LPM 111

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.

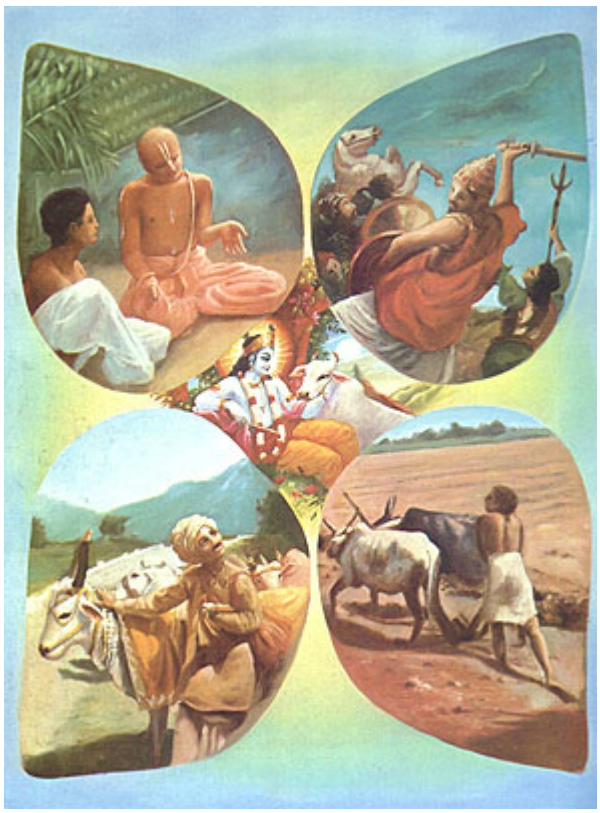
INTRODUCTION

- 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

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.

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.N	REGIO	SPECIES	REGION	REGION'

O	N	PRIORITY				'S SPECIES PROFILE	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.

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**	

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-	13,901	3,535	25.43	819	5.89

98					
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*

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*						

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.

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

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	46.5	65285.85	27380.472	0.42	2.9	1.3

	1.00 ha)						
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(10.00 ha & above)	2.9	1197.713	18649.027	15.57	8.9	5.0
	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 farmers	49.3	27.0	41.8	41.9
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	0.015	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	Sucklin g	Suckling	Suckling	Foal at foot
Act of parturition	Calving	Calving	Lambin g	Kidding	Farrowin g	Foaling
Act of mating	Serving	Serving	Tuppin g	Serving	Coupling	Coverin g
Cry	Bellowin g	Bellowing	Bleating	Bleating	Grunting	Neighin g
Chromosom e 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

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

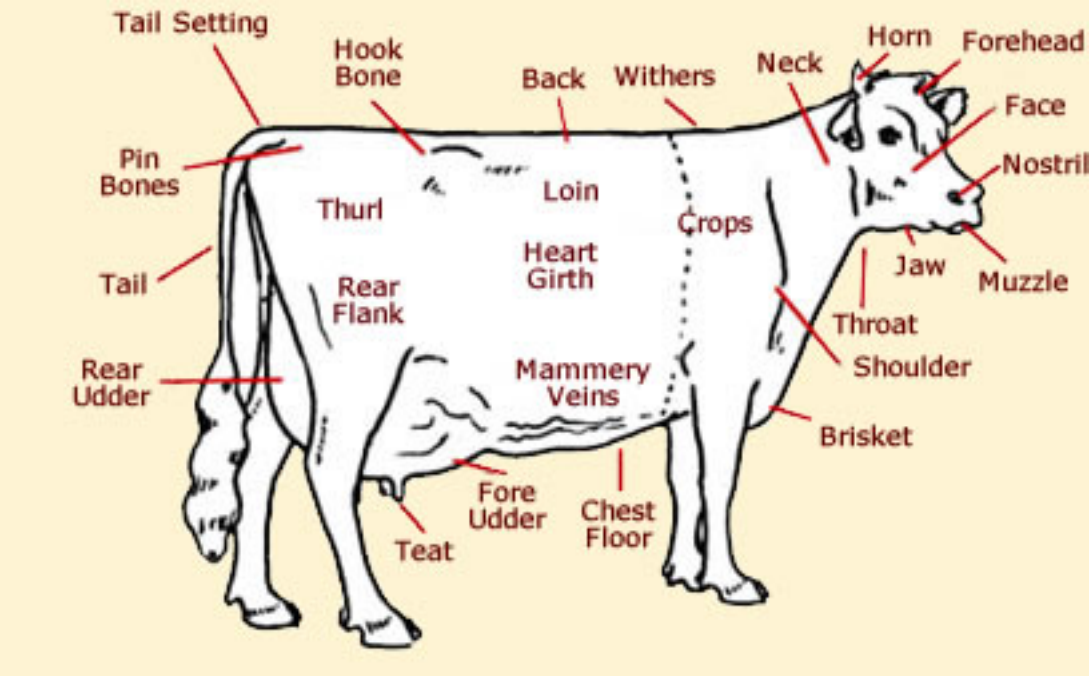
- Cattle : Beef
- Buffalo : Carabeef
- Sheep : Mutton
- Goat : Chevon
- Pigs : Pork
- Rabbit and Poultry : White meat

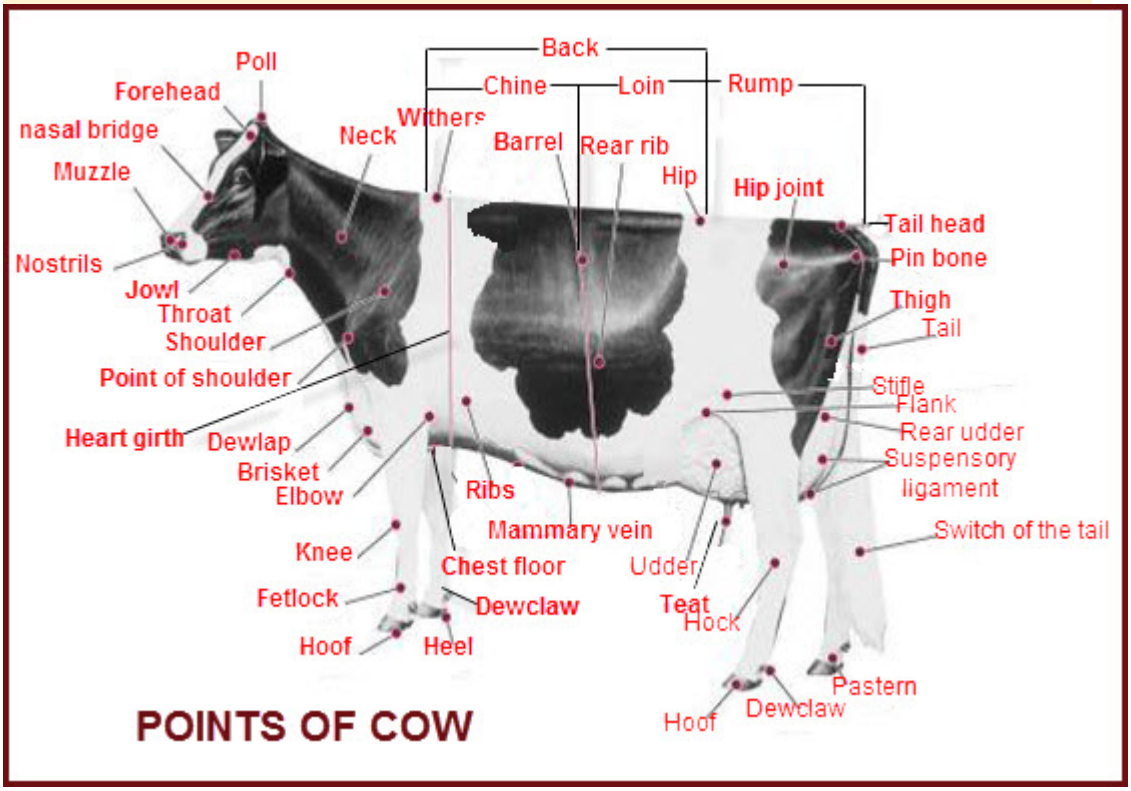
MODULE-7: BODY CONFORMATION AND IDENTIFICATION

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**

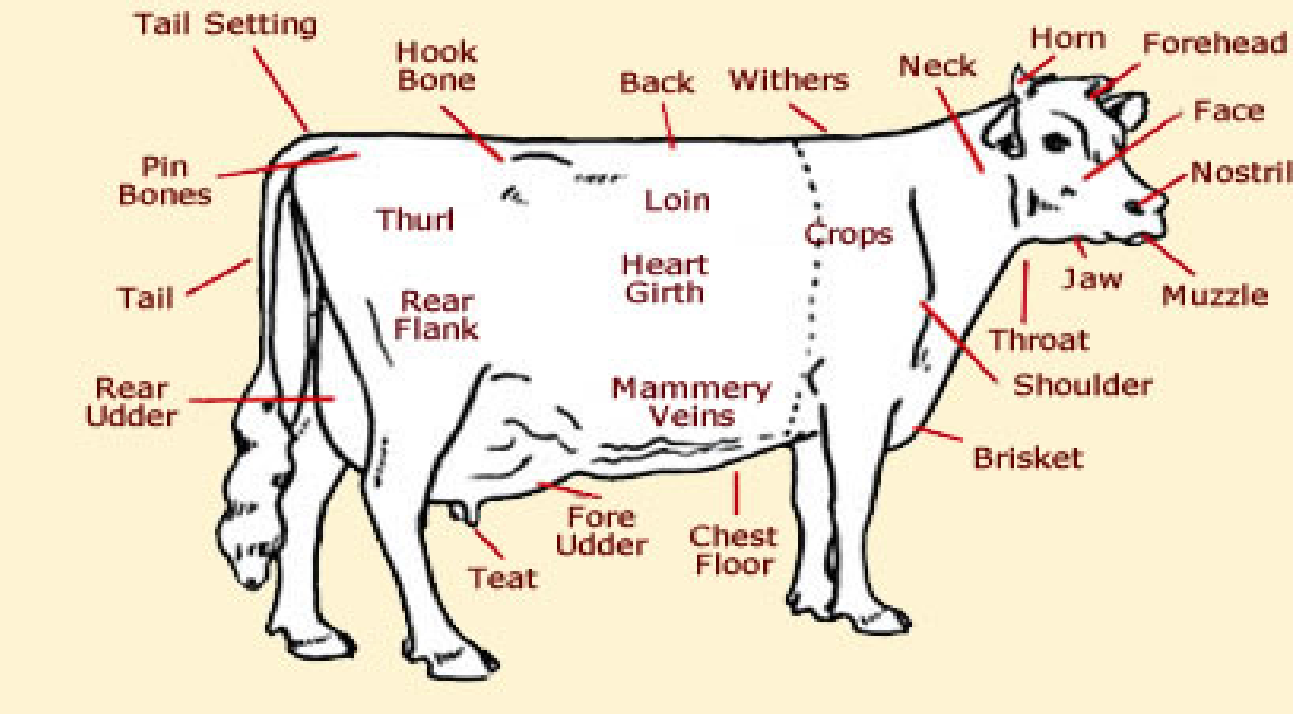




PARTS OF HEAD

- *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.

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.

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

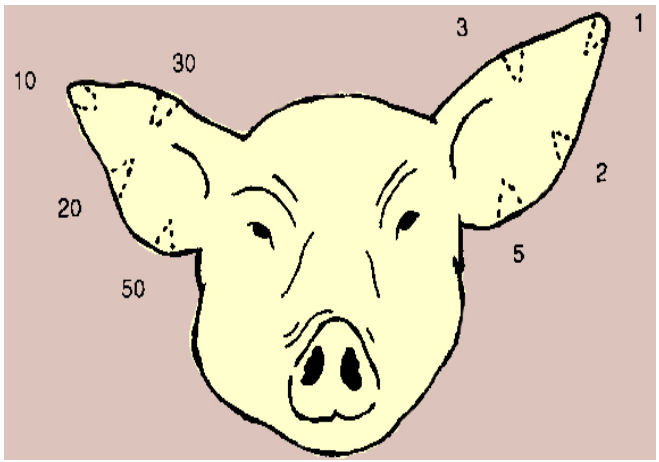
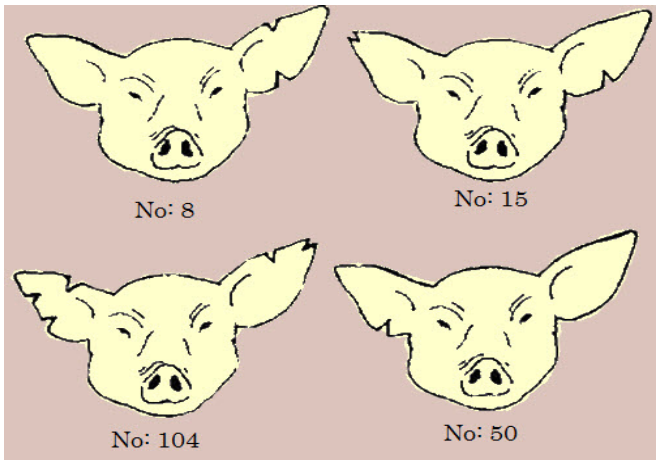
- Iron/copper branders, Liquid nitrogen / dry ice and alcohol.
    - Assemble the necessary cold branders / iron.
    - Cool the branding irons in the liquid nitrogen or dry ice
    - Before application, restrain the animal
    - Clip the area of the branding site, clean and apply alcohol to the clipped 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

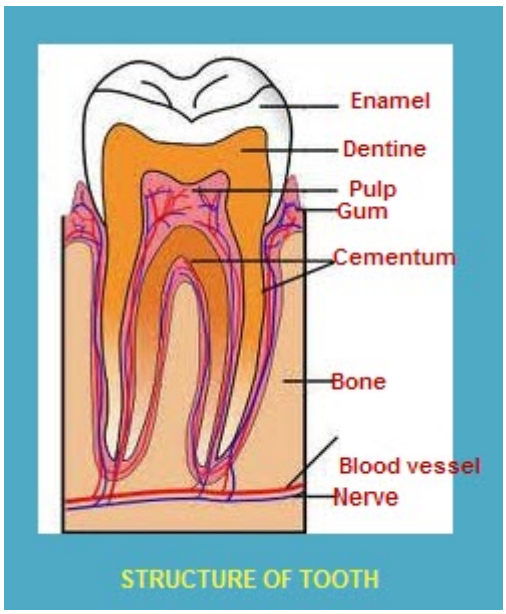
DEFINITIONS

- *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.



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

- 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

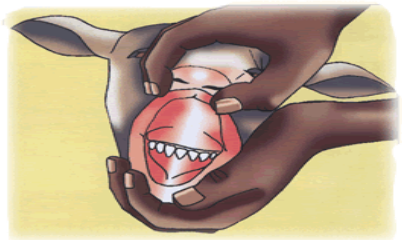
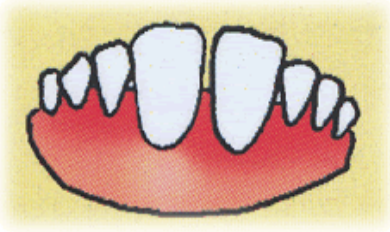
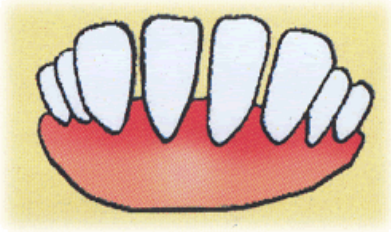
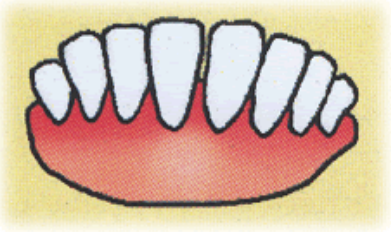
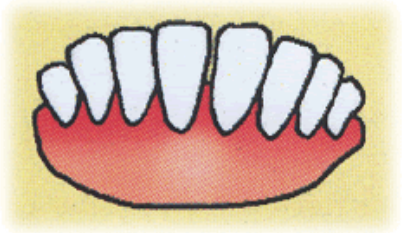
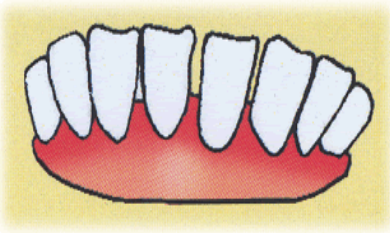
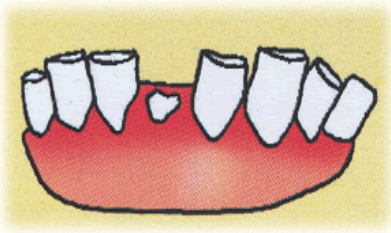
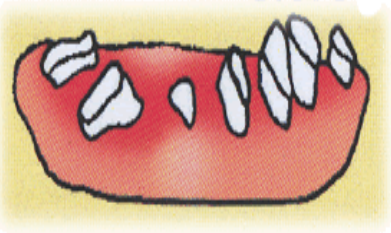
- 1st pair molars - 2 years
- 2nd pair molars - 2 ½ years
- 3rd pair molars - 3 years
- 4th pair molars - 3 ½ years
- 5th pair molars - 4 years
- 6th pair molars - 4½ years

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)**
			

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)

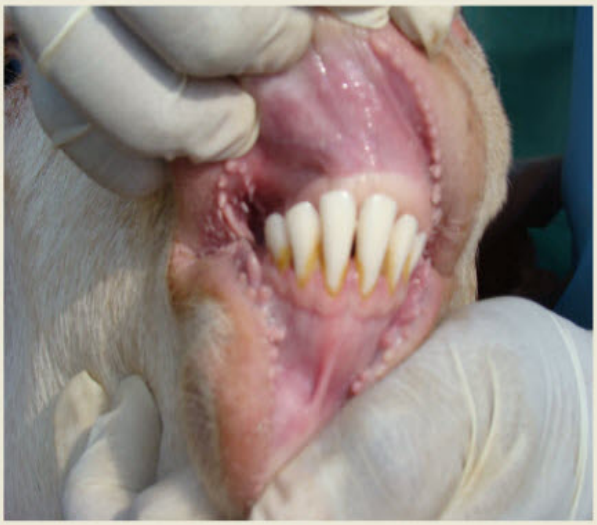
- 0-2 pairs of temporary teeth 6 – 10 months at birth all temporary incisors
- Permanent central incisor 16 – 20 months
- Permanent medial incisors 21 – 25 months
- Permanent lateral incisors 26 – 30 months
- Permanent corner incisors 31 – 40 months



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.

TANUVAS

Dentition - Ageing



Type of Teeth	Age at eruption (months)	
	Cattle	Buffaloes
Temporary Tooth(A)	Less than 24	Less than 30
Central Incisors(B)	24-30	10
2nd pair Incisors(C)	35	42
3rd pair Incisors(D)	48	54
Corner Incisors(E)	54-60	70-72

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 GU
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	SPACE REQUIRED (m^2)

ANIMALS (Kg)	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 $21.2m^2$	$21.1m^2$ and above	Less than 12.5 m2	12.5 m2 and above	25
70	100	50	60	

- 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.

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

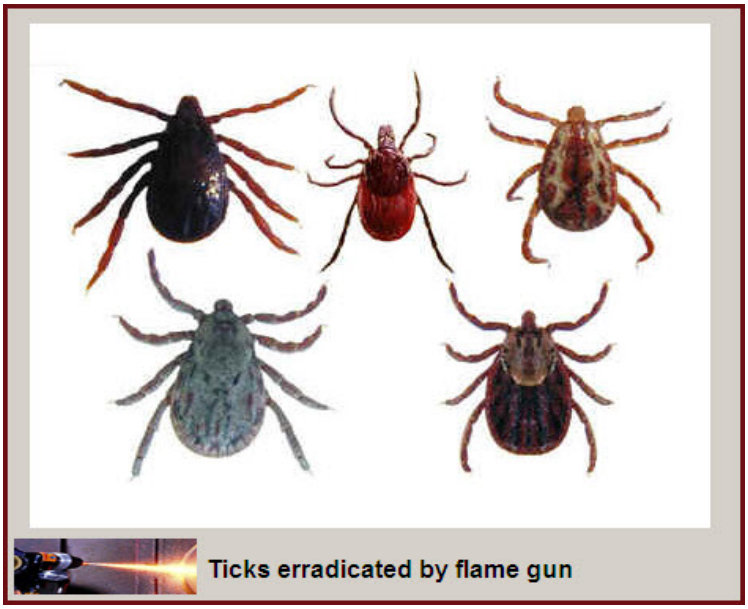
- The technique has been used to control microbial population in air, water and biological materials.

Desiccation

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



Disinfection- Flame gun



Ticks erradicated by flame gun

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

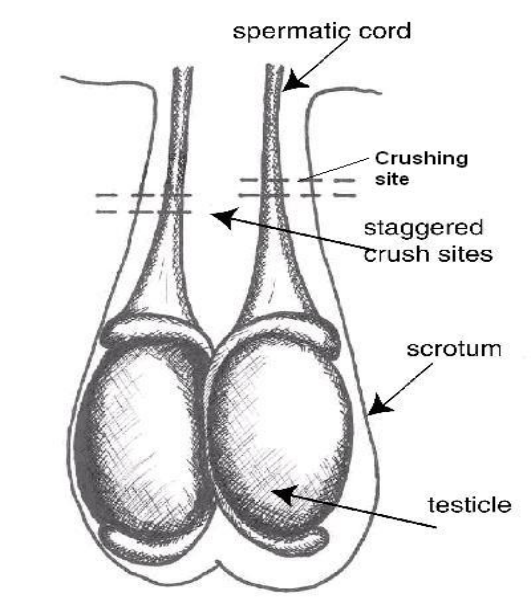
- This method can usefully be adopted when labour is scarce or when the nature of ground is not suitable for construction of pit ie., when the land is water logged.
  - Two parallel trenches about 5 feet long, 9 inches wide and 9 inches deep and 2 feet apart are dug in the direction of the prevailing 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)



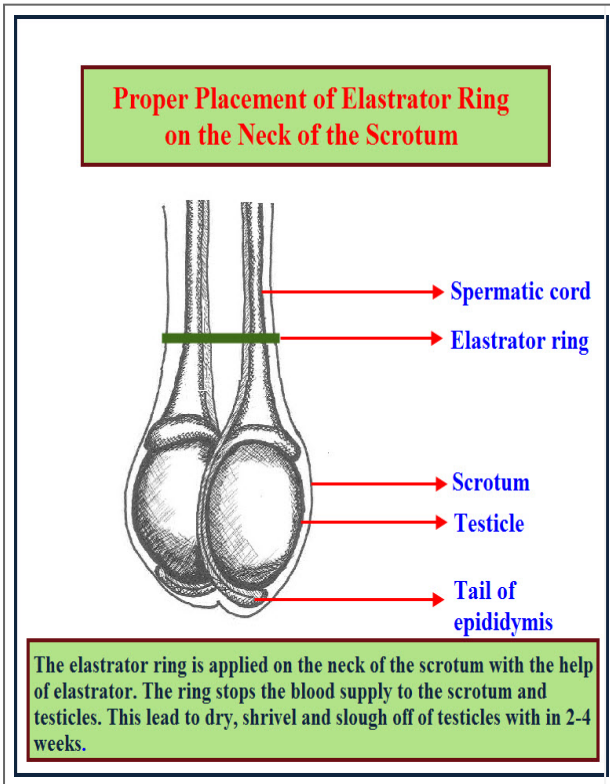
Burdizzo castrator- small (for sheep and goats)

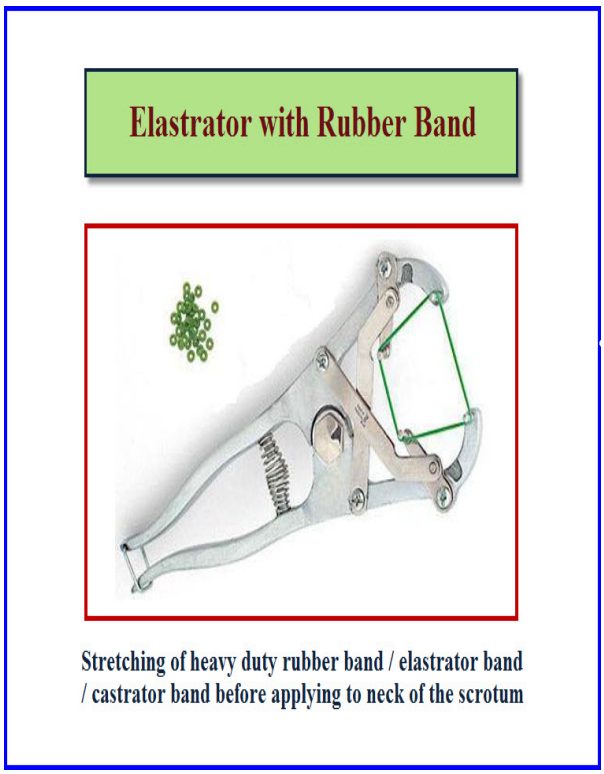
- *Open or surgical method*
  - Scrotum is opened and testicles are removed, aseptically and the wound is treated with antiseptics.
  - In young bulls the cord may be cut as savagely off but in the case of mature bulls the cord should be twisted before severing it.

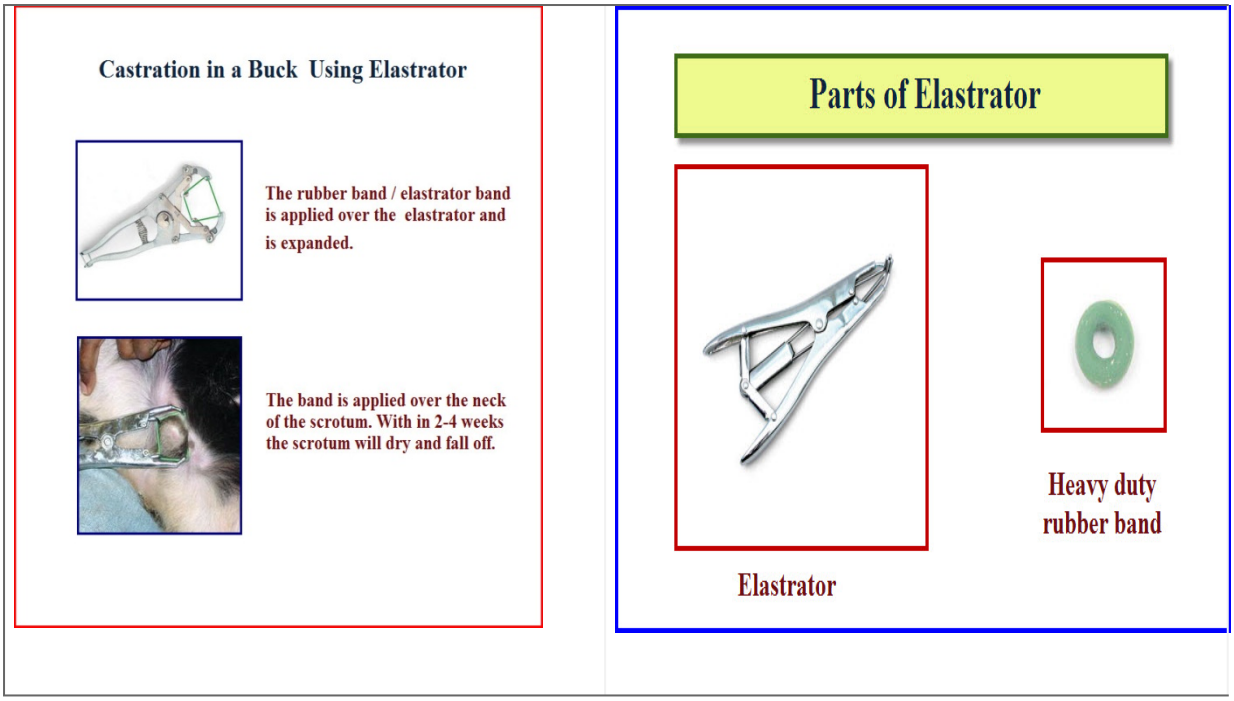
- *Rubber ring or elastrator method*
  - A strong and tight rubber ring placed around the cord at an early age of calf.
  - This creates constant pressure and the testicles are atrophied and absorbed and the ring drops down.
  - Elastrator rings are very painful to the animal and so it is not usually 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° 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.

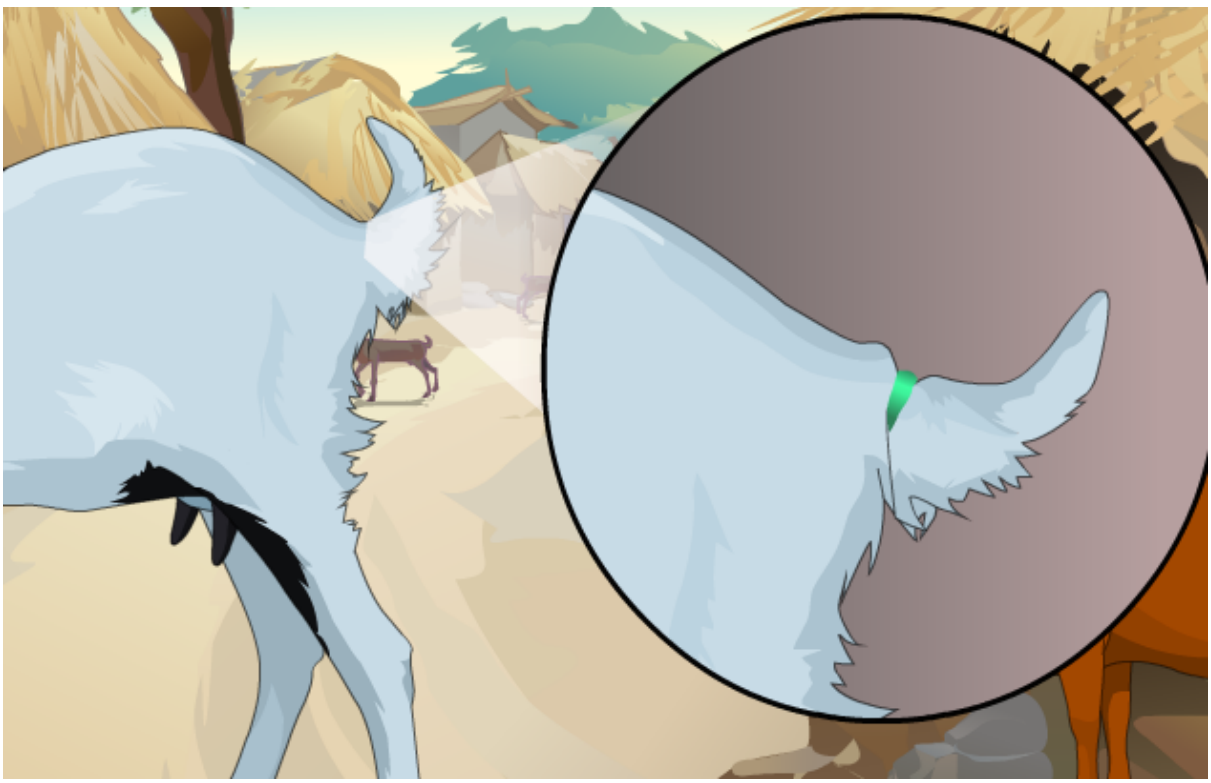
DOCKING





Docking Rubber Ring Method





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.

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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

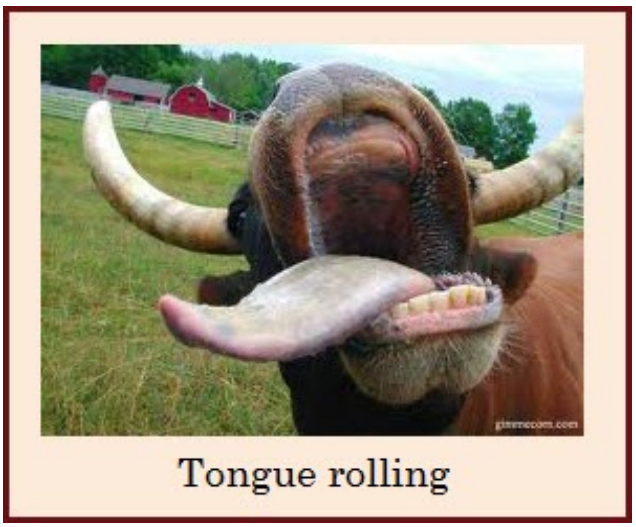
- Recently weaned calves will often suck and lick the walls, bars of their pen.
- This can be controlled by regular creosote paint of wood surface.
- Feeding good quality concentrate and roughage will minimize the incidence.

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.



Tongue rolling



Tongue rolling

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

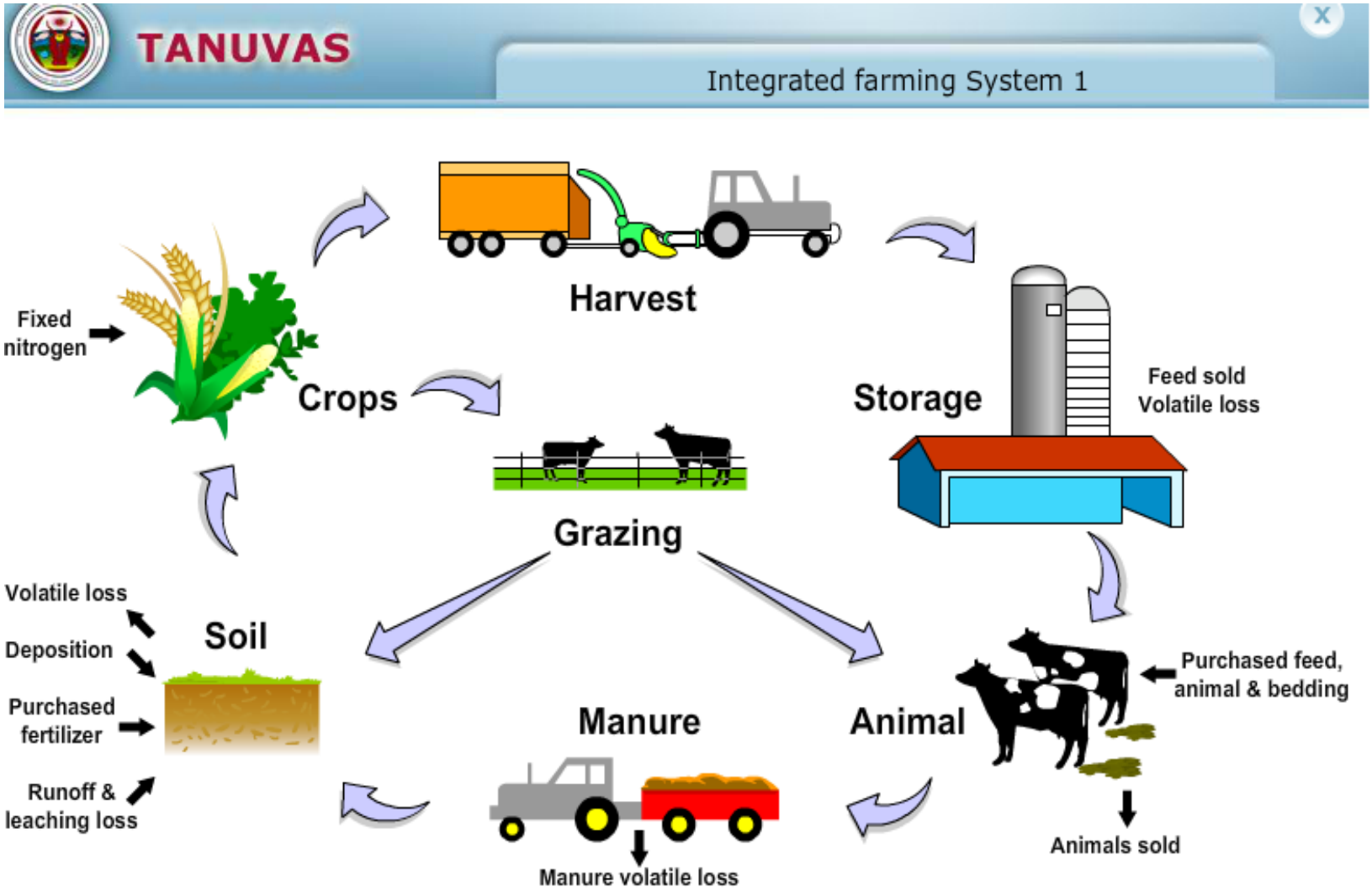
- Rain-fed mixed farming systems are mixed systems in which more than 90% of the value of non-livestock farm production comes from rain-fed land use; these systems can be divided into the same agro-ecological sub-classes.
- Irrigated mixed farming systems are systems in which more than 10% of the value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

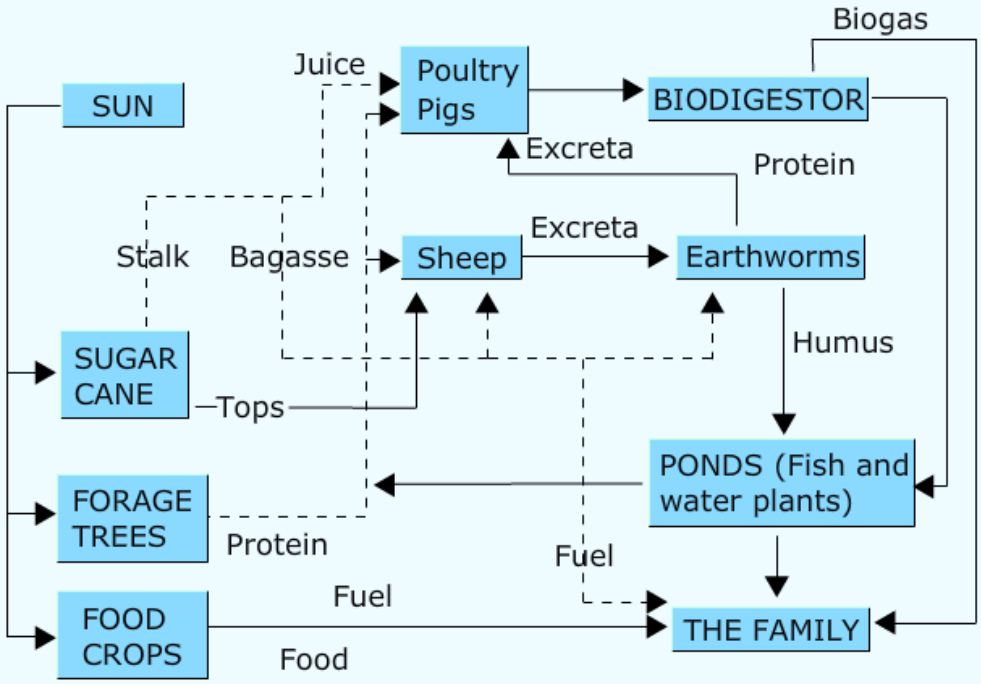
winter and so flocks are moved to lowlands; in summer flocks are moved to highlands where feed is available.

- In the semi-arid and arid regions land use is seasonal and movement of the animals is dictated by rainfall and availability of grazing.


TANUVAS
Integrated farming System 1
Harvest
Fixed nitrogen
Crops
Storage
Feed sold
Volatile loss
Grazing
Volatile loss
Deposition
Soil
Purchased fertilizer
Runoff & leaching loss
Manure
Animal
Purchased feed, animal & bedding
Animals sold
Manure volatile loss

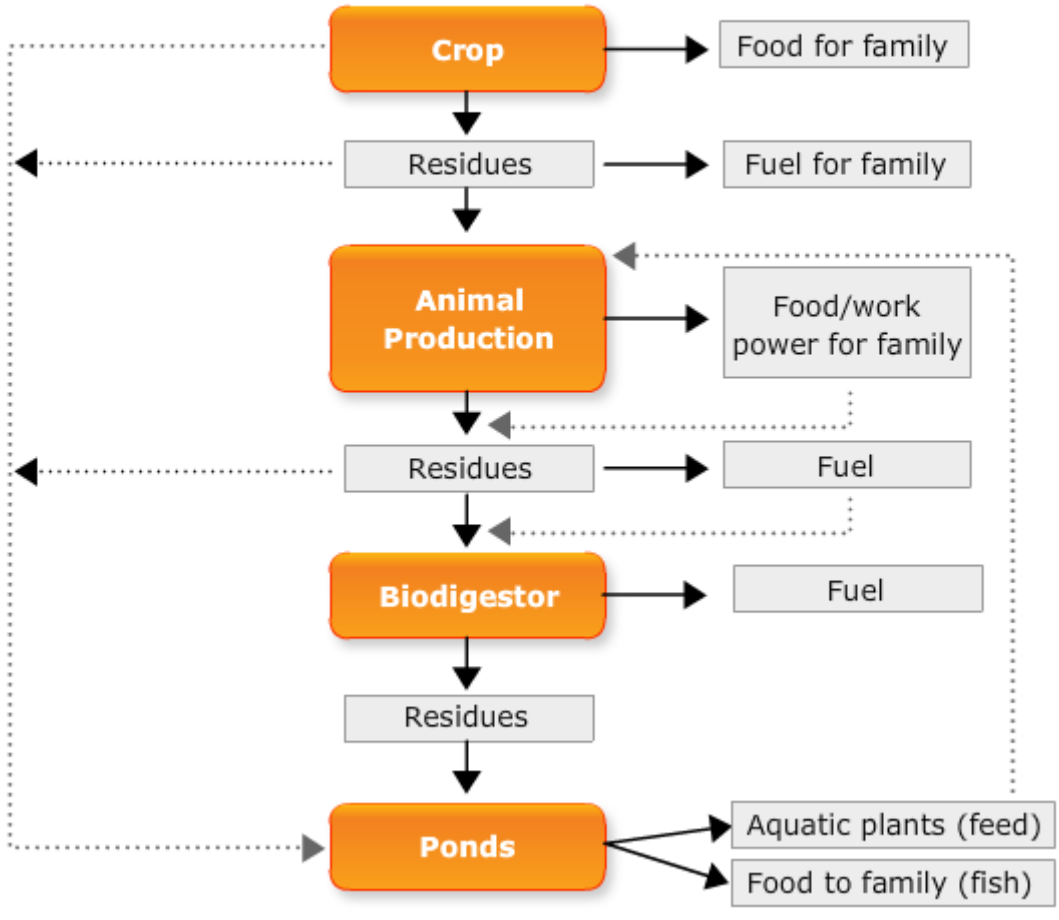
TANUVAS

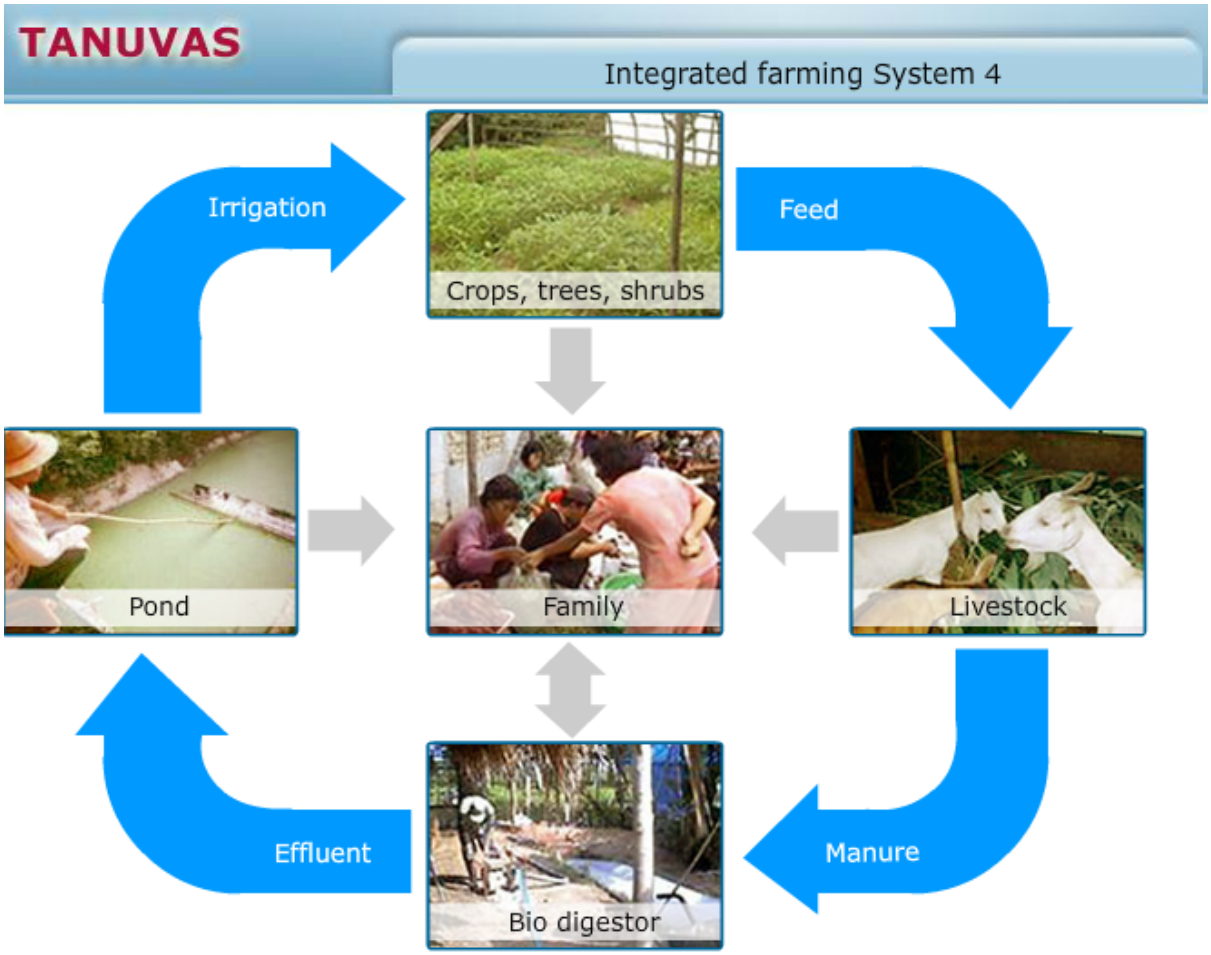
Integrated farming System 2



TANUVAS

Integrated farming System 3





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.

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 heattolerance 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/da
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	25588
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.

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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.

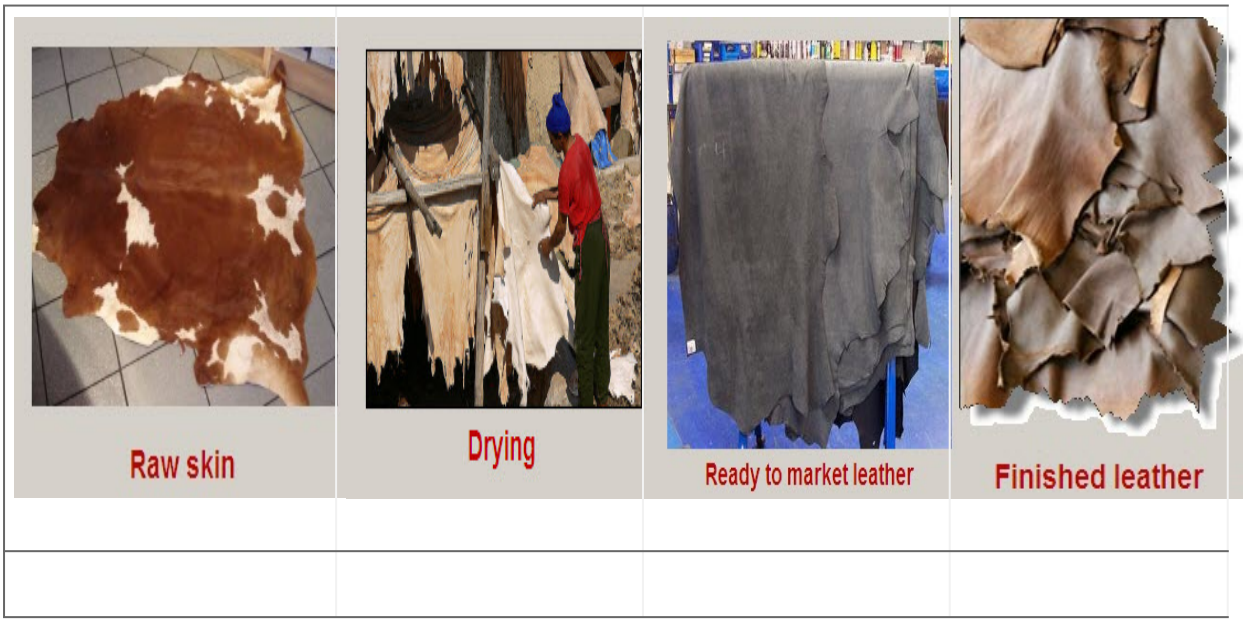
Major production centers

- 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 UNLOADI
	
PRICE NEGOTIATION	**ANIMALS ARE S**
	

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.

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

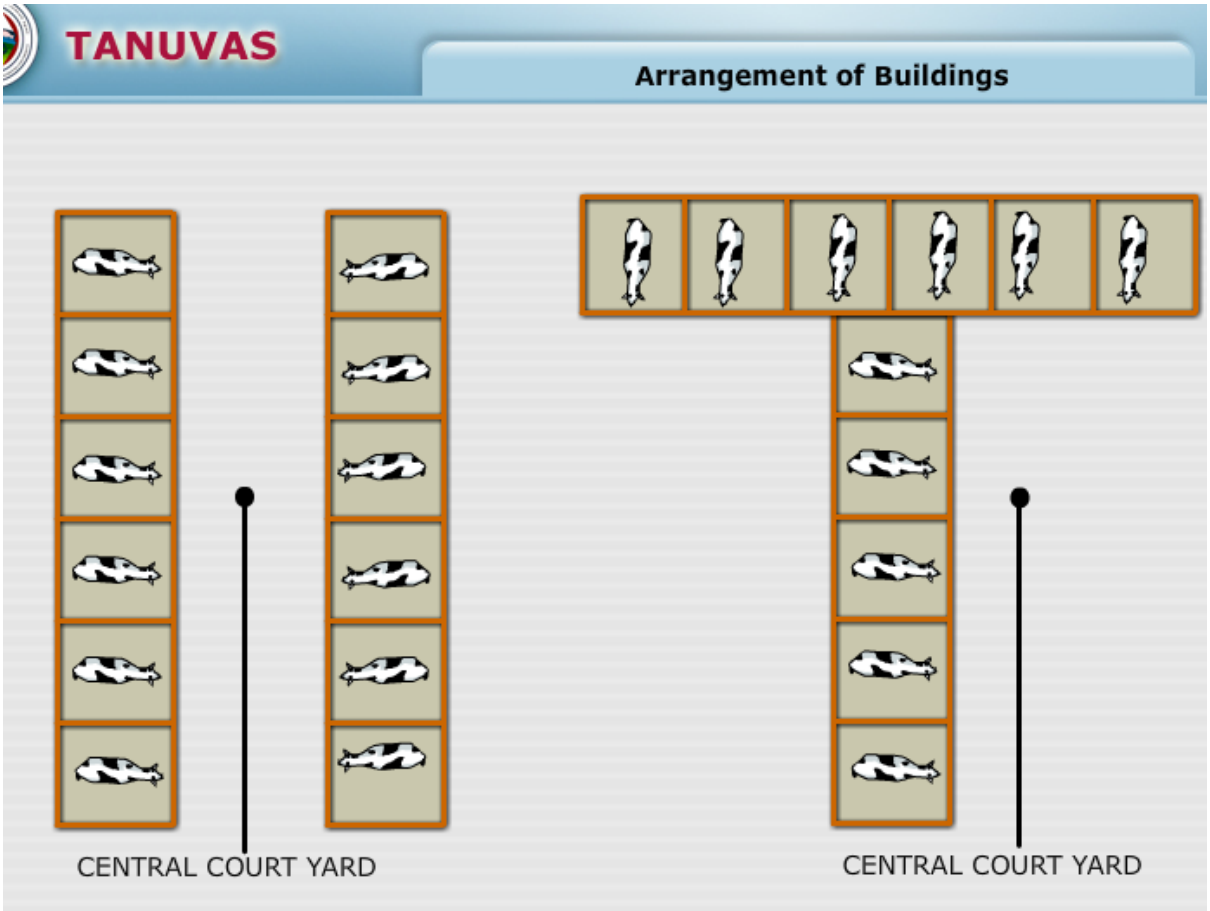
- In this system, there is a wide way at the entrance, leading to a courtyard.
- Farm houses are located at the entrance of the way and different farm buildings are located around the courtyard.

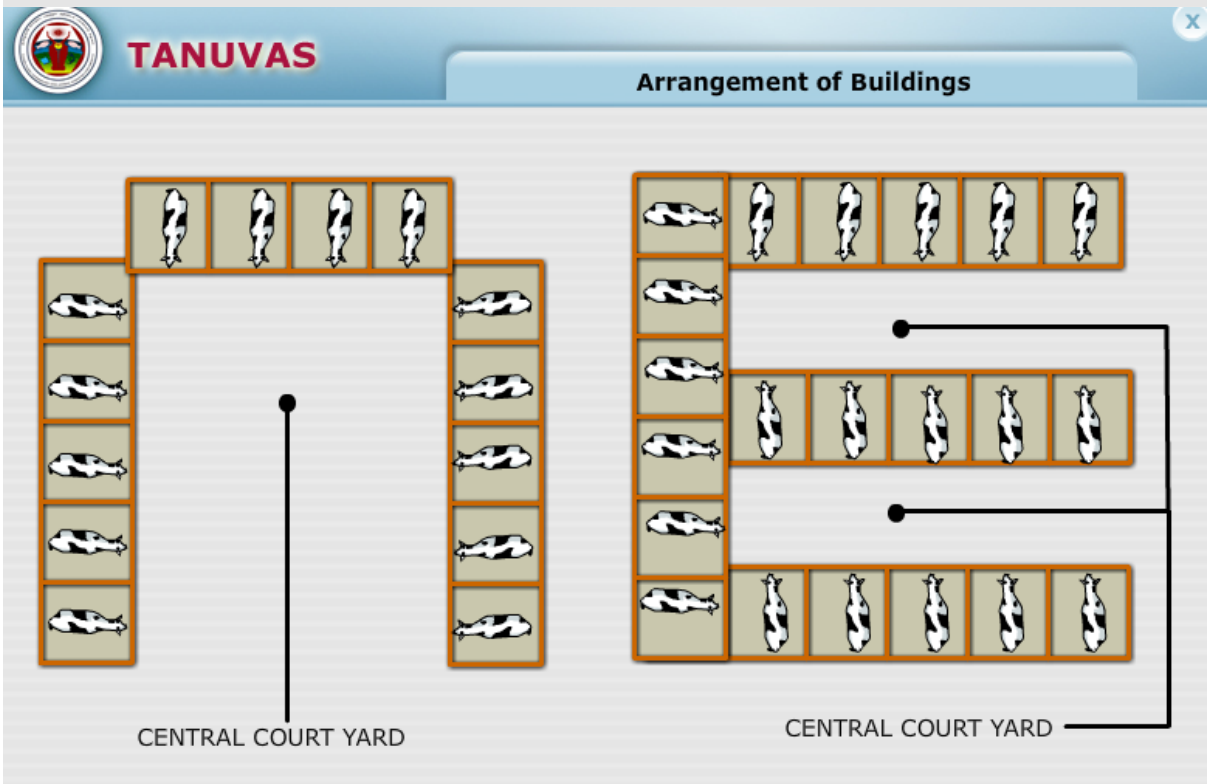
Parallel arrangement with the road

- 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.


TANUVAS
Arrangement of Buildings
CENTRAL COURT YARD
CENTRAL COURT YARD


TANUVAS
Arrangement of Buildings
CENTRAL COURT YARD
CENTRAL COURT YARD

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 = $\frac{\text{rise}}{2 \times \text{run}}$

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
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- 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

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- It is preferable to have material with low conductivity of heat. The commonly used roof materials are.

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- 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.
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- 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

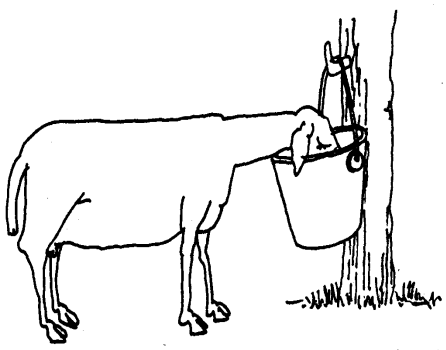
- Wooden posts and planks are used for constructing roof trusses, animal house partitions, yard fences and feeding devises.
- Good quality timber should be selected for this purpose.
- These will be hard and durable. The grains will be dark in colour and closed packed.
- Annual rings will be closely 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

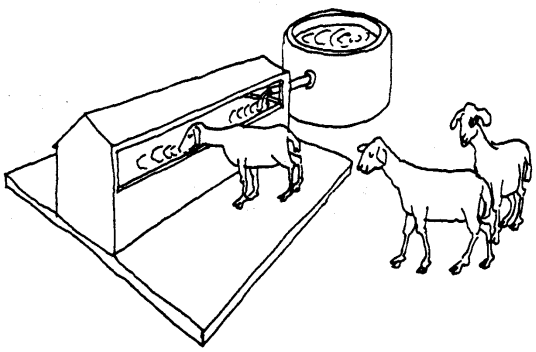
- Soil types and topography vary across the country. Accordingly, the building materials also differ from region to region.
- These materials are usually substances that remain unaffected (or reasonably slowly affected) by the stress of climatic variables.
- These include clay, pebbles, stones brick, 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.

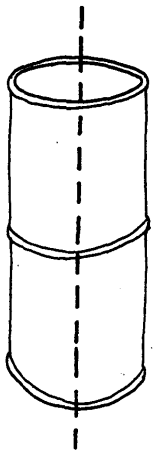
LOW COST FEEDING AND WATERING ARRANGEMENT

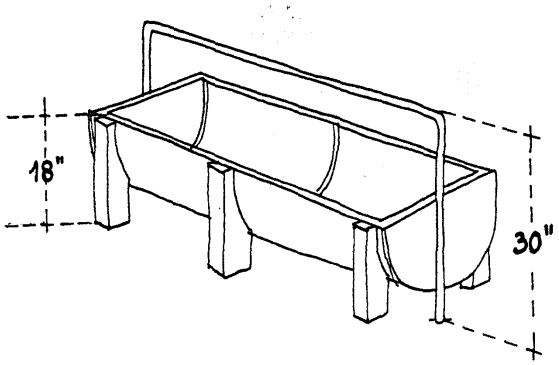


BUCKET

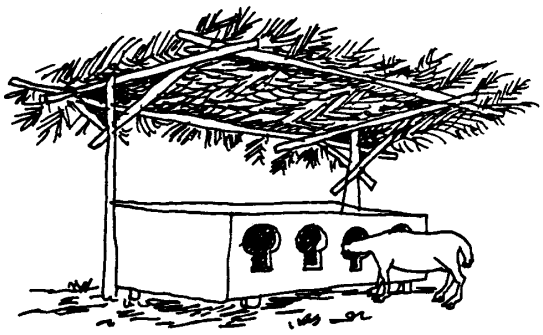


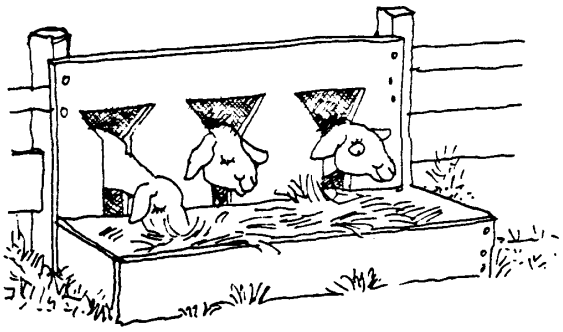
WATER TROUGH



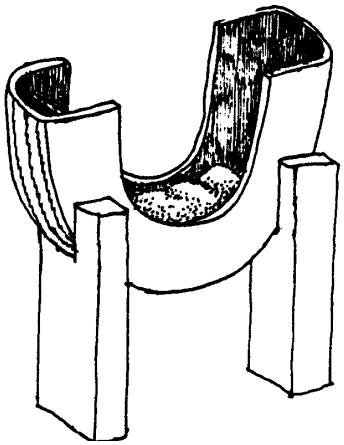


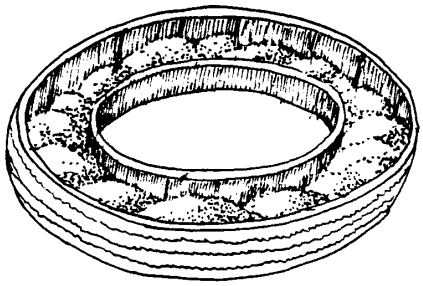
CUT A BARREL IN HALF AND MAKE A ⟶ SEMICYLINDRICAL WATER TANK FOR SHEEP.





KEY HOLE FEEDER





SALT AND MINERAL TROUGHS
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 .