- In developing countries, the policy should be to utilize grazing lands, waste lands and aftermath of grain crops as far as possible and supplement whatever is deficient, with harvested good quality fodder, hay or concentrates.
- An average lamb may be fed 225 to 450g of concentrate mixture listed below depending on the grazing conditions.
- If there is plenty of grazing 225g is sufficient. In over-grazed grasslands they may be given 450g of the concentrate mixture plus half to two kilogram of good green fodder.

CONCENTRARE MIXTURES FOR SUPPLEMENTING LAMB GRAZING

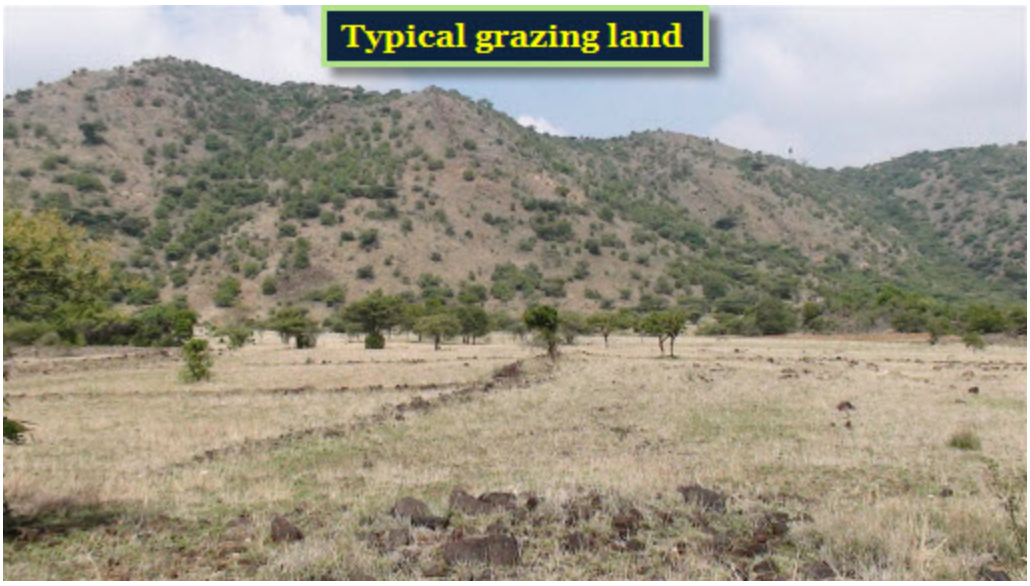
DURING SUMMER		DURING WINTER	
Groundnut cake	20 per cent	Groundnut cake	25 per cent
Wheat bran	35 per cent	Wheat bran	25 per cent
Crushed gram	10 per cent	-	
Oats/Barley	35 per cent	Oats/Barley/Jowar	50 per cent

RATE OF FEEDING CONCENTRATE PER DAY

BODY WEIGHT (kg)	WHEN LEGUME FODDER IS AVAILABLE (g)	WHEN LONG LEGUME FO IS AVAILABLE (g)
Up to 12	25 - 50	200 - 300
12-15	50	300
15-25	100	400
25-35	150	600

SHEEP GRAZING

- Grazing lands in India are over-grazed and generally in very poor condition.
- There is very little attention paid at present to develop the pastures.
- Improvement of pastures is of vital importance to the sheep farming business in India.
- All the uncultivated lands can be converted into community pastures with some effort.
- Boundaries of pasture should be fenced, land reclaimed, ploughed, irrigated and seeded with lucerne and grasses.



- Pasture should be divided into compartments for rotational grazing.
- It should be managed to support 10 to 12 ewes and their lambs, per acre.
- Farmers keeping animals on pasture should be charged fees on per head per day basis.
- The amount will be spent on management and upkeep of the pasture.
- It will be desirable to change the pasture for grazing periodically as sheep consume less due to the monotony of grazing if they have to graze on the pasture continuously.

MODULE-44: WOOL PRODUCTION

Learning outcomes

- At the completion of this module, the learner will be able to understand wool production trends and potential of sheep.

ANIMAL FIBRE

- Animal produce valuable wool fibres some as coat over the body while others as under coat. But all the animal fibres are not of same type.
- They possess inherent qualitative differences and are species specific.
- The important wool fibres of different species are given below:

SI. NO	FIBRES	SPECIES
1	Wool	Sheep, rabbit
2	Pashmina, cashmere down	Goat
3	Mohair	Angora goat
4	Kashgora	Angora x Feral doe (Mohair x Casmere)
5	Fur (pelt)	Karakul, Persian lamb

WOOL

- Wool is the thick, wavy and fibrous protective covering of the sheep.
- It mainly consists of insoluble protein called keratin, containing sulphur containing amino acid, cysteine.
- The wool fibre grows from the follicle situated in dermis (the middle layer of the skin).
- The quality of apparel wool is determined in terms of fibre fineness measured in microns and its uniformity (variation).
- The fineness is also expressed in terms of spinning counts, which is the number of hanks of 512 µ each in 0.45 kg of wool.
- Crimpiness has also been associated with fineness and finer wools are crimpier. Softness or handle has been used in grading of wool.
- Wool quality in terms of fineness and percentage and type of medullation fibres depends on the relative size, number and proportion of secondary to primary follicles.
- In breeds producing fine wool the ratio of secondary to primary follicles (S/P ratio) is as high as 20:1 as against 1:1 to 3:1 in carpet wool breeds.
- Staple length or average fibre length and its uniformity, crimpiness (number of crimps per cm) is also considered in evaluation of fine wools.
- The fleece quality is generally assessed for 2.5 cm x 2.5 cm samples taken from mid-side of animal. This sample is also used for determining the fleece density.
- The fleece in wild or less developed sheep breeds contains 3 types of fibres, viz. wool, hair and kemps. The true wool fibres are relatively fine and 15 to 50 µ in diameter.
- Kemp fibres are very coarse (100 to 200 µ), brittle, tapered, heavily medullated and short because of their limited growth. Hairy or heterotype fibres have a network of hollow, air-filled cell-walls (medulla). The medullated portion can be fragmented, interrupted or continuous.
- Medulla is commonly found in wools coarser than 30 µ. The carpet wools are evaluated in terms of average fibre diameter, staple length and percentage of medullated fibres, viz. kemp and heterotypes.

CHARACTERS OF WOOL

- Wool is an excellent insulator. It prevents body heat from escaping and cold from entering.
- It may also protect against heat in summer.
- Wool absorbs moisture. At 25% of its weight, it still feels dry.
- It may absorb 50 of its weight without saturation.
- Wool is light, yet strong and durable
- Wool is elastic and will stretch and return to shape.

- This resilence causes wool to resist wrinkling or sagging and causes it to be warm in winter and cool in summer
- Wool can be dyed easily and permanently in a wide spectrum of colours
- It is not easily burned

MODULE-45: GLOSSARIES OF TERMS IN WOOL INDUSTRY

Learning outcomes

- On completion of this module, the learner will be able to describe the different terms related to the wool.

CLASSIFICATION OF WOOL

- Wool for commercial purposes can be classified into 5 main types based on fineness and length of fibre.

Fine wool

- Mainly merinos and their derivatives produce fine wool.
- It is the finest apparel wool and accounts for almost 40% of the total world wool production.
- The fleece of Merinos is heavy with high grease content, giving scouring yield of 40-70%.
- Average fibre diameter is 18-24 and spinning count of 64^s to 80^s. Fibre length ranges from 2.5-12.5 cm.

Medium wool

- Average fibre length 5 to 12.5 cm, spinning count is 50^s to 62^s. Scouring yield 40 to 60%.
- Medium wool is used for knitted items, ladies wear, serge, fine tweeds over coatings, blankets etc.

Long wool

- Average fibre diameter is 29.4 to 36.5µ with a spinning count of 44^s to 50^s. Length varies from 15 to 22.5 cm.
- The long wool is lustrous and is used for the manufacture of plain cloth, tweeds, serges, over coats, blankets and felts.
- Scouring yield ranges from 65 to 80%.

Crossbred wool

- The crossbred wool is of medium type. It is 2.5 to 7.5 cm longer than the fine wool.
- Used mainly for knitting trade but also suitable for worsted fabrics and medium class of felts.

Carpet wool

- Carpet wool comprises mixture of long, hairy fibres forming outer coat and fine under coat of the wool.
- These two types of fibres make up the main part of carpet wool fleece. A third type of fibre, the kemp, also occurs in varying amounts.
- The average fineness of coarse, long hairy fibres ranges from 30 to 40µ, and the fibres of under coat is fine and measures from 10 to 24µ.
- The length of coarse fibre ranges from 10 to 25 cm and of fine fibres from 5 to 24 cm.
- The amount of kemp present varies from 1 to 20%. Carpet wool case loftiness and is resilient.
- These are mainly used for carpet, blanket and druggets.

- Good quality carpet wool is produced mainly in India, China, Pakistan, Iran, Argentina and the former USSR.
- Indian carpet wool are extensively used in making hand – knotted persian carpets.

WOOL TERMS

Wool	:	A cylindrical fibre structure of protein of animal origin which is non-inflammable and non-liable to melt.
Fleece	:	Fibre coat that covers a sheep
Fleece density	:	It is defined as number of fibres grown per unit area of skin (per square cm)
Lock	:	A group of fibres clinging together in fleece
Greasy wool	:	Shorn wool with grease and was etc. before removal of impurities
Clean wool	:	Woo free from all impurities expressed as percentage of total weight
Kemp	:	A coarser and brittle wool fibre, which is discontinuously growing fibre. The tips are tapering, chalky white in appearance and fully medullated.
Keratin	:	Wool protein basically known as keratin
Staple length	:	Length of on lock of wool without disturbing the natural waviness of the lock which is a measure of wool quality.
Staple crimp	:	The natural wave in a greasy lock
Crimp	:	Natural waviness of a fibre. Finer the wool more is the crimp. Very fine wool has 22-30 crimp/inch as per US grade.
Crimp frequency	:	Number of crimps per inch/cm, largely determined by genetic factor.
Scale	:	The cuticle of flattened cells protecting the cortex of the fibres
Run of the scale	:	In the direction of root ends of the scale of fibres
Fibre length	:	Mean length of individual fibre. The ratio of which with staple length is an indication of crimpiness of wool.
Suint	:	Secretion of sebaceous gland mostly of alkaline nature having potassium salts.
Wool yolk	:	Wax with suint- a water soluble material in raw wool referred to as yolk which increases in winter. It is more in finer wool
Wax	:	A product of sebaceous gland with small percentage of free acid alcohol C_{18} to C_{30} consisting of about 1 per cent wool wax. Alkalinity of suint helps emulsification of wool coating on fibre and thereby allows suint pigment penetrate into fibre.
Rise in wool	:	Seasonal increase in flow of wax
Hunger fineness	:	Wool of under nourished sheep as of nutritional scarcity producing lighter but finer fleece.
Keratinization	:	Hardening of previously soft plastic fibrous protein
Medullation	:	Condition of wool, the central core found in coarse and medium wool fibre which is characterized by hollowness in different magnitude. Under microscope it appears dark.
Scouring	:	Washing treatment of wool with detergent (sodium carbonate) for removal of impurities from raw wool to obtain clean wool yield and is thus an indication of quality of wool.
Carbonization	:	The process of chemical treatment of wool for removal of vegetable matter.

Shearing or clipping	:	Process of removal of fleece either by hand or with pair of scissors or by machine.
Sweating	:	The process of removal of wool by bacterial digestion of prekeratinous region of fibre root or by application of depilatory agent to the under surface of pelt.
Rooing	:	Plucking of fleece of indigenous sheep having double coat under going partial moult or loosening of the fibre.
Fellomongering	:	The process of removal of wool fibre from sheep skin through use of chemical application (sodium sulphide) or administration (10-14 mg of thallium) for artificial moult in sheep.
Felting	:	It is defined as ability of textile material to undergo irreversible increase in bulk density when subjected to friction and pressure under suitable physical condition.
Hank	:	It is a definite length of yarn or thread which is a measure of quality of wool in worsted system. It means number of hanks of 560 yards per 0.454 kg (1 pound) weight of clean wool.
Grading or classing	:	The process of sorting out by which wool is divided into various groups by visual appraisal to designate the quality of wool to assist the buyer and better return to sheep farmers.
Skirting	:	Removal of objectionable parts and stains from body of fleece after shearing.
Combing	:	Long wool (worsted) used in spinning processes.
Sliver	:	A strand of loose, untwisted fibre produced in carding.

MODULE-46: PHYSICAL AND CHEMICAL PROPERTIES OF WOOL IMPURITIES IN WOOL

Learning outcomes

On completion of this module, the learner will be able to

- understand the growth and development of wool
- know the physical and chemical properties of wool
- differentiate between different fibres

PHYSICAL/CHEMICAL QUALITIES OF WOOL

Physical qualities of wool

- Strength and elasticity
  - Wool is light, get strong and durable. Wool is highly elastic which property is in creased at higher temperatures.
  - This gives the resistance to the wool which enables them to retain their shape and resistance to creases.
  - Woolen blankets maintain their thickness, retaining entrapped air within the fibres to give them their excellent insulation properties.
- Effect of moisture
  - Wool absorbs moisture from the atmosphere and in the process liberates heat out.

    - A woolen garment varies normally from 16-35 percent moisture content without feeling wet and in its gradual absorption of water and liberation of heat helps to buffer the skin from market fluctuations in moisture and temperature both from surrounding atmosphere and from exertion and perspiration from within.
    - In contrast to its ability to absorb moisture from the atmosphere, wool is resistant to liquid water so that it has good water proofing qualities.
- Durability and shrinkage
    - Though wool fibres are not particularly strong under tension, they are very tough and resistant to breaking when repeatedly flexed.
    - Cotton is much less durable than wool. Another important property is felting property.
- Felting
    - Wool fibres when subjected to pressure combined with movement creating friction, form a denser matted mass that subsequently holds together as a fabric.
- Crimpness
    - A notable property of wool in its crimpness or waviness.
    - There is a close relationship between the frequency of crimps and the fineness of the staple.
- Grading of wool
    - Wool is graded according to the fineness of the fibre.
    - Finer fibres are capable of being spin in to fine yarn and thus more length of yarn can result.
    - The spinning count is expressed in the number of hacks of yarn that can be spin from 1lb of clean wool.

Chemical properties/ Composition of wool

- Chemically wool is approximately 50 carbon, 22 to 25 oxygen, 16 to 17 nitrogen, 7 hydrogen and 3 to 4 sulfur.
- Because composed almost totally of amino acids, wool is described as 100% protein and is classified as an insoluble, sulfur containing protein called keratin.
- Wool dissolves in acid and alkali solutions; caustic soda solution dissolves wool fibre. Wool becomes yellow if kept in warm humid places.

CHEMICAL STRUCTURE OF WOOL FIBRE

- Wool is chemically a protein called keratin along with other components like fat, sterol and lipids.
- Keratin molecules have long chains and are linked together side by side through chemical bond of cystine link.
- Keratin is the wool protein which has high proportion of sulphur containing amino acid.

GROWTH AND DEVELOPMENT OF WOOL

- Wool fibres and hairs grow in follicles in the skin, containing the "roots" which are down growths from the epidermis into the inner dermis. These follicles are of two types

Primary follicles

- Which produce hair and very coarse wool. The features of primary follicles are
    - An erector muscle which enables the hair to stand
    - A sebaceous gland which is responsible for the grease of the sheep's fleece giving it its lubricated glory property and
    - The sweat gland which gives the dried sweat or suint of the fleece.

- Suint from sweat gland and grease from the sebaceous gland together give the yellow "yolk" of the fleece.
- These primary follicles develop from 15 to 18th day of pregnancy

Secondary follicles

- These begin to develop from the 85th day of pregnancy up to birth of lambs.
- The secondary follicles give rise mainly to true wool fibres.
- Secondary follicles develop similar to that of primary follicles but there are many major differences.
- They are smaller in diameter than primaries.
- The sweat gland and arrector muscle are not present and the sebaceous gland is smaller.
- More over the secondary follicles are often branched.

Secondary/Primary (s/p) ratio

- The proportion of secondary and primary follicles determine the fineness of the fleece.
- In sheep breeds that are highly developed for wool production like Merinos the ratio in 15-25 secondaries per primary follicle where as it is only 2:1 for Indian coarse wooled breeds.
- Wool and hair fibres are made of very hard protein called keratin.
- Hairs are thick fibres and have a hollow center known as the medulla.
- Fine wool fibres are thin and do not have a medulla, but coarse wool fibres are usually medullated.
- The kemp in the coarsest of the fibres and originate in the primary follicles. They are chalky white in appearance and are very brittle.

Fibre diameter ranges and approximate quality counts of wool

WOOL TYPE	FIBRE DIAMETER (µm)	QUALITY COUNT
Fine	18-26	80's-56's
Blanket	28-36	52's-42's
Carpet	38 or more	40's to less

DIFFERENCE BETWEEN PRIMARY AND SECONDARY FOLLICLES

Sl.NO	PRIMARY FOLLICLE	SECONDARY FOLLICLE
1	Primary follicles are largest	Not so larger rather smaller
2	Are arranged in rows in skin often of three primaries each	Are more numerous and lie to one side of primaries.
3	Formed first in the foetus, and fibres found at the time of lamb born	Formed later, do not produce fibre until after birth.
4	Hair, coarse wool, kemp and heterotype grow only in primary	True wool fibre alone grow in the secondary
5	The number does not change after birth	Secondary follicles increase in number up to 4-6 months of age

PHYSICAL COMPONENTS OF WOOL FIBRE

- The physical components of wool fibre are
    - Cuticle or scale structure/epidermis of fibre
    - Cortex and
    - Medulla

Cuticle

- This is the outermost layer of the fibre and made up of black irregular horny cells/ scales on the surface.
- The cells overlap like tiles of the roof and pointing towards the tip of the fibre.
- Fine fibres have less number of scales, which are also regular in shape.
- Felting property depends on inter locking of scales. Scales are hard and resistant to chemical attack.

Cortex

- It is found below the protective cuticle. It constitutes the peripheral body of the wool.
- It is made up of long spindle shaped cells. The tensile strength and elasticity of any fibre depends upon the cortex of the fibre.
- When fibres are pigmented these cell retains the colour of the pigment. It is responsible for most of the chemical reaction in the fibre.
- It has crystalline and amorphous portions. There are two components viz. Ortho and para-cortex.
- The crimp in wool is due to the bilateral structure of the cortex. Cross section of fine wools are elliptical.
- Coarser wools generally have dog bone or ribbon type cross sections.

Medulla

- This is the innermost layer made up of many super imposed cells of various shape of ten polygonal forming a honeycomb like structure.
- Various pores and channels pass through the medulla, which are normally filled with air.
- The presence of medulla in the fibre is detrimental to the quality from the standpoint of the manufacturer.
- The spinning quality of the medullated fibre is very low. Medullated fibre has a chalky white appearance.
- Under the microscope, medulla appears black. Medullated fibres are light and thus have high volume for same weight.
- They are not uniformly dyed. Carpet wools perform better when there are medullated fibres up to 25% but higher proportions are not desirable.

DIFFERENT TYPES OF FIBRES

Hair

- It has well pronounced medulla, with less of cortex and have perfectly smooth surface without any serrations.
- The medulla may have pigments appears as a dark cellular structure with varying degree of colour depending upon the nature of pigmentation.
- The dark appearance is due to the presence of air in the middle. The cortex appears as striated, translucent structure at the edge of the medulla.
- The cuticle appears as a smooth line on the outer surface.

Wool

- Medulla may be present or absent, cortex extends up to the centre and appears as a translucent structure when medulla is absent, and the cuticle is very irregular in outline.
- It gives under microscope a saw like serrated appearance at the edges.

Cotton

- These are vegetable fibres, which appear under microscope as a irregularly twisted fibres.
- Medulla is absent. Cuticle is smooth. They usually appear in-group or in bundles.

Silk

- These fibres appear as smooth, structureless translucent filaments with occasional constriction and swelling.
- Every fibre is a double fibre. Cortex and cuticle are not well defined.
- The absence of different structure of silk/wool must always be recognized to confirm it.

Kemp

- These are fibres, which have been shed from the skin and called as dead fibres.
- They have chalky white appearance without luster.
- They are larger in diameter than the surrounding fibre and have no strength.
- They have opaque highly medullated, shed periodically, which is a serious defect of the animal.
- The presence of kemp fibre in a wool sample decreases the value of the wool.
- This is a negative point for a ram or ewes for selection of breeding stock.
- Under the microscope the tapering tip of the fibre can be clearly seen, the medulla also taper towards the tip.

Heterotype

- This is a fibre showing the characters of both fibre wool and also the hair.
- That is in a single fibre a portion may be medullated and coarse where as the remaining portion may have no medulla and of fine quality.

DIFFERENCES BETWEEN WOOL AND HAIR AND ALLIED FIBRES

The main differences are:

- Wool fibres are usually much smaller in diameter, the epidermal cells of hair are fastened to the cortex throughout their length; hair is always medullated; hair is never crimped like fibre wool, although some is wavy like the coarser wools.
- Both hair and wool may have pigment within the cortex but most wool is free of pigment.
- Wool fibres grow much denser on the skin than hair grows.
- In very dense fleeced fine wool sheep, there may be more than 50,000 fibres per square inch of skin area.
- In the coarser loose-fleeced sheep, the number may not exceed 5,000 per square inch.

MODULE-47: FACTORS INFLUENCING THE QUALITY OF WOOL, WOOL GRADING, RECOVERY OF WOOL WAX AND ITS USE

Learning outcomes

At the completion of this module, the learner will be able to

- know the factors influencing the quality of wool
- understand wool grading and recovery of wool wax and its use

FACTORS AFFECTING QUALITY OF WOOL

- Wool fibres grow from small structures in the skin called follicles. The follicles are epidermal in origin.
- There are tow types of follicles called primary follicles and secondary follicles.
- Each follicle is a microscopic sac or indentation of epidermis which stand to depth of 1 to 2 mm.
- The basic distinguishing feature in the growth and function are:
    - Sheep - primary follicle produce three types of fibres wool, hair and kemp and secondary follicles produce wool.
    - Goat - Primary follicle produces hair and kemp and secondary follicles produce mohair in angora goat and pashmina in Cashmere goat.

Factors affecting quality of wool

- Character: This refers to the appearance of the grease wool with regard to brightness, lusture, white or creamy colour and the crimp pattern. In general character denotes the characteristic that contributes to the attractiveness of a fleece.
- Purity: This refers to absence of undesirable fibres like kemp, hair, dark coloured fibres etc in the wool.
- Soundness: A sound fibre is one that has no weak spots in it tender spots caused by inadequate nutrition or sickness cause the fibres grown during that period to be small and weak. This is referred to as break in fleece.
- Cleanliness: The amount of foreign material in wool like, manure, dust, dirt, plant matter etc. affect the quality of wool
- Shrinkage: Refers to the loss of weight of wool after removal of yolk, dirt, water, vegetable, animal and mineral matter when the wool is scoured
- Grease content: Though grease protects the scales on the wool fibre and prevents the fleece from becoming matted excessive grease detracts the value of fleece as it increases shrinkage
- Uniformity: though fleeces are not uniform in length and fineness it is desirable for the fleece to be as uniform in fineness and length of fibre as possible
- Colour: From the manufacturing point of, view any colour other than white is undesirable only white can be dyed to any colour as per the market demands. A common defect is, canary bellow, a bright yellow stain occurs in white wool due to moisture and heat or light.

GRADING OF WOOL

- Wool may be classified into type and quality.
- Quality is based on fineness of fibre which is given quality number ranging from 28’s for course fibre to 80’s for the finest wool.
- The normal range of fineness used in the industry is 18 to 40 microns.
- Internationally two systems of wool grading is practiced
    - British system
    - Blood system (American system)

British system or count system

- The English use the count system for wool grading.
- Wool is graded on the basis of diameter of yarn to which it can be spun.
- A clean one pound wool (0.454 kg) of 80’s can be spun 80 hanks of wool yarn. One hank is equal to 560 yards.

Blood system

- It takes into account the proportion of imported merino blood in crosses with original British colonial sheep as its basis for classification.
- Thus American wool has 7 grades
    - Fine (pure merino - 64's and above
    - ½ merino - 58-60's
    - 3/8 merino - 56's
    - ¼ merino - 48-56's
    - Low ¼ - 46's
    - Common British breed - 36's

Grading of Indian wool

- There is no uniformity in grading system has been followed in our country.
- Wool is graded based on colour, vegetable content and fineness.
- Wool grading system recommended by ISI is also followed.

Pashmina

- Pashmina or cashmere is obtained from Chegu and Changthangi breed of goats in the cold arid region.
- Pashmina is a fine under coat fibre. Indian pashmina goat produce the finest fibre among all other known fibre producing breeds of animals.
- It possesses the maximum warmth property.
- It is soft, silky feel and feathery lightness. The fibres are generally soft and non medullated.
- Its fineness is equivalent to wool count of 70's-80's and some fine fibres have 110's quality.
- The average length of fibres ranged between 3-12 cm and 13-18 micron in diameter.
- Because of its fineness the are less durable than woolen fabrics.
    - Pashmina grows as under coat as protecting mechanism of Chegu and Chagthangi goat in cold arid region of high altitude areas of Ladakh(JK), Lahaul and Spiti region (HP).
    - It grow in winter and is obtained by combing. The fibres can also be collected by gathering when they are shed with rise in ambient temperate.
    - True pashmina fibres do not have cut end and have cylindrical scales.
    - Male goats produce more pashmina than female because of difference in body size.
    - Pashmina is used to produce finest fabrics which fetches good price in the international market.
    - The Kashmir ring shawls is one of the product obtained from pashmina.

Mohair

- Angora goat produces mohair fibre.
- They are similar to wool in chemical composition.
- The scales are very smooth and thin.
- The fibres are strong and elastic and lustrous.
- The fibre locks normally grow like ringlets and crimps are generally absent.
- It is very strong and durable when compared to pashmina.

PROCESSES

Oiling

- The wool is lubricated with oil emulsion to minimize the breakage of fibre during carding, reduce the fly waste and static electricity in carding and increase cohesion of the fibres in loose silver, thus facilitating drafting and spinning.
- Mostly non-ionic mineral emulsified oils are used in the strength of 3-5 per cent of wool weight.

Carding and spinning

- *Woollen carding*
  - Woollen carding is done to further open the wool, straighten the individual fibre and remove natural impurities and delivering it in a convenient form for spinning.
  - Carding is the next process after drying. This is done by passing the wool between the cylinders which have fine wire teeth and which revolve at different rates.
  - The wool comes from the cards in a fluty rope like roll in which fibres lie in all directions.
  - Woolen carding is done to further open the wool, disentangle locks, straighten the individual fibres, remove natural impurities, further mix the stock and deliver it in a convenient from for transfer to spinning frame.
  - These objects are accomplished by 2-3 or 4- card system. The woolen yarn is spun either on mule or ring spinning frame.
- *Worsted carding and spinning*
  - Properly lubricated wool is subjected to worsted carding where wool fibres are placed parallel to each other and the impurities removed.
  - These fibres are arranged into a continuous sliver of definite weight and thickness.
    The carded slivers are gilled on an autoleveller to improve the parallelization of the fibres ready for combing to produce a homogenous mixture of fibres and to deliver the sliver of uniform weight distribution.
  - Wool combing of a previously gilled sliver is done to remove the short fibres to attain parallelization of the fibres and removal of vegetable matter, slubs and neps.
  - The combed material is usually termed as top. After combing, top finishing processes are employed to obtain sliver regularity, desired sliver weight, retain the parallel state of fibres and wrap the sliver so that is forms a suitable package.
  - At spinning units the top is autolevelled and drawn and wound on to suitable package cap or ring spinning into worsted yarns.
  - Worsted yarns are known for their regularity, uniformity and strength and are used for suiting, shirting, serge, knitwear and knitting yarns single or in twisted ply.
- *Weaving*
  - Weaving of yarn involves a series of preliminary process, which includes cone winding, pin winding etc.
  - Weaving of yarn involves a serious of preliminary processes, which include cone winding wrap preparation, warp sizing, winding of welt yarns, tying in and drying in of warp.
  - Various types of looms are used. All the looms have 3 common basic motions, which are let off and taken up.
  - All these motions play a vital and basic role in fabric weaving.

Dyeing and finishing

- It forms the final process in the preparation of wool ready to market.

PROCESSING OF WOOL

Tagging

- Tagging is a practice that improves the appearance of wool clip.
- It consists of removing the tags and dung locks especially in the sample obtained from hindquarters of the animal.

- The removal of fibres between the hind legs of the animal before lambing is helpful for the newborn lamb when it first attempts to suckle.

Skirting

- This is done after shearing. It is removing the objectionable parts such as tags, leg pieces, face, neckpieces, bellies, locks and stained portions from the body of the fleece.
- In addition any applied colour or pigmented wool should be taken out and kept separately.
- Similarly heavy burry wool found below the jaw should be picked.
- This will help the breeder in realizing a better price for his wool.
- After skirting, the actual grading of the wool is done by a trained person (classer) only the wool is graded.

Wool grading or Wool classing

- It is done on visual appraisal of length, fineness (handle or feel). No two fleeces of wool are alike.
- Further, no single sheep will grow wool of the same quality through out the period. The quality differs in many respects.
- The value determinants are fineness or diameter, staple length, strength, elasticity, crimp, pliability, colour, lustre, felting property, spinning and working properties.
- Wool staples vary in length from about 2cm up to 34cm. They are divided broadly into two main groups as
    - Combing wool
    - Carding wool (Clothing wool)
- In the process of grading they are further divided into following subgroups namely, body combing, strict combing, French combing, fine staple and stubby.

Sorting

- Raw wool brought to the factory is sorted first as per the requirement.
- This is an advanced step requiring more skill and is different from classing or grading.
- In classing or grading fleece, as a whole is a unit, where as in sorting, fleece is opened up in different sub locks for more specific usage.

Opening and dusting

- Raw wool contains natural impurities such as oils and fats secreted by sebaceous glands and water-soluble salts from dried excretion from the skin known as suint.
- The acquired impurities include sand, dirt, burrs and other forms of vegetable matter.
- The applied impurities consist of tar, pitch and paint used in small quantities for animal identification purposes or chemicals used for treatment.
- The machinery employed for scouring opens up the clumps of fibers into individual staples and at the same time delivers a uniform quantity of opened stock to the scouring train.
- This facilitates the proper penetration of the scouring liquor into the wool fibre, rendering the scouring more uniform and throughout.
- It also reduces cost by saving on soap alkali scouring liquor.

Scouring

- It is washing the wool in warm water and in detergent solutions.
- This is an important operation in the removal of impurities in raw wool.
- It is accomplished by aqueous scouring process or by solvent-degreasing process.
- It is accomplished in a serious of vats or bowl (3-6) through which the wool is propelled by mechanical rakes with intervening squeezers.
- The scoured stock is dried through specially constructed dryers. For Indian carpet type wools, 3 bowls are sufficient.

Burr picking and carbonizing

- Wool contains a large or small amount of burr. If the burrs are not removed they cause considerable difficulty in the manufacturing process and may damage card clothing and combs.
  Burrs are removed by mechanical means such as burr crusher or manually by hand scissoring of the heavy burry parts of the fleece.
- The chemical removal of burr is known as carbonization.
- It is done using acids such as sulphuric or hydrochloric and/or by salts as aluminum chloride which produces acids when heated.
- The acid reduces the vegetable matter to hydrocellulose, which on heating is converted to charcoal carbon.
- The carbon is removed by subsequent mechanical action during crushing, beating and neutralizing.

MODULE-48: JUDGING FOR THE QUALITY AND CONFORMATION OF BODY PARTS OF CATTLE, BUFFALO, SHEEP AND GOAT

Learning outcomes

On completion of this module, the learner will be able to

- know the conformation of body parts of cattle, buffalo, sheep and goat
- understanding judging of animals by using score card

SCORE CARD METHOD

I. Weight

- Score according to age - 6 months - 6 points

II. Form: 53 points

- Head and neck: 7 points
  - Head: Face short, month and nostrils large: larger clear eyes: broad fore head: alert ears: wide between ears 5 points
  - Neck: short, thick, full at junction with shoulder 2 points
- Fore quarters: 9 points
  - Shoulder: smoothly covered with flesh; compact on top: even with the body: 6 points
  - Breast: Full in outline and well-extended 2 points
  - Legs: straight, short, wide apart strong, fore arm full 1 points
- Body: 22 points
  - Chest: wide, deep, heat girth full 2 points
  - Ribs: well sprung, long close thickly covered 4 points
  - Back: broad, straight, thickly and evenly covered 8 points
  - Loin: thick, broad, well covered 8 points
- Hind quarters: 15 points
  - Hips: Neat: smoothly covered
  - Rump: long, level wide to dock; well covered 4 points
  - Thighs: Deep, wide, full 5 points
  - Twist: Deep, plump 4 points
  - Legs: straight, short, strong set well apart; pasterns straight 1 points

III. Finish

- Deep; even; firm covering over loin, back ribs and shoulders: points indicating finished condition, thick dock, thick neck and full shoulder, plump breast 18 points

IV. Quality

- Head and ear medium size; bone five 5 points

V. Fleece

- Not considered in mutton sheep

VI. Dressing percentage

- High finish not paunchy 8 points points

VII. General appearance

- Straight top and underline; 10 points deep broad, uniform in width, lowest, compact, symmetrical finish

Total 100 points

JUDGING OF SHEEP AND GOAT FOR BREEDING

- Eye appraisal is the easy and effective way to evaluate such characteristics as breed type and characters, sex characters, structural sound ness and evidence of disease and parasitic infections.
- It is best to examine the animals systematically.
- The vital point in judging include
    - Condition of the animal
    - size of the animal
    - feet of the animal
    - legs of the animal
- The procedure for inspecting and handling the animals are
    - First look at the animal from a distance of at least 15 feet.
    - Observe front, rear sides with regard to the size, length, depth and study the breed and sex characters.
    - Inspect the sheep from the front, look for the width over the shoulders
    - Examine the sheep from rear, look down the width of back, loin and rump and straightness of the legs and toes.
    - Handle the animal firmly to get the proper feel or touch.
    - Keep the hand nearly flat and use only enough pressure to accurately indicate the amount of fleshing
    - While handling the sheep start from the rear to front side of the sheep and goat and examine the various parts.
    - Feel the size of the leg and inspect the testicles in males and teats and udder in females.
    - In breeding animals examine the horn pits and scars in polled breeds.
    - Finally a last inspection from a distance and reach a decision about judging of animals.
- Score for each category
    - General appearance - 25
    - Fore quarters - 34
    - Hind quarters - 38
    - Breed and sex character - 3
- Total -100

CRITERIA FOR GOOD BREEDING ANIMALS

General appearance

- The animals should have straight and strong top line and muscular through out the body.
- Animals should have long body with straight underline.
- Skin should be fine textured, loose and pliable. Weight should be according to the age

Fore quarters

- *Head:* Medium in length, broad muzzle, large open nostrils, large bright eyes, broad foreheads, alert and fine ears and wide apart
- *Neck:* Thick, medium length and blend smoothly in to shoulders
- *Breast:* Wide and trim
- *Chest:* Wide
- *Ribs:* Well sprung, wide apart, long, covered with minimum amount of firm flesh, flat and long
- *Back:* Muscular, straight and uniformly covered

Hind quarters

- *Loin:* Thick, strong muscular and uniformly covered
- *Hip:* Far apart, neatly laid in and smooth
- *Rump:* Long and thick ,wide and muscular
- *Thighs:* Deep thick and wide and muscular
- *Pin bones:* Wide apart, lower than the hips, well defined
- *Udder:* Strongly attached to the belly, halves evenly balanced and symmetrical. The texture should be soft, pliable and elastic with uniform sized teats with cylindrical in shape and free from obstruction
- *Flank:* Deep and firm
- *Legs:* Straight, strong, medium in length placed squarely and wide apart
- *Feet:* Shorter and straight with deep heel and level sole.

Breed and sex character

- The breed characters are appropriate to the breed
    - *Male:* Attractive, individuality revealing vigor ,masculinity, impressive style and majestic carriage with graceful and powerful walk
    - *Female:* Feminity with impressive style and attractive carriage and graceful walk

DEFINITION AND SCORE CARD

- Judging is the process of comparing individuals with ideal dairy characters by giving scores and grading or ranking them from excellent to poor.
- This score card was developed by the Purebred Dairy Cattle Association (PDCA) to describe the general traits or the character of a good dairy cow.

Official score card - Grade Score

- Excellent 90 – 100
- Very Good 85 – 89
- Good Plus 80 – 84
- Good 75 – 79

- Fair 70 – 74
- Poor less than 70

STEPS IN JUDGING

- First, view the individual or a group of animals from a distance of 20 to30 feet (6 to 9m); look at the side, front and rear of the animal.
- The animal should stand on level or with the front feet slightly higher than the rear.
- Examination from front and side view
    - From the side view
        - Look at the top line, rump, barrel, heart girth, shoulders, udders and teats, flanks, legs and neck.
    - From the front view
        - Look at the barrel, loin, hips, pin-bone, tail head, udder and hind legs.
- Make written notes on each animal as they are viewed on the first inspection, First impression is usually more accurate and should be carefully noted.
- Compare such animal with ideal characters described in the dairy cow unified score card.
- The class of the animal being judged is usually walked slowly around the judge in clockwise direction.
- Look at the style, carriage, straightness of legs and topline, udder attachment while they are walking.
- After observing the animal from a distance move in for a closer inspection.
- Observe the shape of withers, texture of udder and development of mammary veins in this close inspection.
- When a pair is close, make the decision on the mammary system.
- If the mammary system is also equal in the pair, use dairy character to determine the placing.
- If this also in close, the cow which is in milking should be placed higher in rank compared to that of a dry cow.

RELATIONSHIP BETWEEN SCORE CARD AND MILK PRODUCING ABILITY

Frame - 15

- Frame is skeletal parts excluding feet and legs.
- Broad muzzle and strong jaws indicates better feed consuming ability especially roughage.
- Strong shoulder improves the ability to move around and set up and down in stanchion and stalls.
- Straight topline indicates general strength and conformation; weak topline leads to quicker ageing (proper development of digestive, reproductive and mammary system is related to strong topline)
- Width of pelvic region which will affects the ease of calving, width and length of rump affects support and placement of udder.

Dairy character - 20

- Excellent dairy character – converting feed with maximum efficiency.
- Poor dairy character - Usually coarse and too fat (over condition) .Skin should be thin, loose and pliable.

Body capacity - 10

- [Volumetric measurement of capacity of the cow (length x depth x width) evaluated with age]
- Good body capacity helps in more feed and roughage consumption results in high milk yield.

Feet and Legs - 15 (It is evidence of mobility)

- Proper placement of legs indicates ability to move with ease.

- Width in front legs provides room for a wider chest, width in rear legs provide room for a larger udder.
- Too much sickle hock weakens the legs as age advances. Too straight legs cause much stress on the hock.

Udder - 40

- It should be soft, pliable and elastic. If firm and large even after milking probably full of fibrous or scar tissue (meaty) .
- Teat should be 1.5 – 2.5 inches long, when the udder is full they should hang the structure down.
- Size of mammary vein indicates the amount of blood circulating to the udder.

DISCRIMINATIONS AND DISQUALIFICATIONS

- Horns: No discrimination for horns
- Eyes
  - Blindness in one eye – slight discrimination
  - Cross or bulging eyes – slight discrimination
  - Evidence of blindness – slight to serious discrimination.
  - Total blindness – disqualification
  - Cropped ear – slight discrimination
- Wry face – slight to serious discrimination
- Parrot jaw – slight to serious discrimination
- Shoulders – winged - slight to serious discrimination
- Tail setting
  - Wry tail or other abnormal tail setting - Slight to serious discrimination.
- Capped hip: No discrimination unless effects mobility
- Legs and Feet
  - Lameness apparently permanent and interfering with normal function - disqualified.
  - Lameness occurring apparently temporarily not affecting normal function - slight discrimination.
  - Evidence of campy hind legs - Serious discrimination
  - Evidence of fluids in hocks - Slight discrimination
  - Weak pastern - Slight to serious discrimination
- Udder
  - Lack of defined udder - slight to serious discrimination
  - Poor attachment - serious discrimination
  - Blind quarter - disqualification.
  - Uneven teats - slight discrimination
  - Obstruction in teat - slight to serious discrimination
  - Side leak - slight discrimination
  - Abnormal milk - possible discrimination
  - Temporary and minor injuries- slight to serious discrimination
- Free martin heifers - disqualification.

MODULE-49: SELECTION AND CULLING OF ANIMALS

Learning outcomes

- At the completion of this module, the learner will be able to explain about the following important requirements for a financially successful farming enterprise
  - selection of animals for milk
  - selection of animals for meat
  - selection of animals for work
  - culling of livestock

SELECTION OF ANIMALS FOR MILK

(Source: BAIF Development Research Foundation, Pune)

- Proper selection is the first and the most important step to be adopted in dairying. Records are the basis of selection and hence proper identification of animals and record keeping is essential.
- Cross-breed animals with exotic inheritance of about 50 percent are preferable. This preference is based on comparison of the performance of the animals with different percentage of exotic inheritance.
- Fifty percent of the native germplasm is helpful to retain the adaptability, heat tolerance and disease resistance traits of local animals, in cross breeds.
- The utilization of the Zebu (Sahiwal) germplasm in the formation of breeds like Australian Friesian Sahiwal (50% of Holstein and 50% Sahiwal) and its international recognition as a breed for the tropics is an example.
- Maintaining animals sustainable to the situation is the best policy. Bringing animals from different agro-climatic conditions causes problems due to non-adjustment in many cases.
- In case, purchase becomes absolutely essential it should be from similar environmental conditions as far as possible.
- General selection procedures for dairy breeds

Selection of dairy cows

- Selecting a calf in calf show, a cow in cattle show by judging is an art.
- A dairy farmer should build up his own herd by breeding his own herd. Following guidelines will be useful for selection of a diary cow.
- whenever an animal is purchased from a cattle fair, it should be selected based upon its breed characters and milk producing ability
- History sheet or pedigree sheet which are generally maintained in organized farms reveals the complete history of animal
- The maximum yields by dairy cows are noticed during the first five lactations. So generally selection should be carried out during First or Second lactation and that too are month after calving.
- There successive complete milking has to be done and an average of it will give a fair idea regarding production by a particular animal.
- A cow should allow anybody to milk, and should be docile.
- It is better to purchase the animals during the months of October and November.
- Maximum yield is noticed till 90 days after calving.

Breed characteristics of high yielding dairy cows

- Attractive individuality with feminity, vigour, harmonious blending of all parts, impressive style and carriage
- Animal should have wedge shaped appearance of the body
- It should have bright eyes with lean neck
- The udder should be well attached to the abdomen
- The skin of the udder should have a good network of blood vessels
- All four quarters of the udder should be well demarcated with well placed teats.

Selecting breeds for Commercial Dairy Farm - Suggestions

- Under Indian condition a commercial dairy farm should consist of minimum 20 animals (10 cows, 10 buffaloes) this strength can easily go up to 100 animals in proportion of 50:50 or 40:60.
- After this however, you need to review your strength and market potential before you chose to go for expansion.

- Middle class health-conscious Indian families prefer low fat milk for consumption as liquid milk. It is always better to go for a commercial farm of mixed type. (Cross breed, cows and buffaloes kept in separate rows under one shed).
- Conduct a through study of the immediate market where you are planning to market your milk You can mix milk from both type of animals and sold as per need of the market. Hotels and some general customers (can be around 30%) prefer pure buffalo milk. Hospitals, sanitariums prefer cow's milk.

Selection of cow breeds for commercial farm:

- Good quality cows are available in the market and it cost around Rs.1200 to Rs.1500 per liter of milk production per day. (E.g. Cost of a cow producing 10 liter of Milk per day will be between Rs.12, 000 to Rs.15, 000).
- If proper care is given, cows breed regularly giving one calf every 13-14 month interval.
- They are more docile and can be handled easily. Good milk yielding cross breeds (Holstein and Jersey crosses) has well adapted to Indian climate.
- The fat percentage of cow's milk varies from 3-5.5% and is lower then Buffaloes.

(Source: BAIF Development Research Foundation, Pune)

CHARACTERS OF GOOD MEAT ANIMAL

I. Weight

- Score according to age - 6 months - 6 points

II. Form: 53 points

- Head and neck: 7 points
  - Head: Face short, month and nostrils large: larger clear eyes: broad fore head: alert ears: wide between ears 5 points
  - Neck: short, thick, full at junction with shoulder 2 points
- Fore quarters: 9 points
  - Shoulder: smoothly covered with flesh; compact on top: even with the body: 6 points
  - Breast: Full in outline and well-extended 2 points
  - Legs: straight, short, wide apart strong, fore arm full 1 points
- Body: 22 points
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- Hind quarters: 15 points
  - Hips: Neat: smoothly covered
  - Rump: long, level wide to dock; well covered 4 points
  - Thighs: Deep, wide, full 5 points
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III. Finish

- Deep; even; firm covering over loin, back ribs and shoulders: points indicating finished condition, thick dock, thick neck and full shoulder, plump breast 18 points

IV. Quality

- Head and ear medium size; bone five 5 points

V. Fleece

- Not considered in mutton sheep

VI. Dressing percentage

- High finish not paunchy 8 points points

VII. General appearance

- Straight top and underline; 10 points deep broad, uniform in width, lowest, compact, symmetrical finish

Total 100 points

SELECTION OF ANIMALS FOR WORK

- Charaters of good work animal

TYPES OF CULLING

I. Policy culling

- The following categories of animals are to be culled
    - not true to type or breed
    - Parentage not known (if pedigree is required)
    - Genetic defects
    - Poor production/reproduction
    - Surplus stock: males and females not selected for breeding and those that are cast off after breeding use
    - Age
        - cattle 12 years or calved more than 5 times
        - sheep and goat: six years and gummer and broken mouths
        - swine rabbit : above 2 years
        - work cattle: too old and unfit for work
    - animals with vice
    - poor body weight and growth rate

II. Veterinary culling

- The following categories of animals are to be culled under veterinary culling. All veterinary culling propose should be supported by detailed case sheet
    - Animals with disorders refractory to treatment
    - Animals incapacitated or become unsuitable for normal production life
    - Weak and debilitated (animal losing weight and having static weight during growing phase or losing 25 per cent or more weight during adulthood will be recommend for culling under this category)

- Suspected/confirmed cases of animals ailing from contagious/infectious/ zoonotic diseases. In such cases, the disposal of the animals will be as per the rules ad regulations prescribed by the animal disease acts.

III. Emergency culling

- The farm/station heads are empowered for emergency culling in anticipation of approval by the competent authorities in following cases.
  - Animal involved in accidents, predatory attacks etc., whose prognosis is grave
  - Animal suffering from non specific diseases whose prognosis is grave
  - Confirmed cases of tuberculosis, johne's disease and brucellosis may be destroyed by the farm manager.

CULLING OF SHEEP AND GOATS

Definition

- Culling is a vital practice in which undesirable animals will be removed from the flock for the development of ideal breeding flock.
- About 10-20 per cent of the animals may be culled in every year to form a healthy flock.
- The flock size can be maintained by replacing with lambs/kids for the culled animals in the flock. Culling can be classified into three types.

Policy culling

- The following are the criteria for policy culling
  - Not true to breed/type
  - Parentage not known
  - Genetic defects
  - Poor production /reproduction
  - Surplus stock :Males and females not selected for breeding and those that are cast off after breeding
  - Age: Sheep and goats of six years and above and those with gummers and broken mouth condition
  - Poor body weight and growth rate

Veterinary culling

- The following are the criteria for veterinary culling
  - Animals with disorders refractory to treatment
  - Animals incapacitated or become unsuitable for normal production life
  - Weak and debilitated (Animals loosing weight and having static weight during growing phase or loosing 25 percent or more weight during adult hood could be recommended for culling)
  - Suspects /confirmed cases of animals ailing from contagious/infectious /zoonotic diseases.

Emergency culling

- The following are the criteria for emergency culling
  - Animals involved in accidents, predator attacks etc whose prognosis is grave
  - Animals suffering from non specific diseases whose prognosis is grave
  - Confirmed cases of Tuberculosis, Johnes and Brucella
- In general sheep and goats may be culled from the herd if they are
  - Fail to breed conceive and produce offspring
  - Wean light weight and low grade offspring’s

- Lack desirable conformation, breed characters or sex characters
- Develop incurable physical defects
- Show evidence of heredity disease

- Normally males and females that are healthy and free from parasite or diseases or defects are more productive and are easier to manage than those with health problems.
- Teeth defects and feet and leg defects , udder defects in females , testicle defects in males are commonly occurring problems in commercial sheep and goat population.
- Any of these can limit the usefulness of sheep and goat either by directly reducing production or by limiting the grazing ability.
- Both selection and culling are involved in keeping this problem at minimum.

MODULE-50: PREPARATION OF ANIMALS FOR SHOWS, ANIMAL FAIRS AND MELAS

Learning outcomes

At the completion of this module, the learner will be able to

- understand the methods for preparation of animals for shows
- know about showing of animals and showing ethics

INTRODUCTION

- About 2600 large and small livestock fairs and shows are organized every year throughout India.
- All India cattle show society, started in 1939, with a grant of Rs.2,25,000/- which conducts the All India Cattle show every year in various parts of the country.
- There are two unique cattle fairs conducted in India.
- They are Cattle fair at Rohtak, Haryana and Sonepur cattle fair in Bihar, during November-December.
- Breeders and farmers from different parts of country assemble at these fairs and exhibit their cattle

SELECTION OF ANIMALS

- Select only competitive animals to have a chance to win their respective age class in the competition.
- General musculature of the body should be given due consideration with well developed firm udder in females.
- Selection of show animals should be made well in advance.
- This will allow sufficient time to prepare the animals which requires adjustment in the feed intake of some animals or may be desirable to breed some cows to freshen at certain point of time to look at their best on the show day.

CONDITIONING THE ANIMALS

- The feeding of show animals is very important for the best results, so that the animals carry a fair amount of flesh.
- Thin animals will be discriminated from other good animals and they need more period of nourishment.
- Many grain rations can be used successfully in show animals.
- In general, rice bran, wheat bran, ground maize, cotton seed meal and linseed meal constitute a larger part of the ration.
- Linseed meal is a very popular feed which give gloss to the hair and quality to the hide.
- It is better to have the animals on the same feeding practices that they will receive during the show period.

TRAINING THE ANIMAL FOR SHOW

- The animal must be trained to lead and stand properly.
- It should be trained to walk slowly taking short steps with head up and alert, to stand with its weight evenly distributed on all the four feet and with their feet in proper position and to respond to a light touch from the leader.
- Proper leading and posing can overcome many minor weakness of dairy cattle such as slightly weak loin, crooked legs etc.
- Improper leading and posing can accentuate these problems. This training should take place well in advance to the show season.
- In general, the younger animals can be trained with ease to stand and lead.
- Leading and training can be achieved by coaching and gentleness and not by the physical abuse.
- Firm yet gentle control of the animal during the training period is important.

CLIPPING

- Proper clipping can enhance the appearance of the animal.
- Areas that are normally clipped include head, ears, neck, tail, udder and mammary gland.
- Often leaving some hairs in the lower parts on the rump, loin and neck, shaping the hair to the point over withers or clipping some of the hairs from the hocks, leg and brisket will enhance the appearance of the animal.
- The hair should always be blended at the place where clipped and unclipped areas meet.
- It is advisable to clip about one month before the show, however be reclipped within a few days of the show.

HOOF TRIMMING

- The hooves of all show animals should be carefully trimmed and shaped.
- Long toes and misshaped hooves detract the appearance of the animals and make it difficult for them to walk and pose properly.
- Hoof trimming should be done well in advance (at least 2 to 4 weeks earlier) of the show.
- Often an animal can become temporarily lame after trimming. This is especially true for those who require extensive trimming.

BRUSHING, WASHING AND BLANKETING

Brushing

- Stimulates the circulation of blood and help a glossy coat of hair.
- It also removes dirt, dust and loose hair.

Washing

- The animal should be washed with milk soap and the hair should be washed thoroughly.
- It is advisable to keep the animals, lightly blanketed to avoid exposing them to draft and cold until they dry.
- All the animals should be washed and allowed to dry before clipping.
- They should be rewashed within 12-18 hours of show time.

Blanketing

- Blanketing helps to keep the coat clean and smooth and gives the animal a smooth and clean appearance.

TRANSPORTING

- Avoid feeding the animals with large amount of concentrates and succulent feeds within 12 hours of transportation.
- Thus, the cattle defecate less during hauling and are clean on arrival.
- This practice may increase their appetite on arrival and ease the problem with the cattle on taking the feed in the new surrounding.
- It is advisable to reach the destination at least 2-3 days ahead of the actual time of show or sale.
- This allows time for the animals to adjust to the new surroundings and to get the animal in best shape before the show.

FINAL PREPARATION

- The rules and methods of particular show should be studied carefully.
- The final washing should be several hours before the show time, so that the cattle can have sufficient time to dry and eat.
- The timing of last milking before the show should be determined by milking interval at which the udder looks the best.
- Individual quarters of some cows may not be completely milked, in order to balance the udder.
- It is very important to anticipate the approximate time when a particular class will be shown.
- Perform the last pre-show milking in accordance with the show time so that the correct amount of milk will be in the udder at the show time.
- Most showmen prefer to feed liberal amount of hay but to withheld water, concentrate and succulent feeds for a period starting from 12-15 hours before the show time. This helps to ensure a good appetite during the show time.

SHOWING

- The exhibitor should do brushing, cleaning and haltering nearer to the place where the class is called for show.
- He should lead his animal around the ring in a clockwise direction, holding the halter strap on his left hand and walking backward. This enables him to see both his animal and the judge.
- From the time the animal enter the ring until it leaves, it should be the duty of the showman to see that the animal is being exhibited at its best.
- The judge’s direction should be followed promptly. Cows in milk looks normally the best .
- The cow normally stand with the left rear leg nearest to the judge slightly ahead of the other rear leg and with the front feet evenly spaced wide apart.

SHOWING ETHICS

- The following things should not be done to maintain the showing ethics
    - Misrepresenting the age and / or milking status of the animal for class in which it is shown.
    - Balancing the udder by any means by leaving naturally producing milk in any or all quarters.
    - Blocking the nerves to the foot to prevent limping, by injecting drugs.
    - Striking the animal to cause swelling in a depressed area.
    - Insertion of foreign material under the skin.
    - Changing the colour of hair at any point/ spot on the animal body.
    - The use of alcoholic beverages in the feed or through a drench.

- Criticizing or interfering with the judge, show manager or other exhibitors while in the show ring.

ADVANTAGES OF FAIRS AND SHOWS

- It provides excellent opportunity to the breeders to exchange ideas with fellow dairymen.
- It develops a healthy spirit of competition among the farmers and provide them incentive for development of cattle.
- It encourages uniform standard of the husbandry practices.
- Showing dairy cattle has been responsible for maintaining the dairy interest of many youngsters.
- While attending fair or show (as the exhibitor or spectator) careful observation of the real professional things can be a valuable learning experience.
- Fairs and shows provide excellent opportunity to field and extension workers to understand the local problems of husbandry and it will also educate the farmers in newer techniques of dairy farming.
- Showing is an excellent means of advertising cattle and contacting prospective buyers.

ANIMAL MELA

- **Sonepur mela** is the Asia's and probably one of the worlds largest cattle fair. No other mela in Bihar can boast about the crowds it attracts whether it's Diwali, Chhath, Sivaratri, Ramnavami, Kartik Purnima, Janmashthami, Holi or Durga puja.
- Nearly all animals brought here for sale include a ll breeds of dogs to camels to buffaloes, donkeys, ponies, monkeys, chimps, Persian horses, sheep, rabbits, bears, cats, and guinea pigs. All varieties of birds, poultry and fishes are also available. The Sonepur mela specialises in the sale of every type of bird and animal, big or small. This is only place in the world that sells elephants in large numbers. Handicrafts, paintings and pottery not only from famous **Madhubani** but all over India can be seen here. All varieties of horticulture can be admired; this is a particular feast for the people of Bihar as it's a major opportunity to enhance their gardens.

MODULE-51: SHEARING OF SHEEP

Learning outcomes

- On completion of this module, the learner will be able to demonstrate clipping and shearing of sheep and goats.

SHEARING

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

Hand shear

TIME OF SHEARING

- Most flocks are usually shorn twice a year, i.e. March-April after thewinter and September-October after the rain.
- In Jammu and Kashmir,and Rajasthan sheep are shorn thrice a year, although this is not a correct wayas it produces wool with very short staple.
- The spring clip (March-April) is generally white and autumn clip(September) which is about two-thirds of the total wool in the country isyeallow especially in greater part of plains. This is called as canary coloured wool, and the problem with this woolis that the yellow colour cannot be removed by the conventional scouring methods.
- This can be reduced by shearingsheep before the onset of staining, protecting them from solar radiation tillthe fleece is more than 2 cm long or by grazing them in the cooler hours of the day and by restoring to evening feeding of supplementary feed or fodder.

CHEMICAL SHEARING

- **Chemical shearing** was developed at the USA. Cyclophosphamide fed at the rate of 24 mg perkg live weight. This chemical removes the wool within three days starting from 12th day after drug administration.
- The wool comes off in patches. The major disadvantages of this method are
    - from the day of wool shedding, the sheep should be confined
    - this drug may affect the foetus adversely
    - the drug may leave residual effect on meat
    - the drug removes the wool too close to the skin which expose the animal more seriously to environmental stress.

SHEARING MANAGEMENT

- A shearing shed and yard should have a forcing pen, a concrete or brick paved drafting yard, sweating pen, a catching pen where the sheep are shorn and finally a pen for keeping shorn sheep.
- A wool section to carryout the sorting of fleece and rolling tables along with bins for classing fleece in addition to sufficient space for storing wool packs is also required.
- A clear day should be chosen for shearing
- Tetanus injection is advised to all the shorn sheep
- Winter shearing is not advised.