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# ANIMAL PRODUCTION

## DAIRY CATTLE PRODUCTION

In Himachal Pradesh, the total livestock population is almost matching to the human population out of which 2.17 and 0.616 million are cattle and buffaloes, respectively and the total milk production is 0.50 million tonnes against national figure of 60.0 million tonnes. The average milk yield in the State is 1.502 lit. and 3.008 lit. in respect of cows and buffaloes, respectively.

### Improved dairy cattle

The local cows are predominantly non-descript and chronically low yielders. There is no specific breed of hill cattle in Himachal Pradesh and the whole stock is highly variable under different agro-climatic zones. In order to improve the milk production potential of the local cattle, intensive cross-breeding programme has been launched since 1950's by using high merit Jersey and Holstein Friesian semen/bulls. There are approx. 4.0 lac cross-bred cows in the State against the national figure of about 9.0 million.

The comparative performance between hilly cow and Jersey crossbred cow is given below :-

Sr. No.	Particulars	Hilly cow	Jersey crossbred cows
1.	Birth body weight (kg)	12-13	15-17
2.	Age at first service(months)	38-45	20-30
3.	Age at first calving (months)	47-57	29-39
4.	Gestation period (days)	250	280
5.	Lactation period (days)	200-400	250-300
6.	Intercalving interval(days)	400-700	330-430
7.	Dry period (days)	200-500	120-150
8.	Average lactation yield(L)	150-350	1200-1400
9.	Peak yield (L)	0.75-2.0	4.00-6.00
10.	Fat (%)	3.00-3.75	4.00-5.00

Characteristics of Jersey and Holstein Friesian breeds of cattle that are recommended for cross-breeding purpose in Himachal Pradesh, are given below :

Character	Jersey	Holstein Friesian
Country of origin	Island of Jersey in the English channel	Holland
Desirable colour markings	Fawn with or without white markings	Black and white
Av. body weight (kg)		
female	450	675
male	675	1000

Av.gestation period (days)	280	280
Av. lactation yield(L) 305 days)	4000	6150
Age at first calving (months)	38	36
Distinguishing Characters	Has straight top line level rump and sharp withers. Head shows a double dish. Animals are inclined to be nervous and sensitive, often vicious. Capable of utilizing roughages efficiently. Can with stand tropical and humid climate better	Ruggedly built and posses large feeding capacities and udders. The head is long, narrow and straight with slightly rounded withers.
Composition of milk		
Fat (%)	5.5	3.5
Protein(%)	3.9	3.1
Lactose(%)	4.9	4.9
Ash (%)	0.7	0.7
Total solids(%)	15.0	12.2

### Selection of a Good Dairy Cow

An average crossbred cow should have age at first calving 24-30 months, weight at first calving 300 kg, lactation yield (300 days) more than 2,800 L, service period 60-90 days, dry period 60 days, calving interval 12-14 months and fat percentage 4.0-4.5. For achieving these characteristics, the local cows should be mated with exotic bulls of Jersey breed to produce crossbreds, having 50 per cent exotic germplasm (halfbreds) in this state. The best local cows with a good milk yield should be mated with progeny-tested bulls of exotic breed having high genetic potential for milk yield. These crossbred cows (halfbreds) should be mated with crossbred bulls (halfbreds) so that the level of exotic germplasm is maintained around 50 per cent.

### Reproduction

Crossbred heifers attain puberty around 12 months of age whereas the local heifers attain the same around 30-35 months. The age at sexual maturity in crossbred heifers is about 15-18 months as against 30-35 months in the local ones. The weight of the heifer at the time of their first insemination should be 225-250 kg for Jersey crossbred and 250-275 kg for Holstein Friesian.

The average duration of estrous cycle is 21 days with a range of 18-24 days. The duration of heat is 24-36 hours in crossbred cows and 12-24 hours in local cows. The symptoms of heat can be sub-grouped as early heat (0-8 hours), mid-heat (12-18 hours) and late heat (24 hours). The symptoms of heat are given below:

### Symptoms of heat at different time periods

Symptoms	Early heat (mounting 0-8 hours)	Mid-heat (standing 12-18 hours)	Late heat (24 hours)
Social behaviour	Restless, tries to get isolated from other cows	Mixes with other cows	Normal behaviour
Excitement	Shows signs	More pronounced	Absent/ calm
Bellowing	Sometimes	Frequent	Very rarely
Milk yield	Decreases	Further decreases	Starts increasing
Mucus Discharge from vulva	Clear, watery, does not break while falling down from vulva and flows	Turbid, opaque, does not break while falling	Seldom seen
Mounting other animals	Very rarely seen	Frequently observed	Seldom seen
Standing still when other cow or bull mounts	Some times	Very common during the second half of the mid-heat and indicates right time for insemination	Not frequent
Urination	Frequent	More frequent	Normal

**Time of insemination.** Ovulation occurs about 12 hours after the end of oestrus. The fertile life of ovum after ovulation is about 12 hours. Fertile life of spermatozoa in genital tract is about 24 hours. To achieve best conception rate, the cow should be inseminated during mid to end of heat. The insemination should be done 11-16 and 18-24 hours after the onset of heat for local and crossbred cows, respectively. Only good quality semen of outstanding bulls should be used by taking adequate precautions for its collection, dilution, storage, handling and insemination.

**Pregnancy diagnosis:** It should be done by rectal palpation, 60-90 days after insemination. The average gestation period in cows is 280(+/- 7) days. The pregnant animal should be given atleast two months dry period and hence milking should be stopped two months before calving. Luxative ration should be given in small quantities to avoid constipation.

**Stages of parturition:** The first stage of parturition (preparatory stage) lasts for 1-6 hours. The second stage (state of expulsion of foetus) takes about 30 minutes to two hours. The third stage (stage of expulsion of placenta) occurs 8-12 hours after calving.

#### Fetal disposition during normal birth

Presentation	:	Anterior, longitudinal
Position	:	Dorsosacral
Posture	:	Fore limbs fully extended with the extended head and neck resting on the limbs.

If, after two hours of the rupture of the first water bag (Allanto-chorionic sac) and inspite of vigorous straining efforts, the birth of the foetus does not take place, veterinary aid should be sought.

Complete expulsion of placenta is essential for normal recovery of the cow/buffalo after parturition. The expulsion of placenta usually occurs within 12 hours of calving. It is desirable to have opinion of the expert for proper treatment.

**Post-partum care:** A reddish brown lochial discharge is noticed from the vulva of the animal for about 7-10 days after calving. If the discharge is purulent or foul smelling and continues for more than two weeks, it indicates genital infection that would affect involution of the uterus and delay post-partum heat.

**Service period:** Normally, 30-50 days after parturition are required for the complete involution of the uterus. The first estrus may occur as early as 12 to 15 days post-partum. But the service is recommended after the complete involution of uterus. Cows should be inseminated around 60 days after calving in order to maintain optimum inter-calving period of one year.

In exotic and crossbred cows, the epithelium over the caruncles of uterus is very hyperemic and some capillary hemorrhage may occur resulting in postoesal bleeding. This is a normal physiological phenomena and the animal should be checked before doing the insemination.

### **Artificial Insemination**

The animal should invariably be examined to find out whether it is in proper heat or not.

**Loading of Insemination Gun:** The straw is dipped in warm (37°C) water, taken out and wiped with a clean towel so that there is no water sticking on the outside. It is held by the Labseal and given one or two jerks to bring air space towards the labsealed end. The labsealed end of the straw is cut out at right angle using the sterile scissors. Straw should not be cut obliquely lest the semen leaks into the sheath during insemination. Push back the piston of the A I gun and the straw is put into it with the factory sealed end down. The sheath is slipped over the gun and plastic ring is fixed over the sheath. The gun is now ready for use. Thawed semen should be inseminated within 30 minutes for getting good fertility.

**Site of deposition of semen:** The thawed semen is deposited in the mid cervix and frozen semen is deposited near the internal os of the cervix or the body of the uterus. But, before doing so, the animal should be examined as to whether it is in proper heat or not.

### **Special care in handling and thawing of frozen semen**

After proper identification, the desired straw should be quickly removed using a forceps or a pair of tweezers. While removing straw, the canister/goblet containing straws should never be raised above the frost line as the temperature within the neck of the container is higher enough to damage the motility and fertility of the semen. Even brief exposure is detrimental.

Frozen semen straws are thawed horizontally in a bread box or any other vessel, containing water at about 37 °C for 15 to 30 seconds. Care should be taken to avoid excessive heating of semen.

### **Synchronization of heat**

Synchronization of heat is done to regulate estrus of animals at a particular time. This practice helps in regulating calving in a particular season for efficient marketing of milk, easy calf management and embryo transfer technology.

The corpus luteum on the ovary is made to regress by using prostaglandin (Lutalyse 5 ml or Estrumale 3 ml). The best results can be obtained if the injection is given between 9 and 14 days after the heat or two injections of prostaglandin 11 days apart. Next estrus will occur 3 days after the last injection.

### **Nutrition**

#### **Nutrients required by the animals**

The nutrients required by the animals can be broadly divided into four categories, viz. energy, protein, minerals and vitamins. The fifth one i.e. water can in no way be overlooked.

**Energy:** It is the primary requirement of animals which is needed for all body functions and production. It is the first limiting nutrient for milk production. Generally, all the animals eat to satisfy their energy requirements. Organic elements, such as carbohydrates, proteins and fats are the main sources of energy in feeds. For dairy animals, carbohydrates meet about 80

per cent energy needs of the body. Cellulose and starch of plants are the main source of carbohydrates and are supplied to dairy animals in the form of straw, forages or cereal grains. The energy need of animals is mentioned in terms of total digestible nutrients (TDN) digestible energy (DE) and metabolizable energy (ME). Energy requirements for growth, maintenance and milk production are given below as recommended by Indian Council of Agricultural Research (I.C.A.R.;1985).

**Protein:** The main function of protein is not to provide energy, but to synthesize tissue protein or milk protein. The major sources of protein for animals are leguminous crops, oilseed cakes and some agro-industrial by-products. The protein need of animals is mentioned as digestible crude protein (DCP). Urea is also used as a source of crude protein, but with special care. The I.C.A.R. Nutritional Panel (1985) has also recommended following DCP requirements for different category of cattle:

Nutrient requirements per lit. milk production

Fat(%)	DCP(g)	TDN(g)
3.0	48	275
3.5	51	300
4.0	55	325
4.5	58	350
5.0	62	375
5.5	65	400
6.0	68	425
6.5	72	450
7.0	75	475
7.5	79	500

Note : 2.8 g Ca and 2 g P should be given per kg of milk produced.

**Minerals:** There are about 20 minerals which are essential for animals. Calcium, Phosphorus, Sodium, Chlorine, Magnesium, Iron, Copper, Cobalt, Iodine are of special mention, which should be adequately ensured in the ration of the animals. Of these the requirements of calcium, phosphorus are always high. Calcium is generally more in green fodders while phosphorus in concentrate feeds. Magnesium is a specific requirement of Jersey animals. Common salt provides both sodium and chlorine and should always be fed to animals. Mineral mixture is fed to animals to make sure their required intakes. About 30-60 g mineral mixture is fed daily depending on age and production of the animal.

Composition of the mineral mixture for dairy animals

Sr.No.	Ingredient	Parts per 100 kg
1.	Dicalcium phosphate/ Sterilized bone meal	57.000
2.	Calcium carbonate	10.000
3.	Sodium chloride	30.000
4.	Magnesium carbonate	2.100
5.	Ferrous sulphate	0.250
6.	Copper sulphate	0.250
7.	Cobalt sulphate	0.050
8.	Potassium iodate	0.250
9.	Zinc sulphate	0.250
10.	Manganese sulphate	0.100

**Vitamins:** There are about 15 vitamins needed by animals. However, for dairy animals only vitamin A, D, E and K are dietary essential. Most of the green fodders are rich in these vitamins. A vitamin mixture is generally fed when green fodder is not available or is available in limited quantities.

### Formulation of economical and balanced rations

The ration of the animals can be divided into two parts i.e. maintenance ration and production ration. The maintenance ration takes care of the body needs of the animal, whereas the production ration is utilized for the products which animal is to produce. The main product of dairy animals is milk. However for growing animals, gain in body weight and for pregnant cows growth of foetus also come under this category. The maintenance and production requirements are added together before formulation of daily allowance of the animals.

The nutritionists formulate rations for animals keeping into consideration four points namely, maintenance need of animal which depends on body weight, production need of animal which depends on quantity and quality of the product to be produced, the availability of the different fodders, feed ingredients as well as by-products and nutrients available from these fodders and feeds.

The nutrients available from different fodders are given below. Some examples are given for formulation of economical and balanced rations.

Average nutritive value of common feeds and fodders on fresh weight basis:

Feed Ingredient	Moisture (water)	CP (%)	DCP (%)	TDN (%)	MR (Mcal/kg)
<b>(a) Concentrate feeds/by-products</b>					
Maize	10	9.0	7.2	82	2950
Barley	10	9.5	8.0	75	2700
Jowar	10	7.2	6.0	70	2520
Bajra	10	6.6	5.5	65	2340
Gram	10	14.4	12.0	80	2880
Wheat	10	12.8	10.5	80	2880
Oats	10	10.4	8.0	75	2700
Wheat bran	10	15.0	12.0	60	2160
Rice bran	10	9.6	5.0	65	2340
Maize husk	10	4.8	4.0	60	2160
Gram husk	10	0.6	0.5	55	1980
Cotton seed	10	14.4	12.0	85	3060
Brewer's dried grain	10	18.0	15.0	52	1872
Groundnut cake		45.0	40.0	75	2700
Sarson cake	10	36.0	30.0	74	2664
Cotton seed cake	10	21.6	18.0	70	2520
Til cake	10	45.6	38.0	78	2808
Linseed cake	10	37.2	31.0	65	2340
Maize cake	10	21.6	18.0	74	2664
Toria cake	10	33.6	28.0	68	2448
Triticale	10	14.0	11.0	75	2700
<b>(b) Green fodders</b>					
Berseem :					
1st cut	90	1.8	1.5	10	360
2nd cut	85	2.4	2.0	12	432
3rd cut	80	2.6	2.2	15	540
4th cut	78	3.0	2.5	17	612
Jowar:					
Young	80	0.9	0.8	11	396
Prime	75	0.6	0.5	16	576
Ripe	70	0.3	0.2	20	720

Maize:					
Young	75	1.8	1.5	17	612
Prime	72	1.5	1.2	18	648
Oats	75	1.8	1.5	17	612
Bajra	70	1.2	1.0	15	540
Elephant grass	75	1.2	1.4	14	504
Hybrid napier					
bajra(NB 21)	75	1.5	1.2	15	540
Sudan grass	75	1.0	0.8	15	540

  

(c)Dry hay, straw and silage:

Berseem hay	10	15.0	12.0	60	2160
Wheat straw	10	3.0	0.0	40	1440
Oat straw	10	7.2	6.0	55	1980
Rice straw	10	2.5	0.2	40	1440
Maize Kadbi	15	1.8	1.5	40	1440
Jowar Kadbi	15	1.2	1.0	40	1440
Bajra Kadbi	15	1.2	1.0	40	1440
Sugarcane tops	30	1.2	1.0	42	1512
Dub hay	15	4.2	3.5	45	1620
Local grass hay	30	4.0	0.0	42	-
Guinea grass hay	-	11.2	5.8	51.5	-
Green panic hay	-	7.1	3.1	53.9	-
Maize silage	60	1.2	1.0	18	648
Oat silage	60	1.4	1.2	18	648

### Example I

For a heifer weighing 200 kg and growing @ 600 g per day, the nutrient requirements are:-

DM	=	5.0 kg
DCP	=	556 g
TDN	=	3.14 kg
Fodder available	=	green berseem (2nd cut)

Daily feeding allowance :

	DCP(g)	TDN(Kg)	DM(Kg)
Green Berseem(15 kg)	360	1.80	2.25
Concentrate mixture (1.25 kg)	200	0.90	1.20
Wheat straw(1.5 Kg)	3	0.60	1.35
<b>Total</b>	<b>563</b>	<b>3.30</b>	<b>4.80</b>

### Example II

A cow weighting 450 lit. and producing 15 kg milk with 4 per cent fat.

Nutrient requirements :

DM	=10-12 kg
DCP	=250 + 825 = 1075 g
TDN	=4.0+4.9 = 8.9 kg

Green fodder available : Green maize

Daily feeding allowance:

	DCP(g)	TDN(Kg)	DM(Kg)
Green maize (30 kg)	450	5.1	7.5
Concentrate mixture (5 kg)	750	3.8	4.5

Total	1200	8.9	12.0
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It may, however, be difficult to make specific calculations for each and every animal. Thus, a ready reckoner or some thumb rules are easier to use in large herd.

### Example III

Compute a ration for a Jersey cross-bred cow weighing 400 kg, producing 20 litres of milk with 4 per cent fat.

Nutrient requirements

	Dry matter	DCP	TDN
Maintenance	17.5 kg	0.250 kg	3.10 kg
Milk production	-	1.000 kg	7.10 kg
<b>Total</b>	<b>17.5 kg</b>	<b>1.250 kg</b>	<b>10.20 kg</b>

Daily feeding allowance:

Source	Quantity (kg)	DM (kg)	DCP (kg)	TDN (kg)
i. Green oats/ green maize/or hybrid sorghum silage	42/25	8.5	0.340	4.67
ii. Green berseem/ clovers	33	5.0	0.450	3.00
iii. Concentrate feed*	4.4	4.0	0.520	2.80
<b>Total</b>		<b>17.5</b>	<b>1.310</b>	<b>10.47</b>

\*DCP-16%, TDN-75%

### Maintenance and production need of animals

About 30 kg green fodder such as berseem, lucerne, maize, jowar or bajra will meet maintenance need of a 400 kg cow or buffalo. For heavier animals, say about 500 kg cow, 40 kg green fodder will be enough. It is desirable to mix some wheat straw (about one-tenth of green fodder) with green berseem or lucerne because these fodders are high in protein and their dry matter content is low. The requirement for milk production or that of growing calves is met by feeding green fodder as well as a balanced concentrate mixture. Some of the examples are given below :

**Example I:** Practical type of ration for a Jersey crossbred cow weighing 300 kg, producing 5-6 litres of milk with 5% fat.

Nutrient requirements

Dry matter (Kg)	DCP(Kg) Maint. + Prod.	TDN (Kg) Maint. + Prod.
8-9(2.5-3% of body wt.)	0.168+0.372 = 0.540	2.65 + 2.25 = 4.90

Daily feeding allowance:

- i. Provide *ad lib.* Wheat straw or hay or paddy straw.
- ii. Green fodder and concentrate feeding may be adjusted as below :

A		B	
Green berseem(kg)	Conc. feed(kg)	Green oats/ green maize(kg)	Conc. feed(kg)
-	4.0	-	4.0
or 10	3.0	or 10	3.5
or 20	2.0	or 20	3.0
or 30	1.0	or 30	2.5
or 40	-	or 40	2.0

**Example II:** Practical type of ration for Jersey crossbred cow weighing 300 kg, producing 10 litres of milk with 5% fat.

Nutrient requirements

Dry matter (Kg)	DCP(Kg) Maint. + Prod.	TDN (Kg) Maint. + Prod.
9-10(3% of body weight)	0.168 + 0.620 = 0.788	2.65 + 3.75 = 6.40

Daily feeding allowance :

- Provide *ad lib.* wheat straw or hay or rice straw, and
- Green fodder and concentrate feeding may be adjusted as below :

A		B	
Green berseem (kg)	Conc. feed (kg)	Green oats/ green maize (kg)	Conc. feed (kg)
10	5	10	5.5
or 20	4	or 20	4.5
or 30	3	or 30	3.5
or 40	2	or 40	2.5
or 50	1	or 50	1.5

**Example III :** Practical type of ration for a Jersey crossbred cow weighing 400 kg, producing 10 litres of milk with 4% fat.

Nutrient requirements

Dry matter (Kg)	DCP(Kg) Maint. + Prod.	TDN (Kg) Maint.+ Prod.
11-12(3% of body weight)	0.223 + 0.550 = 0.773	3.55 + 3.25 = 6.80

Daily feeding allowance :

- Provide *ad lib.* wheat straw or hay or rice straw, and
- Green fodder and concentrate feeding may be adjusted as below :

A		B	
Green	Conc.	Green oats/ green maize	Conc.

berseem (kg)	feed (kg)	green maize (kg)	feed (kg)
-	5.5	-	5.5
or 10	4.5	or 10	5.0
or 20	3.5	or 20	4.5
or 30	2.5	or 30	4.0
or 40	1.5	or 40	3.5
or 50	-	or 50	3.0

## Concentrate mixture

A concentrate mixture is prepared by mixing certain feed ingredients such as cereal grains, oilseed cakes and other agro-industrial by-products to balance energy and protein contents according to the need of animals. Generally, two types of concentrate mixtures are prepared. One which contains lower amount of DCP(10-12%) and is fed alongwith leguminous fodders such as berseem, lucerne and soybean and the second which contains higher amount of DCP (14-16%) and is fed alongwith non-leguminous fodders, such as green maize, bajra, chari etc. One example of each type is given below:

Composition of concentrate mixtures

Ingredient	I	II
	12 -13% DCP	15-16% DCP
1. Maize/wheat/wheat shorts/triticale	15	20
2. Barley/oats/bajra/jowar	5	5
3. Groundnut cake/til cake/mustard cake/ soyaflakes	10	15
4. Linseed/decorticated cotten seed cake.	5	10
5. Wheat bran/deoiled rice bran(50:50)	58	43
6. Molasses	5	5
7. Mineral mixture with salt	2	2

## Green fodder requirement

Farmers growing their own green fodder can produce cheaper milk by feeding higher amount of green fodder and meeting maintenance as well as production requirement of animals. Scientific research has shown that up to 10 kg of cow milk/7 kg of buffalo milk can be obtained easily by feeding highly nutritious green fodder/high quality silage to these animals. Such cows and buffaloes can consume up to 80 kg of succulent green fodder per head per day. However, the quality of green fodder should be good, i.e. pre-flowering stage. Early cuttings of berseem should be mixed with wheat straw in the ratio of 9:1 to save the animals from tympany (Bloat). For very high milk producing cows such a high amount of green fodder should not be fed, otherwise they will not be able to consume enough concentrates for extra milk production.

## Production needs of animals

As a thumb rule, 1 kg of concentrate mixture is fed for each 2 lit. of buffalo milk and 2.5 lit. of cow milk. This difference is because buffalo milk contains higher amounts of fat as compared to cow milk. This amount is calculated after meeting maintenance requirements of the cow.

## Urea feeding

Urea can replace 1/4th to 1/3rd of protein on nitrogen basis. It can be used as a source of protein at 1-2% level in the concentrate mixture. Care should be taken to mix urea thoroughly and uniformly with the feed, avoiding localised concentration and include readily available source of energy such as grains and molasses. Feed the concentrate mixture containing urea in small quantities at frequent intervals. Carelessness in urea feeding may be harmful to the animals. Urea

bags should be kept away in a separate room to avoid accidental mixing. Urea containing ration should be fed to ruminants only above 6 months of age.

**Uromol/Urobran :** Uromol has been recommended for efficient and safe feeding of urea. Ration can be made cheaper, if uromol or urobran is used in the concentrate mixture and it can replace the cakes. The uromol is prepared by boiling urea with molasses in the ratio of 1:3 for half an hour and mixed with almost equal amount of rice bran, deailed rice bran or wheat bran before the product becomes cold. This can be used at 1/3 level in the concentrate mixture by replacing oilseed cakes, as given below :

<u>Ingredients</u>	<u>Parts per 100</u>
Cereal grains, like maize, wheat etc.	20
Rice kani, broken wheat barley etc.	30
Wheat bran or rice bran	20
Uromol (urobran)	28
Mineral mixture with salt	2

Urea or uromol containing ration should not be fed to monogastric animals like pigs, poultry and calves below 6 months of age. The animal should be gradually put on the concentrate mixture in two weeks period.

#### **Other ways of using urea for economical feeding:**

(i) The uromol can be impregnated on dry wheat straw to increase its CP contents. While still hot, boiled mixture of urea-molasses (7 kg urea + 21 Kg molasses) should be dissolved into 100 litres of water and can be sprayed over 200 kg of chopped wheat straw or kadbi. Raking should be done for uniform distribution of uromol solution. Dry the impregnated straw in the sun and store it. This can be fed to the animals as maintenance ration.

(ii) Dissolve 14 kg urea in 800 litres of water and sprinkle the water on 400 kg of wheat bhusa/kadbi thoroughly and stack the wheat bhusa for 10 days pressing it well. After 10 days, the stacked wheat bhusa should be dried and can be fed to the animals as maintenance ration. These two methods increase crude protein contents of wheat straw to about 10% CP and help in saving concentrates for maintenance purpose.

(iii) **Uromin lick:** Brick shaped uromin licks weighing about 3 kg each and containing urea, molasses, minerals, vit. A+D<sub>3</sub> and some feed binders can be prepared. These licks are kept in the feeding troughs of animals. These licks are especially useful to correct the protein energy, minerals and Vit. A.D<sub>3</sub> malnutrition, that generally occurs in field herd.

Preparation of uromin lick : In a big sized iron pan, 400 g urea and 1200 g molasses are mixed together and boiled for half an hour in the same way as for preparation of uromol. While the contents are still hot, the premix of mineral mixture 600 g, salt, 400 g, starch 600 g, deoiled groundnut cake 400 g, deoiled rice bran 400 g, INDOMIX AD<sub>3</sub> (5 lit : 1 Lit/g) 50 mg and bentonite 100g are added to it and mixed well. Then put the whole contents in a brick shaped die and apply pressure till the contents are cool. Thus a hard brick shaped uromin lick is ready. Keep it in a polythene cover until use.

#### **Utilization of some by-products in livestock feeds**

(i) **Apple Pomace:** It is a by-product of apple juice industries having 4-5% crude protein and 18.7% crude fibres on dry matter basis and can be used in the concentrate feed of dairy animals by replacing 50% of grains like maize, wheat, rice kani etc.

(ii) **Malt Sprouts:** It is a by-product of beer industry having 24.5% crude protein as well as 14.5% crude fibres on dry matter basis, and has been found to replace 50% of cereal by-products like rice kani, wheat bran in the concentrate feed of dairy animals.

(iii) **Kainth (*Pyrus pashia*) fruit meal:** Kainth fruit is a product of wild kainth plan commonly growing in the wastelands. The dried kainth fruits have been found as an excellent source of energy for the growing calves when replaced @ 10% in the concentrate feed for rice kani, barley or maize. This material has also been found as a good source of energy for poultry birds.

(iv) **Watercress plant (*Nasturtium officiale*) meal:** It is perennial much branched aquatic herb in floating water with creeping & floating stems and is commonly found in ditches, pools and margins of shallow streams up to an altitude of 2100

m. The dried meal of this aquatic plant contains 24.78% crude protein, 15.12% crude fibres, 3.19% calcium, 2.35% phosphorus, 52.46% neutral digestible fibres(NDF) and a good assortment of micro nutrients. It has been found a good replacement for cereal byproducts like rice bran, wheat bran in the concentrate feeds of calves and dairy cows. It has also been found suitable @ 10% in the diets of grower chicks as a replacement of rice bran and groundnut cake.

(v) **Dried poultry droppings:** This material contains uric acid and some undigested feed proteins and feed drop-outs. This is available from the poultry farms where cage rearing management is followed. The droppings contain CP 23.6%, CF 16.50% silica 8.3%, ether-extract 2.5%, calcium 3.86% and phosphorus 1.42% on dry matter basis. The dried material can be mixed upto 20% in concentrate mixture of dairy animals by replacing wheat bran and mustard cake.

## Conservation of fodders

In Himachal Pradesh, most of the green fodder is available during the monsoon season. This green fodder is usually in the form of local grasses and cultivated maize, bajra, either alone or in combination with cowpea or soybean. During the winter season, the green and nutritious forages like berseem or leucerne are usually in short supply and the animals are maintained either on poor quality hays or straws (by-products of wheat, paddy & maize crops) and some fodder tree foliages that are also limited in supply. Under such feeding regimens, the dairy cattle production is adversely affected due to the non-availability of balanced fodders. The cultivable area under fodder crops in the Pradesh is highly limited (0.75%) and its diversion to fodder crops is also untenable because the first priority is cereals for food production for human population. Therefore, it becomes essential to augmenting the nutritive value of grasses by the available scientific methods. There are two scientific ways to conserve the surplus herbage to meet the balanced needs of animals.

- i. Hay making
- ii. Silage making

### Hay making

Hay is any forage crop cut before it is actually dead ripe and suitably dried for storage. It is more nutritious and palatable than straw, because the entire crop is cut at the proper vegetative stage of growth (strictly before maturity) and scientifically desiccated. High quality hay is made from fine-stemmed grasses and legumes, harvested at the right stage of growth and dried in such a way as not to lose any of the nutrients. It is leafy, pliable, green in colour and free from mould, weeds, dust and has a pleasant characteristic smell and aroma.

The preservation and storage of surplus herbage has become an important activity for the balanced feeding of animals and the purpose in making hay is to produce a dried product of high quality. Quality is a combination of chemical, physical and biological properties that influence the intake, digestion and utilization of the forages that further determine the growth and productivity of the animals consuming them.

To produce a high quality hay, at least two conditions must be observed viz. good forage must be harvested at a proper stage and it must be dried with minimum loss of nutrients.

**Quality of the herbage to be made into hay :** The chemical composition and nutritive value of standing herbage at any one time is influenced by genetic and environmental factors that are highly interrelated. Genetic factors determine the species of plants, the strain within a species, the type of growth and the response to environmental factors. Some environmental factors include climate, weather and soil management. Because of the extreme variability of plants and of the wide range of environmental conditions, even in a limited geographical area, the chemical composition (nutritive value) of any plant at the time of cutting is unique and perhaps are not exactly alike for all types of plants.

**How to feed low grade roughages economically :** Good quality hays are better relished by the animals due to their better palatability, and little residues are left. But the weather conditions in this state are not only highly variable, but the artificial drying facilities are also highly expensive and thus the quality of hays is not usually good. The grasses normally available for hay making are also poor in quality and heavily lignified. Lot of straws and stovers, that are the residues of the crops like wheat, barley, paddy, maize, sorghum and bajra are abundantly available for feeding to the animals during the lean periods and nutritionally these are very poor. The low-grade roughages i.e. poor quality hays, paddy straw, maize, sorghum and bajra stalks can be utilized by ruminants more efficiently if they are suitably processed and the protein content is augmented by adding cheaper non-protein-nitrogenous sources and soluble carbohydrates. The following method is recommended for improving the palatability, intake and utilization of low-grade roughages by the ruminants:

- i. The grass hays, stovers, stalks and straws should be suitably chaffed to the size of 2.0 to 2.5 cm chops.

ii. The chaffed materials should be uniformly mixed with urea, mineral mixture and molasses in the following proportions :

Chaffed material	: 100 kg
Molasses	: 10 kg
Urea	: 1 kg
Mineral mixture	: 2 kg

Urea and mineral mixture should be well dissolved in about 10 L of water and then mixed with molasses. This solution should be uniformly sprinkled over the spread chaffed material and the mixing should be done thoroughly to have even distribution of the urea-molasses mixture.

iii. The mixed feed prepared as above can be fed immediately or can be preserved after proper drying in sun.

**Precaution :** Urea should be well dissolved in water before mixing with molasses and thereafter uniformly mixed with the chaffed material assuring its uniform distribution in the chaffed material.

### Silage making

Silage is the term used for the product formed when suitable green herbage is stored and is allowed to ferment anaerobically. Ensilage is the name given to the process and the container used, is called silo. The fermentation is controlled either by encouraging the formation of organic acids (mainly lactic acid) by bacteria present on the fresh herbage or by direct addition of acids or preservatives. In both the cases, the first objective is to achieve and maintain anaerobic conditions and the second is to discourage clostridial fermentation that leads to the production of CO<sub>2</sub> NH<sub>3</sub> and undesirable nitrogenous compounds such as amines. The practice of anaerobic conditions can be achieved by having suitable type of silos i.e. sealed plastic silo, tall tower type silo or open type bunker silo. The efficiency with which anaerobiosis can be obtained depends upon the degree of consolidation and final sealing. The clostridial activity can be checked by ensiling green crops having 28% or more dry matter and by encouraging lactic acid fermentation or by adding specific additives.

**Crops suitable for silage:** There are many kinds of silages as there are crops and crop mixtures. The crop to be used for making silage should have an adequate amount of fermentable carbohydrate contents, carry suitable type of microbial population and should have the ability to achieve and maintain anaerobic conditions in the silo. Common crops used for silage making are, maize, sorghum, bajra or their admixture with cowpea and soybean, green grasses or their admixtures with suitable legumes, green oats or admixture with peas. When properly made, silage is not only palatable but also nutritious having an agreeable flavour and high carotene contents. The loss of nutrients is comparatively much less than when the green crops are cured as hay.

**How to make silage:** The quantity of silage required for a farm depends upon the herd strength and the period for which to be fed. For a unit of ten animals, approximately 250 qtls of silage is required for feeding for four months. Under Indian conditions, bunker silos are ideal for the making of good quality silage. Only the kharif fodders and grasses are available in plenty, which can be conserved for feeding during the winter months. These fodders and grasses are usually poor in crude protein content and therefore the addition of non-protein-nitrogenous sources can be made in the presence of soluble carbohydrates from molasses. Two silo bunkers of the dimensions of 15' x 9' x 6' each, will be sufficient to preserve 250 qtls of silage from maize, sorghum, bajra or green grasses or green oats. The site of the silo bunker should be located at a comparatively elevated spot. The bunker may be concrete or earth work and the later should be suitably lined at the bottom and sides with a polythene sheet or a layer of grass. The silage crop should be suitably chaffed to a chop size of 2 to 2.5 cm. The following quantities of additives may be added :

S.No.	Silage crop	Additives
1.	Green grasses or maize, sorghum, bajra, teosinte or their mixtures	5 to 10% of molasses and 0.3% urea (fresh weight basis).
2.	Legumes and grasses mixture.	5 to 8% molasses

The dry matter per cent of the crop should be in the range of 28 to 35%, which can be brought about, if needed, by wilting for a smaller duration (preferably not exceeding 12 h) or by spraying with 0.2% formic acid of 85% strength) or 0.40% formaldehyde, uniformly mixed with molasses.

The chooped crop should be well packed in silos with the uniform mixings of urea-molasses solution. The consolidation of the silage material should be done either manually or with suitable machinery so as to ensure maximum exit of entrapped air. The piling should be continued to 2' above the height of the walls and should be given dome-shaped appearance, which may be covered with a polythene sheet or a thick layer of dry grass followed by earth layer (2"-3") and mud plaster. Any cracks appearing in the mud plaster should be repaired regularly to avoid entry of rain water. The silage, thus conserved, will be fit for feeding to the herd after about 8 weeks.

## Management of Dairy Cattle

### Care and feeding of dry and pregnant cow

Dry off the cow 60 days before calving by withholding concentrate and reducing green fodder supply for 5-7 days and stop milking abruptly. Infuse intra-mammary long acting antibiotics meant for dry therapy. During the last quarter of pregnancy, feed the cow as per following schedule to meet the requirements for the rapid growth of the foetus, mammary development and to recoup body reserves, necessary for better milk production in the coming lactation. Give 1 kg extra concentrate ration as growth allowance to heifers upto 2 lactations..

Two weeks before calving, separate the cow from the general herd and keep in disinfected calving pen. Provide comfortable bedding for pregnant cow. Pregnant animals should not be allowed to move long distances. Avoid transportation of the pregnant animals. Check overcrowding and slipping. Prevent injury to the udder as it distends near calving.

#### Ration for dry and pregnant cows/buffaloes

Ingredients	When ample green fodder is available	When less green fodder is available	When scarcity of green fodder
<b>A. Ration for dry cows/buffaloes</b>			
Green fodder (kg)	30-35	10-12	2-3
Straw/stover* (kg)	6-7	8-9	8-9
Concentrate mixture(kg)	1.0	3.0	4.0
<b>B. Ration for pregnant cows/buffaloes</b> (Three months before calving)			
Green fodder(kg)	30-35	10-12	2-3
Straw/stover* (kg)	6-7	8-9	8-9
**Concentrate mixture(kg)	2-2.5	4.5-5.0	5-6

\*Straw/stover to be given only with legume fodders/biul or robinia leaves.

\*\*With leguminous fodders concentrate mixture-I and with non-leguminous fodders concentrate mixture-II should be given.

### Care during calving

Normally, the calving should occur within one hour after the rupture of water bag. If there is delay or other complication, veterinary aid should be sought. After delivery give the cow bucketful of fresh luke-warm water containing 50 g of common salt followed by warm-mash containing 2 kg of wheat dalia and 1 kg gur twice a day for the first four days after calving. It is better to tie the animal till the expulsion of placenta which is likely to occur within 8-12 hours after calving. It should be disposed off and pen should be properly cleaned. If the placenta is not expelled within 24 hrs. or so, seek the help of veterinary doctor. Some animals especially crossbreeds develop edematous swelling on udder or other part of body that is just a normal phenomenon and usually disappears within one week after calving. However, if the swelling is hard, warm and painful, it should be got treated. Wash the udder with luke warm water containing a mild solution of potassium perma-

nganate. Every effort should be made to milk the cow within 2 hr. Avoid complete milking during first 2-3 days in high yielding animals after calving.

### Care and feeding of new born calf

Clean and dry the calf with a clean dry cloth. Cut the naval cord by leaving 10 cm with a sterilized scissors. Disinfect it with tincture iodine and insert a cotton swab soaked in tincture iodine in the naval cord and tie the free end with a sterile thread. The naval cord should be painted with tincture iodine or dettol 2-3 times a day till the naval cord dries up. Help the calf to stand and direct it towards mother's teats. Feed colostrum to the calf within two hours of birth.

#### Feeding schedule for crossbred and buffalo calves (per day)

Age	Milk (L)	Skim milk (L)	Calf starter	Godd quality green fodder
0-3 days	2.5 (Colostrum)	-	-	-
4-7 "	2.5 (Milk)	-	-	-
2 weeks	3.0	-	0.100	<i>Ad. lib.</i>
3rd "	3.250	-	0.300	-do-
4th "	3.000	-	0.400	-do-
5th "	1.500	1.000	0.500	-do-
6th "	-	2.500	0.650	-do-
7th "	-	2.000	0.800	-do-
8th "	-	1.750	1.000	-do-
9th "	-	1.250	1.200	-do-
10th "	-	-	1.300	-do-
11th "	-	-	1.400	-do-
12th "	-	-	1.500	-do-
13th "	-	-	2.000	-do-

#### Feeding schedule of Jersey and crossbred calves with milk replacer

##### Milk with calf starter

a) Up to 40 Kg body weight : Whole milk @ 10% of body wt.

b)	S.No.	Body wt. (kg)	Whole milk (L)	Calf starter (g)
	(i)	40-45	2.5	275
	(ii)	45-50	3.0	275
	(iii)	50-55	3.5	300
	(iv)	55-60	4.0	250
	(v)	60-65	4.5	200
	(vi)	65-70	5.0	175

S.No.	Age of the calf	Colstrum	Milk	Milk replacer
(i)	Upto 3 days after birth	1/20th of B.W.	-	-
(ii)	4-8 days	-	1/10th of B.W.	-
(iii)	9-13 days	-	-do-	50 g
(iv)	13th to 33 days assess the requirements after 4 days i.e. record B.W. of calves twice a week.	-	1.4 L min.	Balance milk quota @ 1/10th of B.W. will be replaced with milk replacer viz. 100 g per 0.5 L of milk.
(v)	33 days onwards- assess the requirements weekly by recording B.W. of calves.	1.0 to 1.4 L min.	-do-	-do-

*Note : Milk replacer should be dissolved in warm (already boiled and cooled) clean water @ 100 g per 500 ml, before mixing with fresh milk and then fed to the calves.*

Colostrum should be given @ 1/10th of body weight of the calf. Colostrum from the mother should be fed 2 times during winter and three times during summer, a day for the first 3-4 days. In case the mother dies immediately after birth then in place of colostrum the calf should be given 5 ml of castor oil (for one day), 5 ml of fish liver oil and one egg twice daily for the first 4 days along with the milk from some other cow. Within 2 hours of first suckling, calf generally passes meconium (first faeces). If this does not occur, anaemia with a teaspoonful of sodium bicarbonate in one litre of luke warm water may be given.

Calves raised on a limited milk feed system must be encouraged to eat succulent fodder and concentrate at an early age, but at the same time do not overfeed them. From 15th day onwards, calf should be offered calf starter ration.

**Weaning:** In calves, weaning should be adopted. Separate the calf at birth. Weaning helps in recording the actual milk yield of the animal, regulates the milk feeding according to calf requirements, avoids injury to teats, checks the transmission of infectious diseases, and solves the problem of mother instinct in case the calf dies. To the weaned calves, feed fresh milk at body temperature (39<sup>o</sup>-40<sup>o</sup>C). Nipple feeding can also be practised.

**Disbudding:** Disbudding of buffalo calves and cow calves should be done between 7-10 and 15-20 days after the birth respectively with a red hot dehorner. Clip the hair around the horn and apply vaseline ring. Then put the red hot iron on the bud and move it in circle. Apply antiseptic cream on the wound.

**Identification:** Proper identification of the animals is necessary if the number of animals in the herd is large. In young calves tattooing in ears or tags in chains around the neck can be used for the identification of calves. In heifers or adult cows ear tags or branding can be followed.

Extra (super mammary) teats which give an ugly appearance and also interfere in milking should be removed at 1-2 months of age surgically. Clip the super mammary teats with disinfected curved scissors and apply antiseptic cream, if it is not too close to the normal teat, otherwise, take the help of veterinarian. Calves should be kept free from ectoparasites (lice, ticks) by grooming, washing, keeping them clean and by regular spraying of insecticides. Proper deworming and vaccination schedule should be followed.

**Care of heifer:** A target of 500-700 g daily weight gain of the dairy heifers can be obtained by feeding balanced ration of concentrate and good quality green fodder. The animal should attain 200-250 kg of body weight at 15 months of age and should have 300 kg weight at 18 months. Heifer should be observed for symptoms of heat after one year of age. If herd size is large, regular bull parading with vasectomized bull should be done.

**Care and feeding of the milking herd:** Animal should be shifted on normal concentrate mixture after 5 days of calving. Concentrate allowance should be increased gradually depending upon the increase in milk yield and the quality and quantity of green fodders available. Milking animals particularly the high yielders lose their body weight during first three months of their lactation. Milch animals should be fed concentrate and green fodder as given in the schedule.

#### Composition of calf starter and replacer (parts)

Sr.No.	Ingredients	Calf starter			CSKHPKV, milk replacer
		I	II	III	
1.	Wheat/wheat flour	10	-	30	10
2.	Maize	15	42	10	-
3.	Wheat bran	25	20	10	-
4.	Groundnut cake	25	20	-	9
5.	Fish meal (Jawla type)	5	7	7	12
6.	Molasses	5	-	-	10
7.	Soyafakes	12	8	10	10
8.	Sesamum cake	-	-	-	10
9.	Coconut oil	-	-	-	7
10.	Linseed	-	-	-	14
11.	Citric acid	-	-	-	3

#### A. Composition

12. Butyric acid	-	-	-	300 ml
13. Mineral mixture	3	3	3	3
14. Hyblend/ Rovimix	25g	25g	25g	25g
15. TM 10	300g	300g	300g	300g
16. Linseed cake	-	-	30	-

#### B. Comparative performance:

1. Body wt.at birth(kg)	19.48	-	-	21.50
2. Body wt. At 90 days(kg)	56.30	-	-	54.50
3. Gain in body wt.(kg)	36.82	-	-	33.00
4. Saving with milk replacer	Rs. 400/- per calf upto 90 days of age.			

### Clean milk production

Milking should be done in calm, clean area and if possible, in a separate milking barn. Pre-milking routines such as washing of cows, feeding concentrate, bringing the pails should be done at regular intervals. Before milking, the udder and teats should be washed with potassium permagnate solution in a separate bucket. Wipe the teats and udder with a dettol or potassium permagnate dipped cloth after milking. Milking should be done with full hand in 6-8 minutes completely, followed by stripping if so required. High yielders should be milked at the end to prevent spread of infection. Milking pails should be clean. When milking machine is used for milking, dip the teats in 50 per cent betadine + 50 per cent glycerine solution. Cool the milk to below 10°C till it is disposed off.

### Handling and care of milk

Immediately after milking, the milk should be transferred from the shed because milk is capable of absorbing odours from the atmosphere. Straining is done to remove large particles of foreign materials like straw, hairs, insects, grass, dust etc. It is done by use of strainer made of wire gauge or muslin cloth. After each use, the strainer should be washed and sterilized. Improperly washed and unsatisfactorily sterilized strainer will increase the bacterial population that will lower the keeping quality of milk.

**Cooling of milk:** The scientific reason for the cooling of milk is to keep down the number of bacteria to the barest minimum. A temperature of approx. 5°C will maintain the milk in this state. Cooling is done by various methods. Under farm conditions, the milk cans are kept in a tank containing cold water, the level of the water in the tank being above the level of the milk in the can. Milk should be transported to the collecting or selling point within 2-3 hours especially in summer months. Delay in this, without proper cooling will result in the production of acidity and curdling of milk. Transportation is done by filling it in cans. Each can should be full to avoid agitation and churning.

**Dairy utensils:** Various metals and their alloys are used for the manufacture of dairy utensils. Metals like iron, copper etc. are not suitable because they are soluble (in traces) and produce undesirable chemical changes resulting in odd flavour and taste. Heavily tinned copper, galvanised iron and chrome nickle steel are quite satisfactory but they are very costly. Aluminium and alminium alloys are the best under our conditions. They are comparatively cheaper, quite durable and free from action by milk constituents. These can be easily sterilized and cleaned.

**Cleaning of dairy utensils:** The most important aspect in the production of high quality milk is the cleaning and sterilization of dairy utensils. The dairy utensils should be cleaned immediately after use and dried. This will avoid the accumulation of milk residues which result in bad odour, accumulation of milk stones-crypts, rust, etc. on the can.

**Management of bulls:** After calthood, young bull should be given liberal amount of good quality foddors and concentrate mixture according to nutrient requirements as given below. Bull should be provided with less bulky foddors.

### Rations for breeding bulls and working bullocks

Category	Ration I		Ration II		Ration III	
	Legume/ green fodder (kg)	Straw/ stover (kg)	Conc. Mix-I (kg)	Non- legume green Hay fodder (kg)	Straw/ stover (kg)	Conc. Mix II (kg)
18-24 months	30-35	2	1.0	20-25	3-4	3
24-30 months	35-40	3	1.0	35-40	4-5	3
Bulls (in service)	35-40	3	2.5	35-40	4-5	5
Bulls(not in service )	35-40	3	1.5	35-40	4-5	4
Bullocks (normal work)	35-40	3	1.5	35-40	4-5	4
Bullocks (heavy work)	35-40	2	2.5	35-40	4-5	5

*Note : Upto 18 months, same feeding schedule should be followed as mentioned for calves and growing heifers.*

**Cattle Housing:** Semi-loose housing system is the most suitable. In this system, animals are tied at the time of feeding, milking and treatment while for rest of the time they are kept loose. This system is recommended because it covers disadvantages of tying (conventional) and loose housing systems. Lengthwise direction of animal house should be east-west with feeding manger towards north.

**Space requirements:** Each adult animal requires 12-14 sq.m space, out of which 4.25 sq. m. (3.5 x 1.2 m) should be covered area and 8.6 sq. m. open area. Provide 1.80-2.25(1.8 x 1.2m) sq. m. for each calf upto 3 months of age and from 3 months to one year provide 2.70-3.25 sq. m. covered area and 6.0 sq. m. open area.

**Manger:** For adults, the manger should be 75 cm wide, and 40 cm deep, the height of forewall and hindwall should be 75 cm. and 130 cm., respectively. The inner side of manger should be rounded and plastered with cement. For young calves the manger should be 50 cm. wide, 30 cm. deep and the height of the forewall should be 45 cm.

**Floor:** The standing platform should be 180-210 cm. in length and 120 cm. manger space should be provided to each animal. A slope of 2.5-4 cm should be given from manger to gutter for easy drainage. Standing floor should be made of concrete or bricks laid with cement. The floor should not be slippery and should have groves. Open area should be laid with bricks. If the farmer is unable to have the open area with bricks, have the area with bricks round the gutter and water trough.

**Gutter:** It should be 30-40 cm wide, 5-7 cm. deep and its ends be rounded, give a slope of 2.5 cm. for every 1.2 m. for efficient drainage.

**Wall and pillars:** The boundary wall should be 1.5 m high, thickness of wall may be 22.5-32.5 cm. and pillars should be 30x30 cm.

**Summer management:** In summer, provide adequate amount of fresh cold, and clean drinking water. Plant shady trees around the sheds and give water bath 3-4 times a day to buffaloes. Install fans and desert coolers for high yielding animals. Give good quality of leguminous and non-leguminous fodders to the animals. Sprinkling of water in the shed also reduces the heat stress. Increase the protein content in animals' ration by 3 per cent.

**Winter management:** In winter and during rains, keep animals under cover especially at night. It may be desirable to provide individual bedding daily to young calves. Give extra feed having more energy during extreme cold. Maintain sanitary conditions in and around the cattle shed. To prevent chilly winds at night, the sides of sheds should be closed by providing curtains of gunny bags or polythene sheets.

## GOAT PRODUCTION

**Reproduction:** The oestrus cycle is 18-20 days and the duration of the estrus is 12-48 hours. The signs of estrus are that the doe becomes very restless. There is wagging of tail and frequent bleating. There is swelling and slight reddening of genital openings and discharge of mucus. Sometimes one goat tries to mount the other. The bringing of buck every morning during the breeding season is helpful for picking up those goats that are in heat. The time of insemination/mating is towards the end of estrus, generally 10th to 15th hr after the first appearance of heat. Gestation period is 145-153 days. The incidence of estrus is from May to October. Generally, Indian goats kid twice in a year. For milch purposes, it is better to have the kidding once in a year, as kids attain better health and lactation period is prolonged. Sexual desire in the female has been noticed at an age of 14 weeks. Puberty is attained at an age of 11-13 months depending upon the body weight, climate and nutrition. In the male, the libido can be observed at 4-5 months of age, but the bucks should be used for breeding purpose at 18-24 months of age. One buck will be sufficient to serve 40 does. The buck, if fed adequately remains fit for breeding till 7-8 years of age.

### Artificial insemination

i) **Semen collection:** The semen from the buck can be collected twice in a week. Artificial vagina is used for collection of semen. The normal volume of semen is 0.5 to 1.5 ml. The colour is creamy or thick creamy white or without yellowish tinge. The concentration of sperms varies from 2-6 million/cmm. The mass activity of the semen is ++++. The semen can be extended with Tris extender.

ii) **Composition of extender:** The composition of the extender is Trishydroxymethylamine methane 3.03 g, citric acid 1.63 g, Fructose 1.25 g, and distilled water 100 ml. Add 10-20% egg yolk and antibiotics at usual rate as for bull semen. The semen can be stored with about 60% motility at 3-5°C for 3-4 days. The dilution (extension) of the semen can be made in the ration of 1:1 to 1:10 depending upon the number of sperms required in one dose. The number of sperms should be 50-150 million in one dose. The dose of the semen can be 0.1 to 0.5 ml.

iii) **Equipment for insemination:** The equipments used include a metal speculum (20 cm. long and 2.5 cm. wide), micro pipette (30 cm. long) and 5 ml. plastic syringe with rubber adapter.

For artificial insemination, the hind quarter of the animal is raised to about 50 cm. (this can be done by an attendant or A.I. crate). Properly lubricated speculum is inserted into the vagina and the cervix is located. Pipette loaded with semen is introduced into the cervix up to a depth of 0.5 to 1 cm. and semen is deposited there. After deposition, it is advisable to retain the animal in hind quarters raised position for 5 minutes for better chances of conception.

### Signs of approaching kidding

The signs of approaching kidding are raising base of tail, sharp hollows at the flank region on either sides, rapid cud chewing, restlessness and pawing at bedding, low plaintive bleating, rapidly filling udder turning pink and shiny just before kidding and a mucous discharge from highly enlarged and edematous vulva. When these signs are exhibited, transfer the animal immediately to a kidding pen and observe it closely.

### Kidding

Kidding pen should be clean and roomy. The floor must be dry with sufficient bedding. Kidding pen should be quiet and free from external disturbances. The doe should be under close observation. Parturition occurs in three stages. The first stage is uterine contractions for a duration of 2-6 hr. The doe becomes anxious and restless, breathes heavily, frequently gets up and lies down, looks inquisitively and there is thick vaginal discharge. In the second stage, the expulsion of fetus takes place and the duration is 1/2 to 1 1/2 hr. First the water bag breaks and the fluid comes out. Animal shows forceful abdominal contractions, fetal parts appear at the vulva and kidding takes place. The process repeats when there are more kids. Care should be taken to prevent wedging of rear quarters against wall or corners. If the kids are not born within 2 hr. after the onset of second stage, help from qualified veterinarian may be sought. In stage three, there is expulsion of placenta. Do not allow the hanging of placenta to twist around the body or legs of the doe. Prevent eating of placenta by dam. If placenta is not expelled within 12 hr., aid of the expert should be sought.

### Nutrition

The nutritive requirement for growth of kids weighing 10-30 kg and growing at the rate of 50 g/day, and those for maintenance, as recommended by ICAR (1985), are given in tables below :

### Nutritive requirements of kids (growth rate 50 g/day)

Live weight (Kg)	DM (g)	DCP (g)	TDN (g)	Ca (g)	P (g)
10	425	25	275	1.8	1.1
15	600	30	350	2.0	1.2
20	700	35	400	2.4	1.4
25	800	40	450	2.6	1.5
30	950	45	500	2.9	1.6

### Nutrient requirements for maintenance of goat

Live weight (kg)	DM (g)	DCP (g)	TDN (g)	Ca (g)	P (g)
30	900	35	400	2.0	1.0
40	1200	40	500	2.5	1.2
50	1400	45	560	2.7	1.4
60	1600	55	670	3.0	1.6
70	1800	60	760	3.5	1.8

To meet the requirements for growing foetus in advanced pregnancy and spermatogenesis in males during breeding season, an extra allowance of 55 g DCP, 400 g TDN, 2 g calcium and 1.4 g phosphorus over and above the maintenance is needed. For each litre of milk produced, the goat should be provided 70 g DCP, 350 g TDN, 3.0 g calcium and 2.1 g phosphorus in addition of maintenance.

The formulation of ration is done in a similar pattern as is given for cattle. The cattle concentrate can be fed to goats. The mineral mixture used for cattle can be used for sheep and goats also.

Some concentrate mixtures that can be used for young kids and young lambs are given as follows :

Sr.No.	Feed ingredient	Parts/100 kg
1.	Maize/barley/triticale	50.0
	Groundnut cake/linseed cake	20.0
	Wheat bran/rice bran	22.0
	Fish meal	5.0
	Mineral mixture	2.5
	Common salt	0.5
	2.	Maize
Bajra		10.0
Groundnut/lucerne/berseem meal		10.0
Fish meal		5.0
Wheat bran		20.0
Mineral mixture		2.5
Common salt		0.5

### Management

i) **Care of kids (birth to three months):** Immediately after birth, remove the mucus covering from the nose and mouth of kids and dry them with clean, disinfected cloth. Put them on a dry and bedded basket (already prepared for them). Squeeze out and cut the naval cord and apply tincture iodine/dettol etc. Wash the dams udder with mild solution of potassium permanganate to prevent infection. Normally the kids start sucking milk within 30 minutes after their birth. Disbud

the lambs and kids during second week after birth, with red hot iron and apply antiseptic cream to the wound. Provide legume hay, concentrate mixture and milk, as given in the following table:

**Feeding schedule for kids according to age and weight:**

Age group	Whole milk(L)	Conc. mixture (g)	Legume hay or green fodder (kg)
Birth-15 days	500	-	-
16 days- 1 month	500	50	0.050 or 0.250
1-2 months	400	100	0.150 or 0.500
2-3 months	200	150	0.350 or 1.500
3-4 months	200	150	0.600 or 2.500
4-5 months	-	100	0.750 or 3.000
6 months and above	-	100	1.000 or 4.000

Above 6 months :

1. Conc. Mixture 0.5 kg (when legume green is not available)
2. Berseem/green *ad lib.*

**Adult stock**

**Female**

1. Maintenance concentrate ration-500 g/head/day (when legume fodder is not available).
2. Production ration-330 g conc. mixture for every 1 kg of milk produced or part thereof.
3. Green fodder *ad lib.*

**Male**

1. Maintenance ration 500-g/head/day (when legume fodder is not available).
2. Green fodder *ad lib.*

Protect the young ones from rodents and crows. Deworm the young ones when they are one month old and regularly deworm them at alternate month or once in a quarter till the stock is disposed off. Control the external parasites by spraying malathion (0.5 to 1% solution). Use dipping bath when the flock size is large. Never overfeed the young ones. If scouring develop, reduce the milk to one fourth and add water containing a pinch of sodium bicarbonate. In severe cases, stop milk, give antibiotics, feed electral solution and start feeding milk slowly. Castrate all males (except from high yielding dams which should be reared as breeding males) at 2 to 3 months of age.

ii) **Care of the young stock (3 months to breeding stage):** Segregate males from females at three months of age. The three groups i.e castrated males, uncastrated males and the females should be kept separately because they differ in their requirements of all types. Trim the hooves regularly after 6 months of age.

iii) **Care of castrated males:** Feed them in such a way that they should gain minimum of 150 g body weight per day and fatten them with fattening ration at the age of 6 months.

iv) **Young breeding males:** Feed them green and hay as given in table. Concentrate mixture may be given to meet the nutritional requirement. Provide light exercise by making them to run for 15 minutes to half an hour. Clean their mouth and belly daily with ordinary soap and water to avoid infection from urination. Test the semen for fertility at one year of age. For breeding, use them lightly (not more than one doe per week) during the first breeding season after attaining one year of age. Keep them separately from adults to avoid fighting between them.

v) **Young breeding females:** Feed them with green and hay *ad lib.*; concentrate mixture should be given to meet the nutritional requirements. Normally, the young females show signs of estrus when they are 9 to 12 months old but they should be bred any time after 18 months or when they attain 2/3 of their mature body weight, which ever is earlier, but not before 15 months. Young ones should be fed extra concentrate mixture during breeding season to encourage ovaries to produce more ova.

vi) **Care of breeding males:** Feed them like that of young breeding males but with more quantities of roughages and concentrate mixture as they have grown in size with more weight. Provide moderate to heavy exercise depending upon the conditions of animal. Half an hour running will keep them fit for breeding. Feed the male *ad lib.*, two months before the breeding season as their feed intake is reduced during breeding season. In case of bucks, hairs around urethra should be trimmed at least once in a breeding season.

vii) **Care of breeding females:** After calculating the approximate date of parturition from the last date of service on the basis of average pregnancy period of 150 days, the animal should be separated from rest of the flock at least 20 days before the expected time. The animal should be housed in clean and well bedded pen. As the animal approaches near parturition, it is evident from diminished or lost appetite, distended and shiny udder, loosening of genitals, depression near the root of the tail, pawing and chewing the bedding and bleating. Close watch and the presence of an experienced person is necessary. The process of parturition is normal kidding. But if it takes unnecessary long time, help of the veterinarian may be obtained. The animal should be given luke warm water to drink followed by warm wheat meal. The soiled bedding, expelled afterbirth etc. should be removed from the pen.

viii) **Care of milking dairy goats:** The udder of the goats should be washed with luke warm water containing few crystals of potassium permanganate. The animal should be milked with full hand method.

**Housing:** The goat should be managed under intensive management (completely stallfed) system or semi-intensive management (partly grazing and browsing and supplementary concentrate mixture feeding in the pens) system, depending upon the area and availability of the pasture facilities.

Provide cheap and clean house with thatched roof made of locally available material and thorny fences. Space requirement for an animal as recommended by ISI may be adopted for construction of the house (Fig.2).

Kind of animal	Floor space required(sq.m)
Adult female	1.0
Adult male	3.3
Young stock	0.4

Fence height should be 1.5 to 2.0 metre. The thickness should be 20 to 30 cm (if made up of thorns), or dog-proof barbed wire fencing up to the same height as given above would be sufficient.

## SHEEP PRODUCTION

### Selection of ram:

A breeding ram should be healthy, sound, masculine in appearance. It should possess all the desirable characters of the breed. It should have strong legs and sound feet, wide brisket and fleshy. The joints should be broad and quarters thick and full.

### Selection of ewe

A breeding ewe should have roomy hind quarters and well formed udder. It should have strong motherly instinct and should have plenty of milk so that the lambs grow fast. For mutton quality, lambs born early in the season should be selected as they grow bigger than those born later. They should have more muscle than bones. Those lambs that attain good weight at the age of 4 to 5 months yield more profits. The quality of mutton from lambs at weaning is of best quality.

### Reproduction

Estrous cycle in ewes varies from 17-19 days with an average of 18 days. Estrus remains for 21-39 hr. though it may vary from 1-3 days. Unlike other farm animals, ewes in general do not come in heat at regular intervals throughout the year. There are three main breeding seasons (1) March-April or summer season (2) June-July (sometimes June to August) or autumn season and (3) October - November or winter season. Nearly 15-20% ewes come in heat in summer, 60-80% at the beginning of autumn and a very small number in winter. The gestation period varies from 142-152 days with an average of 146 days.

The ram, at the age of 12 months when well managed, can be used for breeding purpose but usually should be used at 18 months of age. Normally a ram is in full vigour for breeding from the age of 2 to 5 years. Good rams over 7 years of age may be used successfully but they should be checked carefully as they may be infertile, lack the vigour and ability to get round under range conditions. One ram is sufficient for 50-60 ewes during the breeding season. Under rough range conditions, ewes may be expected to produce about 5 crops of lambs. Hence, the ewes may be sent for mutton purpose at the age of 7 years.

### Preparing the ewe and ram for breeding

Before the breeding season starts, the wool should be clipped from the dock. Sometimes ewes are not bred because wool or tags prevent the ram from making satisfactory grip. Wool should also be clipped around the eyes. The ram should be sheared if the breeding season is in summer. It will improve the fertility. If the ram is not completely shorn, it should at least be clipped around the neck, from the belly and in the region of penis. This will make easier for the ram to make proper contacts with the ewe during the act of mating. Both ewes and rams should have their feet well trimmed so that they can walk naturally. To ensure the mating of ram to an ewe, the breast of the ram may be painted every week by using a good breast paint. A good breast paint can be prepared by mixing lamp black or venetial red with raw linseed oil. This method will help to identify the number of ewes that have not been covered.

### Nutrition

Indian sheep have much lower adult weight and growth rate in comparison with exotic breeds. Inadequate nutrition is the major factor responsible for slow growth and low body weight. Large scale cross breeding work for breed improvement has further necessitated proper nutritional requirements.

**Nutrient requirements for growing lambs**

Live weight (kg)	Rate of gain (g/day)	DM (g)	DCP (g)	TDN (g)	Ca (g)	P (g)
10	50	400	35	220	2.0	1.5
	100	450	45	280	2.5	1.5
	150	500	55	340	3.0	2.0
15	50	500	45	300	2.8	2.0
	100	600	55	360	3.5	2.5
	150	700	65	450	4.5	3.0
20	50	700	50	400	3.5	2.5
	100	800	70	520	4.5	3.0
	150	1000	80	640	5.5	3.6
25	50	800	65	500	4.0	3.0
	100	1100	85	700	5.0	3.5
	150	1200	100	800	6.0	4.0

A pre-ruminant lamb is to be fed creep ration of high quality according to its age of 2 weeks up to weaning at 90 days to promote growth during early age and rumen development. The calf strater ration, as has been mentioned in cattle nutrition, can be used for feeding young lambs as creep ration.

The maintenance requirements for adult sheep are given in the table given below :

**Maintenance requirements of adult sheep according to the live weight.**

Live weight (kg)	DM (g)	DCP (g)	TDN (g)	Ca (g)	P (g)
20	500	25	240	3.0	1.8
25	625	30	300	3.2	2.0

30	750	32	360	3.5	2.5
35	875	35	420	4.0	2.8
40	1000	40	480	4.5	3.0
45	1125	42	500	5.0	3.5
50	1250	45	540	5.5	3.8
55	1375	50	600	6.0	4.0
60	1450	54	640	6.5	4.5

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### Feeding schedule for stall-fed sheep

For breeding rams, 50 per cent more nutrients should be given than their maintenance, ration. Similarly, pregnant sheep should be provided 50% more nutrients than the maintenance needs. Sheep also require extra nutrients to bring them to flush and therefore, should be provided with 25% more nutrients above the maintenance needs before start of breeding season.

Sheep are mainly raised for lamb and wool and not for milk production. However, high lactation performance is essential for the nutrient supply of lambs during early stage. This is all the more important if twins are nursed by ewes. It has been observed that sheep should be fed twice the maintenance requirements to maintain good production status during first 6 weeks of lactation, while the allowance could be reduced to 50% above maintenance, during the remaining period. They also need additional leguminous fodder, preferably hay. A concentrate mixture similar to one used for dairy animals may be prepared to feed them when green fodders are not in plenty.

An adult sheep needs about 0.5 kg concentrate mixture and 5 kg green fodder. For sheep, feed ingredients should be coarsely ground because they chew their feed thoroughly. Before the start of breeding season, feed additional 0.2 kg concentrate or lush green legume fodder. The same amount of additional feed is to be provided during last two months of pregnancy.

### Managing the ewes during gestation

Exercise should be given to the pregnant sheep if they are stallfed. Exercise will help to reduce lambing paralysis and ease at the time of parturition. The pregnant ewes should be kept under shade during warm weather and the sheep should be saved from injury from other animals like cattle, hogs etc. and should not be grazed alongwith other animals.

### Care of ewes during lambing seasons

The ewes should be separated at the time of lambing. In the ewes that are about to lamb, there will be sinking on either side of the rumps in front of the hips, the vulva will enlarge, wax will form at the ends of the teats and they will show the signs of filling. At the time of lambing it will be better to keep the ewes in a separate lambing enclosure. Protection against inclement weather should be provided, if necessary. Just prior to lambing, the ewes show characteristic vertical movements of the tail and usually lag behind from the rest of the flock. Ewe scratches the ground with front legs, constantly changing her position by standing and sitting. The wool should be cut around the teats and the genital organs. Do not disturb the ewe during first stage of labour. However, if it is not normal, then help of an experienced veterinarian should be sought to correct the position of the fetus.

### Care of the ewes immediately after lambing

The ewe should be kept under observations for some days after lambing. The shepherd should be sure that the ewe has expelled the afterbirth and that her udder and bowels are in good condition. If the ewe is constipated, a drench consisting of 125 ml of linseed oil or 85 g of epsom salt, dissolved in luke warm water should be given.

### Care of the new born lambs

When the lamb is born, pinch off the umbilical cord about 10 cm. from the body. The naval should be disinfected with tincture iodine to prevent infection. Be sure that all mucus is removed from the nose and mouth. The lamb should be placed near the ewe's head. She may rest and clean the lamb. If the ewe owns the lamb, it will be best to leave her alone. A strong lamb will be on its legs in a few minutes and will usually suckle unassisted. Provide help to the weak lambs in suckling milk. The first step in assisting a weak lamb is to milk a few drops from the ewe's teats to make sure that the milk channels are open. Place the teat in the lamb's mouth and squeeze some milk into it.

## Care of growing lambs

Castrate the lamb at 7-14 days of age. The lamb should be castrated with "Burdiz" castrator. They should also be docked at the time of castration. The tail should be docked about 5 cm from the body. For identification of the lambs, marking of the lambs should also be carried out with brand paints, plastic or metal tags in ears.

The remaining management practices are same as has been mentioned in case of goat.

## POULTRY PRODUCTION

### Management of chicks

Good quality chicks are the edifice to have high producing layers. Following some of the important points are to be observed while purchasing and rearing chicks:

- (i) Right type and best brand chicks should be purchased from a reliable hatchery.
- (ii) The chicks should be healthy and disease-free and properly vaccinated.
- (iii) The day old chicks should be sexed and their body weights should not be less than 35 g.
- (iv) First debeaking should preferably be done after one day of age.
- (v) Feed mash for a few days.
- (vi) Be sure that each chick becomes 500 g after 7 weeks of age by consuming 2 kg of standard chick mash.
- (vii) The chicks will grow properly if they get "standards chick mash", clean water all the times and cozy environment. The brooder's temperature should be adjusted as below :

1st week	90-95 <sup>0</sup> F
2nd week	85-90 <sup>0</sup> F
3rd week	80-85 <sup>0</sup> F
4th week	75-80 <sup>0</sup> F
5th week	70-75 <sup>0</sup> F
6th week	65-70 <sup>0</sup> F
7th week	60-65 <sup>0</sup> F

The room temperature should be 10-15<sup>0</sup>F below brooder's temperature.

- (viii) For best results provide proper brooder space, floor space, feeding space and water space.  
Brooder space : 8-10 sq. inches per chick (Brooder of the size of 18 sq. ft. for 250 chicks).  
Floor space : 0-4 weeks - 0.5 sq. ft. per chick  
5-10 weeks - 1 sq. ft. per chick.  
Feeding space: 0 to 2 weeks - 1.0 linear inch/chick  
3 to 10 weeks - 2.5 linear inch/chick.  
Water space : 0 to 10 weeks - 0.5 linear inch/chick.
- (ix) Use chick feeders of proper size (chick type) and place them in such a way that these are easily accessible by the chicks.

- (x) Use fresh and dry litter. In the start use 2" deep litter, but for the first few days cover it with old newspaper sheets to ensure that the chicks do not eat litter instead of feed.
- (xi) Use proper light throughout 24 hr upto 8 weeks of age and stop it thereafter upto 20 weeks of age (only exposure to sun light/natural light).
- (xii) Ensure adequate ventilation to avoid suffocation to the growing birds.
- (xiii) Ensure clean pens for healthy chicks. Brood chicks quite away (300 ft.) from adult birds, in a brooder house.

### Management of layers

Laying flock management is the application of principles and practices for the economical production of quality eggs. There are three obvious ways of increasing profits from the laying flock :

- (a) By increasing egg production.
- (b) By decreasing production costs.
- (c) By better marketing.

65-70 per cent expenditure for the management of layers is due to feed costs. A "Standard Grower Mesh" can ensure 1250 g body weight for pullet at 20 weeks of age by consuming 6 to 8 kg of feed during growing period of 12 weeks.

On the whole, a profitable flock should have average more than 50% production throughout the laying year. The following are the important managerial practices for layer flock.

#### Deep litter system:

- (i) **Floor space:** The optimum floor space per bird depends upon (a) size of the pen, (b) size of the bird, (c) weather conditions and (d) managerial practices.

The following schedule be followed for light egg-type birds :

<u>No. of birds in the pen</u>	<u>Average floor space per hen</u>
Upto 200	2.5 to 3.0 sq. ft.
200-400	2.5 to 2.75 " "
400-600	2.25 to 2.50 " "
600-1000	2.00 to 2.25 " "

Over-crowding of birds results in higher incidence of cannibalism and other diseases, higher mortality, a larger percentage of poor producers and overall lower egg production. It will also become difficult to keep the litter dry, when too many birds are kept in a small pen.

- (ii) **Litter:** Provide 6 to 10 inches of deep litter consisting of rice husk or saw dust. The litter must be kept dry at all times and stirring once a week be practised. Wet litter increases incidences of various poultry diseases. Addition of hydrated lime @ 5 kg/100 sq. ft. area is helpful to keep the litter dry and free from sources of infections. New flocks should not be started on old litter.

- (iii) **Feeder space:** The feeders should be of proper size and dimensions, easy to fill, built to avoid wastage, high enough to avoid the mixing of litter in the feed, so arranged that the hens cannot rest on them and so designed that the birds face no difficulty in eating feed from them. Two types of feeders are commonly used.

- (a) Trough type (feed hoppers) : Allow at least 40 linear feet of hopper space for every 100 hens. A five feet long trough provides 10 linear feet of feeding space, that is sufficient for 25 layers. Feed should be available to the birds at all the times. The feed hoppers should not be filled more than one half, preferably one third filling the hoppers results in considerable feed wastage, which may make the poultry farm unprofitable.

(b) **Hanging type round feeders:** Circumference of the lower pan of hanging type feeder may be regarded as the total linear feeding space available for the birds. One hanging type feeder with 14" radius of the lower pan will provide 88" linear feeding space, which is sufficient for about 30 layers. A hanging type feeder once filled has sufficient feed for 3-4 days. Apart from the space for feeding mash, allow a minimum of 12" (linear) of space per 100 birds for calcium supplement (grit) and it should be available at all times.

(vi) **Waterers:** These should be such that they can be easily cleaned, prevent spillage of water around them and water in them remains clean. Earthen pitchers and kanalies with an empty bottle hanging about 1" over top of the inverted pitcher form a satisfactory type of waterer. This system has the disadvantage that it requires considerable labour in filling and refilling them. Drain type waterer made along one side of the wall of laying house is recommended for large poultry farms. The laying house is recommended for large poultry farms. The drain must be so built that the birds cannot roost on it. A simple mechanical device can be used to keep a certain fixed level of water in the drain. Precautions have to be taken to avoid the flooding of the whole house. Fresh and clean water should be kept available for the birds at all times. The waterers should be so placed that they are accessible to the birds within 10 feet in any part of the house. The total watering space should be sufficient to provide about 0.75 linear inch per layer for taking water. Thus a 4 ft. long waterer or one round waterer with 15" radius is sufficient for 100 layers. Also ensure that the water is sufficiently deep for easy drinking because birds cannot suck water.

(v) **Roosting space:** It is, however, not essential for birds, but when provided, about 8 linear inches of perch space should be provided per bird. Perch pole 2" x 2" should be spaced 15" apart from each other. To prevent the birds from coming in contact with the droppings, 0.5" poultry netting or 2x2" or 2x4" welded wire should be tacked on the underside of the perch section. The perches may be 18 " high from the floor.

(vi) **Nests:** They should be such that they are easily cleaned, well padded and conveniently located for egg collection. Two types of nests are comonly used :

(a) Individual nest one 10" x 14" or 12" x 12" nest is sufficient for about 5 layers. Three tier system of individual nest is commonly used.

(b) Community nest : 8' x 2' x 1.25' (L xB X H front back) with two 8 sq. inches holes is sufficient for 80 to 100 layers. A nest with 12 sq. ft. (6' x 2') of nesting space is sufficient for 50-60 layers. Provide 2" deep clean nesting material in the nest. The nests should be located in a relatively darker part of the pen.

(vii) **Light:** Fourteen hrs of light, including day light, should be provided in order to get the optimum egg production. A 60 W bulb or 40 W bulb with reflector, fixed 6-7 ft high from the floor provides sufficient density of light for about 200 sq. ft. of floor area. The light should shine on the roosts, waterers, but never on the nests. The duration and intensity of light should not be allowed to fluctuate. In hot months, artificial light is needed at night so that the birds can eat during the cooler times of the day. The artificial light be given either in the evening or in the morning hours. It is better to follow some fixed lighting schedule.

(viii) **Culling:** It should be a regular process starting from the day-old chicks. Elimination of unproductive birds is necessary to keep the average egg production of flock high and save the extra cost of feeding. The rate of culling varies from flock to flock.

Culling is easier, when birds are kept in individual cages. When they are in a flock, the following characteristics of the birds can be used to identify the layers from non-layers.

Sr. No.	Character	Layer	Non-layer
1.	Comb	Large, smooth, bright, red and glossy.	Dull, dry shrivelled and scaly.
2.	Eyes	Prominent and sparkling	Dull and sunken
3.	Vent	Large, smooth and moist.	Shrunken and dry.
4.	Pubic bones	Flexible and at least two fingers apart	Less than two fingers apart.
5.	Space between	More than	Less than

	pubic bones	three fingers	three fingers. and point of keel.
6.	Skin	Soft and loose under laid with fat.	Thick and

As far as possible, culling should be done at night by using blue bulbs or with the help of torch light. Disturbance caused in catching and handling birds is likely to effect egg production of flock.

(ix) **Miscellaneous:**

- (a) Cull out weak and under developed birds before the start of laying.
- (b) Don't mix birds of different ages or from different sources.
- (c) All possible measures should be undertaken to avoid disturbances in the laying pens, because disturbance/lower egg production.
- (d) Nests should be in position when the pullets have attained the age of 16 weeks.
- (e) The sheds should be rat proof. Rats and mice not only disturb the birds but also eat away their feed.
- (f) Greens like berseem or lucerne or leaves of cowpeas/biul @ 2 kg/100 layers/day may also be supplied.
- (g) The layers are most comfortable when the room temperature is between 55-75<sup>0</sup>F and attempts should be made to this sort of environmental temperature.

**Advantages of the cage system**

The cage system is more useful as it is more economical and gives more returns than that the deep-litter system. There is 50 per cent saving in space, 8 per cent in feed and 75 per cent in labour. The feed and water remains more clean and there are less chances of diseases since birds do not come in contact with their droppings. The broodiness in the birds is minimized. The total cost of construction and installation of cages comes approximately to the same level as in the case of deep-litter system.

**Nutrition**

Feeding has been recongnised as an important aspects as it accounts for 60-70% of the total cost of production. Efficiency in feeding, is one of the key factors for successful poultry production, the efforts, therefore, be made to reduce the cost of feeding, thereby increasing the returns. In order to achieve this objective, it is necessary to understand the principles of nutrition.

To achieve better growth and productive performance, about 40 nutrients are required to be present in poultry rations. Most of the nutrients are absolutely essential and ration must supply every known essential nutrient in proper amount. If insufficient amount of nutrient is present, ration may support life but may not support proper growth and production.

Different nutrients can be divided into six classes depending upon their function and chemical similarities. These classes are : (i) Carbohydrates (ii) Proteins (iii) Fats (iv) Minerals (v) Vitamins, and (vi) Water.

Carbohydrates and fats are primarily required as a source of energy. Energy is needed for : (i) To maintain body temperature, (ii) essential body functions (iii) chemical reactions involved in the synthesis of body tissues, and (iv) for the elimination of body wastes.

Cereals and by-products from cereals serves as source of energy for poultry feeding.

The maximum level for inclusion of different feed ingredients in the ration of chicks, growers, layersand broliers and formula composition of a few rations have been given in below tables mentioned.

**Maximum level of inclusion of different feed ingredients in rations**

Ingredients	Maximum level of inclusion in practical diet (%)			
	Chick	Grower	Layer	Broiler
Maize	40	35	35	35
Wheat	40	35	35	40
Bajra	5	10	10	-
Rice kani	10	15	15	-
Rice bran	30	45	45	5
Deoiled rice polish	15	25	25	-
Groundnut cake	25	18	18	32
Deoiled ground nut cake	10	10	10	-
Mustard cake	10	5	-	10
Deoiled mustard cake	-	5	5	-
Corn gluten meal	5	5	5	6
Sunflower cake	5	5	5	-
Soybean meal	15	15	15	20
Fish meal	8	6	6	10
Meat meal	2	2	2	2

**Chick starter ration**

Ingredients	Formulations		
	1	2	3
	(parts per 100 kg ration)		
Maize	40	20	-
Bajra	-	-	-
Wheat	-	20	30
Rice kani	-	-	10
Rice bran	25	25	25
Groundnut cake	17	5	10
Deoiled GNC	-	-	-
Mustard cake	-	5	-
Deoiled mustard cake	-	-	5
Sunflower meal	-	5	-
Soybean meal	5	7	7
Fish meal	8	8	8
Meat meal	2	2	2
Dicalcium phosphate	2	2	2
Lime Stone	0.5	0.5	0.5
Common salt	0.4	0.4	0.4
Vitamin + mineral	0.1	0.1	0.1
Protein content(%)	20.00	19.05	19.40
Metabolizable energy (Kcal/kg)	2700	2725	2680

## Grower rations

Ingredients	Formulations		
	1	2	3
	(parts per 100 kg ration)		
Maize	37	17	10
Wheat	-	20	17
Rice kani	-	-	10
Rice bran	30	30	32
Deoiled rice bran	12	12	12
Groundnut cake	12	6	-
Maize gluten meal	-	-	5
Deoiled groundnut cake	-	-	5
Soybean meal	-	6	-
Fish meal	5	5	5
Meat meal	1	1	1
Lime Stone	1	1	1
Dicalcium phosphate	1.5	1.5	1.5
Common salt	0.4	0.4	0.4
Vitamin + mineral	0.1	0.1	0.1
Protein content(%)	16.0	16.5	17.5
Metabolizable energy (Kcal/kg)	2790	2740	2710

The moisture content of the feed ingredients should be below 10%. Always keep the record of the feed consumed by the birds and avoid all possible sources of wastage of feed. This should not be stored for more than two weeks in summer and more than one month in winter.

## Layer-cum-Breeder rations

Ingredients	Formulations			
	1	2	3	4
	(parts per 100 kg ration)			
Maize	40	20	-	10
Wheat	-	-	-	10
Triticale	-	20	40	20
Rice polish*	30	30	30	30
Groundnut cake	15	7.5	10	10
Soybean meal	-	7.5	5	5
Fish meal	6	6	6	6
Lime Stone	5	5	5	5
Dicalcium phosphate	2	2	2	2
Molasses	2	2	2	2
Minerals & Vitamins	+	+	+	+

*\*Half the quantity of rice polish may be replaced with deoiled rice polish.*

**Note:** Vitamins and minerals should be added as per ISI specifications as given in Table 1.

## Broiler starter ration

Ingredients	Formulations		
	1	2	3
	(parts per 100 kg ration)		
Maize	55	50	30
Wheat	-	-	25
Rice polish	-	5	-
Groundnut cake	32	16	10
Soyabean	-	11	10
Maize gluten meal	-	5	5
Mustard cake	-	-	7
Fish meal	8	8	8
Meat meal	2	2	2
Dicalcium phosphate	2	2	2
Lime Stone	0.5	0.5	0.5
Common salt	0.4	0.4	0.4
Vitamin + mineral	0.1	0.1	0.1
Protein content(%)	22.0	23.0	23.4
Metabolizable energy (Kcal/kg)	2900	2900	2825

The feed intake varies with environmental temperature. The moderate temperature can be treated as 70-85<sup>0</sup>F. If the environmental temperature is higher, then for each degree F the feed consumption is reduced by 1 g per bird by day and if the temperature falls, the feed intake increased 1 g/bird/day per 1<sup>0</sup> F fall in temperature.

The concentrations of vitamins, minerals and protein should be increased or decreased depending upon the environmental temperature so that in the total quantity of feed that is consumed by the birds, same amount of protein (amino acids), minerals, vitamins should be consumed daily in adequate amounts.

## RABBITORY

The rabbit production has become increasingly important in developing countries, especially in a country like India due to the following reasons :

1. Rabbit meat has no religious taboo as the feed habits of rabbits offer no competition to human population. Rabbit meat can be produced solely from feed that is unfit for human consumption, such as kitchen refuse, weeds and leaves, agricultural and industrial byproducts etc.
2. The different types of rabbits adapt to extreme seasonal variations and available feeds.
3. The rabbit production is highly economical because of large number of kits, short interval between generations and relatively high weight gain per day. For example, a cow produces approx. 0.6 times her weight in off spring during one year period, an ewe 0.8 times her weight while a doe produces 10-20 times her weight in off spring per year.
4. Relatively inexpensive housing.
5. Rabbits also require low level of nutrients as compared to other livestock e.g. a doe with 50 off springs per year requires less than 1/3 feed energy than that of cow and less than half that consumed by an ewe with 1-2 lambs per year.
6. Fur skins from rabbits are used in the manufacture of garments, toys, shoes and gloves etc. and can be readily processed to provide material for many profitable attractive items.

7. Rabbit meat is an excellent source of animal protein for human beings because of its low cholesterol levels, and the meat to bone ratio of a well nourished rabbit is about 5:1.

### Procurement of stock

Before rabbit raising is adopted by the farmers on commercial scale, it is essential to chalk out the comprehensive breeding programme that depends upon :

- (i) Quality of nucleus stock
- (ii) Environmental conditions

The initial stock of breeding animals should be true to the breed characteristics, health, vigorous and of high quality. They should have good production record with respect to litter size, weaning weights, dressing percentage and wool yields etc. For purchasing breeding stock, the following points should be strictly observed:

- (i) Always procure good stock from the Govt. farm or breeders, who have particular stock for sale.
- (ii) Source of rabbitry should be clean and well managed with no disease problem.
- (iii) Purchase superior breeding stock for further multiplication. It is always better to have few good does and bucks rather than several inferior ones.
- (iv) To begin with, rabbit raising operations on a small scale, two bucks and 5 to 10 does are enough and then expand as experience and the market outlets would indicate.
- (v) Purchase mature stock or growing animals when they are weaned. The latter method offers an opportunity to become acquainted with the animals and to gain experience before handling many rabbits, the former method is quicker but stock cost is more.
- (vi) Quarantine the animals if they are purchased from the various sources before mixing with own animals.
- (vii) It is always desirable to obtain stock from a number of different sources to get genetic diversity and start with the highest quality stock.
- (viii) When breeding stock is purchased from a small flock, it is always better to buy bucks from different sources of the does, so as to facilitate maximum genetic diversity.

### Breeds of rabbits

There are a number of breeds and varieties of domestic rabbits in the world. Out of these, 38 breeds and 87 varieties are recognized and well established. They vary in size, colour, type of hair coat and other characteristics. The name and descriptions of some of the important breeds are :

**Wool type:** Angora rabbit is usually white and albino, but some coloured varieties are also available. The angora is one of the oldest breeds of domestic rabbit and kept for wool for many years. It is the only breed from which wool for spinning can be obtained. There are three recognized strains of this breed (i) German (ii) French and (iii) English. The wool of English Angora is silky in nature unlike the French strain which has a coarse wool. The French angoras are heavier than the English ones. The adult body weights vary from 2.5 kg to 3.5 kg and the annual wool yield ranges from 400 to 1000 g. Young angoras should be sheared at weaning and subsequently every 10 to 12 weeks.

**Meat and Fur Type:** The most common breeds for this purpose are : (i) Newzealand White (NZW), (ii) Soviet Chinchilla (SC), (iii) Grey Giant (GG) and (iv) White Giant (WG).

**Newzealand White:** For meat production NZW is the principal breed. It has a number of desirable traits viz. a rapid growth rate, good carcass quality, good prolificacy and good mothering ability, and in general possesses all the characteristics desirable for a meat producing animals. It is a larger animal, weighing 5-6 kg. It has excellent breeding quality.

**Soviet Chinchilla:** The first Chinchillas were exhibited in France in 1913 as they were produced by crosses of wild rabbits with Himalayans. The pelts of Chinchilla are very fine and most expensive in the world. Its pelts which are impossible to

imitate with dyes, usually fetch a better price than other normal fur breeds' skins. This breed fetches better price than other normal fur breed skins. The breed weighs between 4-5 kg and has excellent meat qualities.

**Grey Giant.** Large in size, an excellent meat producer. Adult weighs 3-4 kg, possessing very good combining ability.

**White Giant:** Large in size and good meat producer. Adult weighs 4-5 kg

**Research or Laboratory types.** Primarily Newzealand White but small number of Dutch breeds are also used.

**Fancy/Hobby type.** The most important breeds under this class are Tah, Polish Palomino, Havana, Florida White, Dutch and English Soot. These animals are lighter in body weight and fancy to look at.

**Other breeds:** Many other breeds including Rex and Satin breeds, that are kept mainly for pelts and produce meat in addition. Their pelts fetch better price.

## Housing

Rabbits can be reared either indoor (enclosed sheds) or out (dour hutches system)

1. **Hutches:** For housing the rabbits in hutches, the animals should get additional protection from inclement weather. The hutches can be constructed from wooden frames, galvanised wire mesh, angle iron and tubular iron with asbsestos/PVC sheets or wooden frames, used as roofing material. The construction of cage floor depends upon the type of utilization (with or without beddings). Hutch for breeding animals should have dimensions of 60 x80 cm (floor space) and 50-60 cm height. Identical hutches can be used for 5-6 fattening animals (2.50-2.75 kg live weight).

2. **Cage systems:** Cages mainly have wire mesh floors, and the structure is mainly metallic (angle iron, tubular iron) or wooden frames/bamboos with the walls entirely of wire mesh. Cage systems vary depending upon supervision, comfort and convenience of handling. There are 4 main systems of arrangement of cages :

3. **Flat-deck type:** In this system, all cages stand 70-80 cm high on legs (wooden, metallic, concrete etc.) or may be suspended at one level. The entry is through a door on top or front of the cage. Feed and water fixtures are attached on the front sides. The litter drops directly into a pit. The nest box is usually placed in the front of the cage. This is mainly suitable for breeding stock and for nurseries. For fattening animals, there is higher investment cost per animal.

## Reproduction

Age of puberty varies according to the size of the breed in rabbits. The puberty is attained at 4, 4-5, 8-9 months age in small, medium and heavy breeds, respectively. A female rabbit appears to have no definite estrus cycle, although a certain rhythm exists in their sexual receptivity. The signs of heat are, restlessness, rubbing the chin on the walls of the hutch, lying in mating posture lifting the tail and congested purple and moist vulva.

The bucks reach sexual maturity by 20 to 32 weeks of age depending on breed, size and level of nutrition. The formal ejaculate of the adult buck ranges from 0.5 to 1.5 ml. The sperm concentration ranges from 100-300 million per ml. Tail flagging is a common sexual behaviour. The buck elevates his hind quarters walks stiff legged and lays his tail flat across his back. Intermission is usually accomplished after 3-12 rapid copulatory movements.

The doe is always taken to bucks for mating. If the doe is in full sexual receptivity it will lift tail and within a minute the buck will be mating the doe. Successful breeding is observed when the buck falls to one side or backward after mating. The gestation period is 29-35 days. The interkindling interval is 2 months. It can be reduced to one month if doe is bred immediately following kindling. During last week of pregnancy a nest box with good bedding material like wooden shavings or finely chopped hay should be placed inside the cage. The normal size is 6-8 kits. Weaning is done at 4-6 weeks age.

## Care and management of pregnant doe & foster rearing

A pregnant doe requires more tender care and different management as compared to rest of rabbit stock. Before breeding a doe, factors like nutritional status, age, wool length and the previous breeding performance of the doe must be considered for better results. It involves different aspects of feeding, environmental conditions, housing, kindling etc.

1. **Feeding:** Nutrients supply in adequate amounts and proportions is an important factor in the feeding of a pregnant/lactating doe. A pregnant doe consumes approx. 200 to 250 g of balanced pelleted feed when combined with

good green grasses/hay. The female should have *ad lib* availability of feed in the feed trough. Grass/hay can be given @ 100 g per day.

A balanced nutritive feed should have following levels of nutrients :

Crude protein	17%
Crude fat	2%
Crude fibre	14-17%
Methionine	1.0%
Arginine & Cystine	0.6%
Lysine	0.5%
Vitamins (A,D,E,K,B-complex)	Adequate amounts
Minerals	1.5%
Digestible energy	2600 Kcal
T.D.N.	600 g

The well balanced nutritive feed supply ensures higher number of eggs for fertilization, reduced risk of embryonic deaths and better foetal growth.

## 2. Environmental conditions (optimal):

Temperature	20-24°C
Humidity	60%
Air movement	0.5 m/sec.
Light	16 h/day

3. **Housing:** Pregnancy diagnosis is done on the 14th day after mating. Pregnant doe are kept separately in clean and sterilized cage. On 25th day, clean and disinfected nest boxes are attached to the cages in which pregnant does have been kept.

**Nest Box:** These may be fabricated of material like resinfree-wood, plywood, sty foam, etc.

**Size:** 36 x 36 x 30 cm, having a window (15 x 20 cm) on one side facing the cage.

**Nesting material:** Wooden shavings, straws, coconut/jute fibres or animal's fur. Nesting material is put in the nest box 2-3 days before kindling. Pregnant doe also plucks its own wool to make a nest.

4. **Kindling:** Kindling takes place on 31st day and often in dark hours. It can be induced artificially by giving oxytocin @ 0.25 ml I/M but in practice injection of hormones should not be done. Process is completed in 15-20 minutes. Stillborn kits, placental remains should be removed immediately and live kits be put together in the middle of the box. This is done by the mother herself.

Any psychological disturbance during kindling may lead to delayed births or retention of foetus in uterus.

**Foster rearing:** Fostering of kits is taken up :

1. When litter size is more than the number of teats of the doe.
2. When doe has mastitis or respiratory infection.
3. When doe exhibitsagalactia.

The kits should preferably be fostered within 48 hr after birth.

## Feeding and nutrition

Rabbits are less than half as efficient as cattle for feed conversion, which is due to the rapid rate of passage of ingesta and moreover animals primarily depend upon microbial digestion of fibre in the hindgut are usually less efficient than the ruminants. However, fibre is important in rabbit feeding not because of its nutritional value (which is very low for rabbits) but for the prevention of enteritis and fur chewing. The digestive tract of the rabbit is adapted to the utilization of fibrous

feeds but not to use of fibre itself. The digestive strategy of the rabbit is to ignore the fibre and concentrate on the 75 to 80 per cent non-fibre fraction. The rabbit hindgut is able to selectively excrete/retain solubles and small sized particles in the cecum for fermentation.

Complete feed pellets prepared from high quality feed ingredients and clover hays are normally recommended for the balanced feeding of commercial rabbits, because mash feeding gives respiratory problems to the stock (snuffles).

By utilizing the locally available materials, well-balanced and economical rabbit feeds can also be developed and some illustrations are given below :

#### Composition of standard rabbit pellets

Feed ingredients	Parts (%)	CP (%)	CE (%)	TDN's (%)	Lys. (%)	Meth. Cyst (%)
Sun-dried alfalfa meal	54.00	10.80	10.80	27.0	0.47	0.30
Soyafakes	21.00	9.45	1.05	17.17	0.67	0.31
Wheat midlings	20.00	3.54	1.40	15.60	0.12	0.06
Molasses	3.00	-	-	1.50	-	-
Soyabean oil	1.00	-	-	9.00	-	-
Dicalcium phosphate	0.25	-	-	-	-	-
Common salt	0.50	-	-	-	-	-
Additives (Trace-Minerals and vitamins)	0.25	-	-	-	-	-
<b>Total</b>	<b>100.00</b>	<b>23.79</b>	<b>13.25</b>	<b>70.27</b>	<b>1.26</b>	<b>0.67</b>

*Source: Oregon State University Research Centre.*

## FISHERY

Himachal Pradesh has vast potential for culture fisheries under the different agro-climatic conditions. So far the concept of culture fisheries in the State is at its inception. The Department of Fisheries, College of Vety., & animal Sciences, Palampur is engaged in conducting the need based research on culture aspect of fishery. Such a polyculture model has been evolved for the agro-climatic environment of lower reaches of zone II and higher reaches of Zone I, particularly the prevailing conditons like that of Palampur valley in Distt. Kangra. In this model, 3 species of exotic carps (Grass carp, Silver carp, Mirror carp) have been recommended to the farmers which is based on their growth performance adaptability and other eco-biological parameters that have been investigated thoroughly.

The pre-requisite for the fish farming is the availability of perennial water. As such the fish farming in the hilly region may be practised in the watershed areas, along the streams and river banks or any place where the water supply is assured either by irrigational channel or lift irrigation scheme.

**Selection of site:** For fish culture such a site should be selected where the water is available through a regular source like spring, river, channel, etc. or even waterlogged land may be reclaimed for this purpose. The soil should not be completely sandy but should be a mixture of sand and clay so that it has the capacity ofretaining the water. Alkaline soils are always better for good growth of fish. Before construction of pond, the physic-chemical properties of soil should be got tested from soil testing laboratory.

**Construction of ponds:** The size and shape of the pond depends upon the availability of the land and type of production. For an economically viable project, the minimum size of pond should be 10m x 10m x 1.5 m and above. A typical pond should have an inlet for the entry of water fixed with wire mesh so as to prevent the entry of unwanted indigenous fauna and an outlet for overflow of excess water fixed with wire mesh to prevent the exit of stocked species. There should be a drain pipe at the bottom of pond and a harvesting pit to facilitate the harvesting and to dry the pond from time to time. The sides or dykes of the pond should be well compacted, sloppy and planted with grasses or herbs to protect them from erosion. The gullies and watershed area can also be converted into pond by raising an earthen dam.

**Preparation of ponds**

(i) **Liming:** Liming of the pond is necessary to eradicate the harmful insects, micro-organisms, to render soil alkaline and provide calcium to the growing fish. If soil is not acidic, the lime can be used at the rate of 25 g per sq m and if soil is acidic, increase the quantity of lime by 50%. After broadcasting of lime in whole tank, it must be left dry for 4 days to one week.

(ii) **Manuring:** Manuring is done with the objective to increase the plankton which form the natural food of the fish. The rate of manure depends on the fertility status of soil. The organic manure such as cow dung is used @ 20 tonnes/ha i.e. 2 kg per sq m area in Palampur valley. Initial manuring is to be done with 50% of total required manure and subsequently the rest 50% should be used in the equal monthly installments. Fill the tank with water just after manuring and leave it for 12-15 days.

(iii) **Control of aquatic weeds and predators:** The algal blooms are sudden out-bursts due to higher manuring or organic effluent. These blooms liberate good amount of carbon dioxide leading to oxygen depletion which can cause large scale mortality. If reddish scum appears on the surface of the water, this means the outbreak of algal bloom. The manuring and artificial feeding should be stopped immediately and allow fresh water in the pond. If the algal blooms are in excess, spray 3% copper sulphate solution selectively to worst affected areas of pond or superphosphate at the rate of 1 g/m water area. The eradication of weed and predatory fishes is necessary to avoid competition with culturable fishes for space and food. These fishes may be eradicated either by repeated netting or draining the water or poisoning the pond. Generally used poisons for this purpose are mahua oilcake (200 ppm), 1% tea seedcake or turpentine oil @ 250 l/ha. The other chemicals such as Aldrin (0.2 ppm) and Endrin (0.01 ppm) can also be used. In case of the use of these chemicals, the stocking of fish seed (fry/fingerlings ) may be delayed atleast by 10 to 25 days so as to facilitate elimination of the chemicals/residues.

### Stocking

Judicious selection of compatible fast growing species is of vital importance in maximizing fish production. A combination of three species viz. mirror carp, grass carp and silver carp fulfills the species selection requirements and this model has proven to be the ideal combination for sub-temperate region of the State. Of these, mirror carp is a bottom feeder, grass carp is a macro-vegetation feeder and silver carp is surface feeder.

### Species ratio

Selection of species ratio generally depends upon the local conditions, seed availability, nutrient status of pond, etc. The species ratio in the recommended model for Zone II is - 3 mirror carp : 2 grass carp : 1 silver carp.

### Stocking details

Rate of stocking usually depends on the fertility of the pond and the measures adopted to increase its biological productivity by manuring, artificial feeding, monitoring of growth and maintaining good health of fish. The rate of stocking recommended for this zone is 15,000 fingerlings per ha with artificial feeding. It is good to stock the ponds with fingerlings of 40-60 mm size for better survival and high production. It is better to stock the pond after 15 days of manuring in early hours of day or in the evening. The cloudy day or warmer part of day is to be avoided for stocking.

### Supplementary feeding

The level of natural food organisms in the fish culture ponds can not be maintained to the required extent even after manuring. Hence, supplementary feeding with diet rich in protein, carbohydrates and fats is essential for higher rate of fish growth. The ingredients generally used for artificial feeding are groundnut oil cake and wheat bran in the ratio of 1:1. Feed should be preferably provided in the form of pellets or bowls @ 2% of the total biomass and feed them by hand at different places in the ponds so that all the fishes must get uniform quantity of feed for their uniform growth.

Grass carps are to be fed with chopped succulent grass or discarded vegetable leaves. Kitchen refuse can also be used as supplementary feed for fish culture.

A practical feed formula which is in practice at Fish Farm, CSKHPKV is given below:

Ingredients	Ingredients (%)	Qty for preparing 10 kg feed
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Fish meal	15	1.5 kg
Wheat bran	50	5.0 kg
Groundnut cake	30	3.0 kg
DCP	5	0.5 kg
Supplevit-M	0.5	0.05 kg

Supplementary feeding @ 1-2% is necessary for better yield per unit area since the natural productivity of water in this zone is very less. The comparative performance of different species under two regimes (with supplementary feeding and without supplementary feeding) are given below :

Name of species	Growth performance of three species with supplementary feed at 2% level (g)				Growth performance of three species without supplementary feed (2)			
	Initial Wt	Wt. after 8 months	Gain in wt.		Initial wt.	Wt. after 8 months	Gain in wt.	
			Gross	%			Gross	%
Silver carp	312	16,000	15654	5424	308	12117	11809	5830
Grass carp	927	57,482	56555	6100	1,015	26182	25167	2479
Common carp	6173	39,430	33257	538	1,800	8061	6261	381

#### Monitoring of growth:

Besides nutrients, the abiotic factors like temperature, salinity and photoperiod influence the growth of the fish. After 2 months of stocking, the 20% of the stock should be harvested so as to evaluate the growth per month as well as to calculate the correct amount of feed to be supplied daily. Later on, this practice is to be repeated every month till the fish stops artificial feeding. Based on research data generated at Fish Farm HPKV, Palampur, it is seen that the fishes attain their growth during 8 productive months (i.e. middle of March to middle of November) under the existing climatic conditions. During four winter months (i.e. middle of November to middle of March), there is no growth. As such the supplementary feed is to be given during the eight productive months. The results in terms of production efficiency of aforesaid model is computed as high as 4 tonnes per ha per year.

#### Harvesting

Harvesting is conveniently done either by drag netting or by cast netting (useful for small ponds) or by draining the pond. Supplementary feeding is stopped a day before the date of harvesting. Harvesting is done during cool morning hours as per the demand of market. For this region, the best time of harvesting is December and January which are non-productive months for fish farming. The preferable time of stocking is mid of March or first week of April. In this way the four non-productive winter months can be utilised for the renovation, desilting and preparation of ponds.

#### Calendar for fish farming

##### January:

- (i) Construction of tanks.
- (ii) Renovation of tank which includes desilting and repairing of old tanks.

##### February: Preparation of tank.

- (i) **Liming:** General rate 250 kg/ha or 25 g/sq m of water area.

- (ii) **Manuring:** After a week of liming, manuring should be done @ 25 tonnes/ha. Initially half of the total quantity and subsequently rest half in equal monthly instalments. For example 1 hectare area (10000 sq. m.) the total amount of manure required is 2500 kg i.e. 1250 kg to be applied in the beginning and rest to be applied @ 156 kg per month from March to October.
- (iii) Fill the pond with water just after manuring and leave it for 12-15 days.
- (iv) In case of old ponds, the unwanted weed fish, predatory fish and harmful insects etc. to be eradicated either manually or by poisoning the water.

#### March: Stocking of tanks

- (i) Stocking should be done after 15 days of manuring when water colour is green which is indicative of the presence of natural food in water. The cloudy day or warmer part of the day is to be avoided for stocking.
- (ii) Species to be stocked are common carp, grass carp and silver carps.
- (iii) Species ratio- common carp 3:Grass carp 2: and silver carp 1.
- (iv) Stocking rate - 15,000 fingerlings/ha. For example 0.1 ha tank is to be stocked with 1500 fingerlings, in the ratio of 750 common carp : 500 grass carp : 250 silver carp.
- (v) Stocking upto 15th March.

#### Feeding

Feed ingredients : Wheat bran (50%) +  
groundnut cake (40%)  
+ supplevitamins(15%)

or

Wheat bran (50%) +  
Groundnut cake 30%)  
+ Fish meal (15%) +  
Supplevitamins (0.5%)  
+ DCP (5%).

Feed requirement : For a water body of 0.1  
ha stocked with 1500  
fingerlings is 15 kg

## TROUT FARMING

Zone II and III of Himachal Pradesh have vast potentials for the culture of highly prized fish "Rainbow Trout". The agroclimatic conditions of the area under these two zones are very congenial for cold water aquaculture. The Deptt. of Fisheries COVAS, HPKV, Palampur has successfully reared the Rainbow trout fingerlings for table purposes at campus fish farm, Palampur. As such the conventional practice of culturing Rainbow trout in the high hills only is no more tenable in the light of recent findings. However, more tenable recent findings included trout can be cultured at lower elevation even upto 1000 m msl, provided the optimum water quality and quantity is ensured.

#### Selection of site

For trout culture, such a site should be selected where the quality and quantity of water is available through perennial source like spring, river, etc.

#### Construction of ponds

The cemented ponds are required for the culture of trout fish. The rectangular tanks are better than the circular cisterns. The economical size of a trout race way should be 12-15 m x 2-3 m x 1.2 -1.5 m with an inlet and an outlet for overflow of water fixed with wire mesh screws to prevent the exit of stocked species. There should be a drain pipe at the bottom of the pond to facilitate the harvesting as well as the cleaning of tank from time to time.

### Water supply in the farm

The water supply in trout farm should be through a filter bed/sedimentation tank. There is a lot of silt problem in this area particularly during monsoon season when the water is turbid which is not good for trout farming. The quantity of water required for a trout farm is related with the stocking density, size of fish as well as the water temperature. Therefore, it is necessary to regulate the flow of water very carefully. For example, 30,000 fries need water flow of about 15 L/minute, the fish below 250 g needs a water flow of 0.5 L/kg/minute at 10-12 °C. The water flow of above mentioned economical size of tank should be 52 m<sup>3</sup>/hour for stocking of fingerlings of 5-50 g at 15°C. Thus, the water flow is regulated in such a way that fishes should not assemble at one place and also do not move fast. The flow of water should be increased with the increase of water temperature.

### Physico-chemical parameters required for a trout farm:

The physico-chemical parameters responsible for the successful culture of trout are temperature, dissolved oxygen, pH and turbidity.

**Temperature:** The fish thrives well within the temperature range of 5 to 18°C, but it has been found to tolerate the water temperature upto 26°C in the region without any mortality. However, the maximum growth is obtained within the temperature range of 10 to 18°C.

**Dissolved oxygen:** The oxygen concentration range is from 5.8 to 9.5 mg/L. If the oxygen concentration is 5 mg/L, it is better to increase the flow of water.

**pH:** A neutral or slightly alkaline pH is best for the trout. The tolerable minimum and maximum pH values are 4.5 and 9.2, respectively. However, pH range is ideal for the growth of this fish.

**Turbidity:** The crystal clear water is required and there should not be any contamination. The turbidity should not be more than 25 cm.

**Stocking density:** It is related with the water supply, water temperature, quality/water and types of feed. If water temperature is above 20°C, the stocking density should be less than the recommended density. The fry fingerlings (5 to 50 g) is stocked at the rate of 20 kg fish per cubic meter of water surface area.

**Supply of feed:** The quantity of feed mainly depends on the water temperature and size of fish. If the water temperature is above 18°C, the recommended feed should be reduced to just half of the required amount and above 20°C, better to stop the feeding. The feeding should also be suspended on a cloudy day and when the water is turbid.

A practical feed formula that is in practice at Fish Farm, CSKHPKV, Palampur, is given below :

Ingredients	Percentage of ingredients	Quantity for preparing 10 kg of feed(kg)
Fish meal	50	5
Soyaflakes	10	1
Groundnut cake	20	2
Wheat flour	10	1
Linseed oil	9	0.9
Supplevit-M	1	0.1
Choline chloride	0.1	0.01

Feeding @ 4-6 % is necessary for the fingerlings for better growth but due consideration should also be given to the water temperature for following the feeding schedule. At the water temperature range of 10-12°C, feeding schedule of

6% is optimum but when it increases to 15°C, the feeding schedule to be lowered to 4% and beyond 19°C, it should be just 50% of the optimum schedule. The optimum growth rate per month is 80 g.

#### Table size fish

The fish after gaining the weight of 250 g is advisable to be harvested because beyond this size the growth is slow and rearing is uneconomical.

#### Hygiene

The cleanliness is a very important factor in trout farming. The trouts should be cleaned and disinfected either with 10% formaline or 4 ppm KMnO<sub>4</sub> solution periodically. The infected fish should be immediately removed from the tank and due care should be taken to consult some fishery expert regarding the disease, if any.

## ANIMAL HEALTH

### COMMON DISEASES OF LIVESTOCK AND THEIR CONTROL

#### BACTERIAL DISEASES

1. **Anthrax:** (*Bacillus anthracis*)

**Animal affected:** Cattle, buffalo, sheep, goat, pig.

**Symptoms/lesions:** High fever (105<sup>0</sup>-106<sup>0</sup>F), oedematous swelling of the neck and throat, loss of appetite, difficult respiration, sudden death is also common, After death, bleeding from natural orifices.

**Treatment/Control:** Keep the affected animal away from others. Annual vaccination recommended before the onset of rains.

2. **Black Quarter:** (*Clostridium chauvoe*)

**Animal affected:** Cattle, buffalo, sheep, goat.

**Symptoms/lesions:** High fever (104<sup>0</sup>-105<sup>0</sup>), stiff gait, lameness of fore or hind legs, crepitating swellings over the shoulder, back and other places. Sudden death may occur.

**Treatment/Control:** Keep the affected animal away from others. Annual vaccination recommended before the onset of rains.

3. **Brucellosis:** (*Brucella abortus*)

**Animal affected:** Cattle, buffalo, sheep, goat, pig

**Symptoms/lesions:** Abortion in late pregnancy, retention of placenta and metritis. In male pigs, lack of sexual drive and infertility. Joints are swollen.

**Treatment/Control:** Get your animals tested for brucellosis., Vaccination of female calves at the age of 6-8 months is preferred with strain-19 vaccine.

4. **Contagious postular Dermatitis or *Contagious ecthyma:***

**Animal affected:** Sheep and goat

**Symptoms/lesions:** Erythema which develops into scabs on lips, muzzle & nose. Restricted suckling & grazing. Sometimes gastroenteritis and broncho-pneumonia.

**Treatment/Control:** Antiseptic dressing of wound. Antibiotic injections.

**5. Enterotoxaemia/Pulpy kidney disease:**

**Animal affected:** Sheep and goat especially young lambs.

**Symptoms/lesions:** Sudden death. Otherwise excitement, excessive salivation, champing of jaws, frothing, head pushing, convulsion, glycosuria at terminal stage (Hyperglycaemia). Soft pulpy kidney after 3-4 hours of death.

**Treatment/Control:** Broad spectrum antibiotics like chlortetracycline. Vaccination-Alum precipitated formalised anaeroculture @ 2.5 ml S/C in lambs above 3 months. Repeat after 14 days. For pregnant ewe : 1st dose at 35 days before parturition. 2nd dose at 21 days before parturition.

**6. Contagious caprine pleuropneumonia:**

**Animal affected:** Goat

**Symptoms/lesions:** Weakness, copious nasal discharge, loss of appetite, cough, respiratory signs, abortion may occur.

**Treatment/Control:** Rolitetracycline @ 10 mg/kg x 7 days i/m. or Chloramphenicol @ 30 mg/kg x 7 days i/m. or Tylosin tartrate @ 10 mg/kg every 12 hourly x 3 days i/m. Attenuated vaccine = 0.2 ml in the tip of tail. Repeat every year.

**7. Contagious Agalactia:**

**Animal affected:** Goats and sheep

**Symptoms/lesions:** Transient fever, anorexia, depression. Udder gradually atrophies and milk yield decreases. Abortion in pregnant ewes. Purulent keratoconjunctivitis. Joints swelling, pain, arthritis & lameness.

**Treatment/Control:** Rolitetracycline @ 10 mg/kg x 7 days i/m. Chloramphenicol @ 30 mg/kg x 7 days i/m or Tylosin tartrate @ 10 mg/kg 12 hourly x 3 days i/m.

**Vaccination :** Formalised killed alum precipitated vaccine 0.2 ml S/C before breeding.

**8. Contagious bovine pleuropneumonia:**

**Animal affected:** Bovine

**Symptoms/lesions:** Pneumonia. Rise in temperature. Anorexia, disinclination to move, painful cough & death. On PM :- characteristic marbling of lungs.

**Treatment/Control:** For diagnosis intradermal mycoplasma test can be done. Rolitetracycline @ 10 mg/kg x 7 days or Chloramphenicol @ 30 mg/kg x 7 days or Tylosin tartrate @ 10 mg/kg 12 hourly x 3 days. Combination of Tylosin tartrate and cotrimoxazole give better results. Vaccination: Attenuated vaccine 0.2 ml in the tip of tail.

**9. Tetanus (*Clostridium tetani*):**

**Animals affected:** Mostly Horse but sheep, goat, pig and cattle also suffer.

**Symptoms/lesions:** Rigidity of muscles, feeding suspended, hyperaesthetic to touch & sound, erection of ear, opisthotonus/hypohotic, muscular twitching, difficulty in walking, lock jaw, protrusion of third eye lid, recumbency.

**Treatment/Control:** Antiseptic dressing of the wound. Penicillin locally. Penicillin systematically @ 1000 IU/kg i/m. Antitetanus serum in LA, 1,50,000-2,00,000 IU i/v. In SA, 25,000-50,000 IU i/v. Muscle Relaxants - MgSO<sub>4</sub> 10%, 100-200 ml i/v. or Chlorpromazine @ 1 mg/kg. Vaccination - Tetanus toxoid 10 ml i/m in LA, 4 ml i/m in SA. In ewes, give 2-3 wks prior to lambing.

**10. Glanders:**

**Animal affected:** Horse, Mule, Donkey

**Symptoms/lesions:** Acute-high temperature, coughing, nasal discharge, ulceration of nasal mucosa. Chronic ; - cough, epistaxis, laboured, respiration, nodules on nasal septum and turbinates produce serous to mucopurulent discharge, enlargement of submaxillary lymph node, s/c nodules discharge honey like pus.

**Treatment/Control:** For diagnosis - Mallien test is necessary. CST of pus. As per glanders and farcy act, the affected animals are to be destroyed.

**11. Collibacillosis: (*E. coli*)**

**Animal affected:** All animals

**Symptoms/lesions:** Calves, lambs, and kids are commonly affected. Important symptoms are fever, diarrhoea or dysentery, loss of appetite, dry skin coat, sunken eyeballs, temperature becomes subnormal

**Treatment/Control:** Neftin 1 to 2 tablets twice daily for one week. Gestina or Thalazole in recommended doses.

**12. Haemorrhagic septicaemia: (*Pasteurella multocida*)**

**Animal affected:** Cattle, buffalo, sheep, goat, pig

**Symptoms/lesions:** High fever (105<sup>0</sup>-110<sup>0</sup>F), difficult respiration, oedema of the throat region, loss of appetite, coughing, sudden death may occur.

**Treatment/Control:** Annual vaccination of animal is recommended before onset of rains.

**13. Johne's disease: (*Mycobacterium paratuberculosis*)**

**Animal affected:** Cattle,, buffalo, sheep, goat.

**Symptoms/lesions:** Diarrhoea of long duration, not responding to any treatment, loss of body weight, emaciation etc.

**Treatment/Control:** Consult the veterinary doctor for the testing of your animals and segregation.

**14. Mastitis (*Staphylococci, streptococci* & many other bacteria and fungi)**

**Animal affected:** Cattle,, buffalo, sheep, goat.

**Symptoms/lesions:** Fever in acute mastitis, udder is enlarged, hot and painful, milk becomes watery in consistency often with flakes of blood, taste saltish in the advanced stage, udder becomes hard, milk secretion very much reduced.

**Treatment/Control:** After removing milk completely from affected quarter(s) introduce intramammary infusions as per the advice of the doctor. Leave it for 12 hrs and repeat the process for 3 to 4 days. Do not consume milk. Keep the udder clean, wash hands and udder with antiseptic solutions ( like mild Pot. permanganate) before milking. Get your animals tested regularly to detect subclinical mastitis.

**15. Tuberculosis: (*Mycobacterium species*)**

**Animal affected:** Cattle, buffalo, sheep, goat, pig.

**Symptoms/lesions:** Irregular low-grade fever of long duration, coughing, difficulty in respiration, anaemia, progressive emaciation and loss of body weight.

**Treatment/Control:** Consult veterinary doctor for the confirmation of diagnosis and get your animals tested with tuberculin.

**16. Swine erysipelas: (*Erysipelothrix rhusiopathiae*)**

**Animal affected:** Cattle, buffalo, sheep, goat, pig.

**Symptoms/lesions:** Clinically divided into acute, subacute and chronic forms.

1. Acute form : rise in temp. sign of chill, stiff gait or lameness, complete inappetance, dry faeces.
2. Cutaneous lesions urticaria or diamond skin lesions

**Treatment/Control:** Treatment advisable as recommended by the doctor.

#### 17. Ringworm;(Fungal infection)

**Animal affected:** Cattle, buffalo, sheep, goat.

**Symptoms/lesions:** Inflammation of hair, falling of hair hair are brittle, split and many stumps left, lesions are circular on the face, shoulders, neck, below eyes, irritation and rubbing, greyish scales, thick crusts or scales may appear.

**Treatment/Control:** After clipping hair and scrubbing with soap and water, apply any of the following : Salicylic or benzoic acid ointment (2 to 5%) or tincture or iodine once daily until lesions heal or apply an fungicide.

#### VIRAL DISEASES:

#### 18. Foot and mouth disease : (O.A.C & Asia types)

**Animal affected:** All cloven-hoofed animals, i.e. cattle and buffalo, sheep goat and pig.

**Symptoms/lesions :** Rise of temperature, particularly marked in young animals. Vesicles on the tongue, lips, cheeks, gums dental pad and on the skin of interdigital space, bulbs of heel, coronary band, teats and udder. Stingy salivation, difficulty in chewing and lameness. In pig, sheep and goat, the salivation may be absent. Pregnant animals may abort.

**Treatment/Control:** Wash the mouth with mild disinfectants like alum, KMnO<sub>4</sub> solution etc. Apply boroglycerine on ulcers. Vaccination is recommended. Isolate the affected animals.

#### 19. Rinderpest:

**Animal affected:** Cloven-hoofed animals, cattle, buffalo, sheep, goat, pig & wild animals.

**Symptoms/lesions:** High rise of temp, (105<sup>0</sup>-107<sup>0</sup>F). Lesions appear on the inside of lower lips and gums. The lesions are raised and necrotic. There is excessive salivation, nasal and lachrymal discharge. On 4th to 7th day of illness profuse diarrhoea starts.

**Treatment/Control:** Regular vaccination of animals.

#### 20. Cow pox

**Animal affected:** Milking cows

**Symptoms/lesions:** Slight fever, teats become swollen and warmer. Congested area and vesicles appear on teat and udder. After few days the vesicles contain pus and finally dry crusts are formed. In male animals the virus affects scrotum.

**Treatment/Control:** Apply milk and soothing disinfectants.

#### 21. Sheep pox

**Animal affected :** Sheep and goat.

**Symptoms/lesions:** Rise in temperature, swelling of eyelids, pustules that gradually develop into scabs on the skin of entire body, excessive salivation.

**Treatment/Control:** Topical pox lesions and demonstration of intracytoplasmic inclusion bodies are of diagnostic importance. Antiseptic dressing of wounds and a course of antibiotics.

**Vaccination :**  
Attenuated freeze dried vaccine = 1 ml S/C  
Formal. gel inactivated vaccine.  
Adult = 5 ml S/C  
Lamb = 3 ml S/C (1 yr immunity)

## 22. Hog cholera or swine fever

**Animal affected:** Pig

**Symptoms/lesions:** Young pigs are more susceptible. The disease starts with sudden death of an animal followed by illness of other pigs. There is high rise of temperature (105<sup>0</sup>-107<sup>0</sup>F), dullness, weakness in hind quarters, constipation followed by diarrhoea. Red patches appear on the skin of the abdomen, ears and mouth. There may be coughing.

**Treatment/Control:** Vaccination of pigs.

## 23. Canine distemper

**Animal affected:** Dog, fox, etc.

**Symptoms/lesions:** The disease affects puppies and seldom older dogs. There is fever, discharges from eyes and nose, vomition, diarrhoea, respiratory symptoms, pneumonia. The skin of foot pads becomes hard, nervous symptoms like muscular tremors and paralysis may develop.

**Treatment/Control:** Vaccination of puppies after 6-10 weeks age (Pentadog).

## 24. Rabies

**Animal affected:** Dog, cat, wolf jackal, fox and other wild carnivores and man.

**Symptoms/lesions:** Rabies is caused by the bite of a rabid animal. The disease develops usually after 20-60 days of the bite but not less than 10 days of bite. There is a change in the temperament of dog, strange in behaviour, becomes furious, it will bark and bite any object, the animal may stray long distances. The dog howls in an unusual tone, there is frothing and salivation. The animal slowly becomes paralysed and dies within 10 days of onset of disease. The cats also show similar symptoms. Affected cattle become restless, excited and aggressive, there is grinding of teeth, increased salivation and choking. Paralysis of hind quarter followed by death.

**Treatment/Control:** Vaccination of pet dogs. First vaccination at 8-10 weeks, later on yearly basis for adult dogs (flurry strain of brain emulsion of diploid cell culture).

## PARASITIC DISEASES

### 25. Coccidiosis: (*Eimeria spp.*)

**Animal affected:** Cattle, buffalo, sheep, goat, pig, poultry & rabbit

**Symptoms/lesions:** Blood stained diarrhoea, anaemia and weakness. Death may also occur in untreated cases.

**Treatment/Control:** Faecal examination followed by treatment is necessary. Amproforte - AK (Alved ) 1 g/24 kg B.W for 5 days orally. Amprosol 20% (marvid) 30g/25 litre water for 5-7 days. Coccillium Premix 25% 1 kg/ton of feed for 5 days. Codrinal, 4 g/litre of water for 2-4 days.

### 26. Babesiosis :(*Babesia bigemina*)

**Animal affected:** Cattle, buffalo, exotic and crossbred cattle are the worst effected.

**Symptoms/lesions:** Fever, coffee coloured urine, anaemia, jaundice.

**Treatment/Control:** Blood examination is essential. Consult vety. doctor before any treatment is given. Trypan Blue (Ethicare) : 1-4 g slow i/v route Berenil : 0.8-1.6 g/100 kg B.W. i/m, Pronil - H ,0;5 ml./i/m.

**27. Anaplasmosis : (*A. marginale*)**

**Animal affected:** Mostly exotic & crossbred cattle.

**Symptoms/lesions:** Rise in temp., dyspnoea, increased pulse & respiration rate, suspended rumination, anaemia, constipation followed by diarrhoea, mucous membranes become pale, pregnant animal may abort, animal may die.

**Treatment/Control:** Chlortetracycline 5-10 mg/kg 1/m. Tetracycline HCL 5 mg/kg Rolitetracycline HCL 4 mg/kg, Imidocorb 1-2 mg/kg i/m- 2 doses at 7 days interval.

**28. Theileriosis: (*Theileria annulata*)**

**Animal affected:** Exotic cattle, crossbred cattle with high percentage of exotic blood.

**Symptoms/lesions:** High fever, enlargement of the superficial lymph glands, lacrymation, difficult respiration, jaundice and anaemia.

**Treatment/Control:** Blood and lymph gland biopsy examination is essential. No specific treatmet is available. Long acting tetracycline alongwith blood transfusion given at early stage may help. Keep animals free of ticks by regular spraying of recommended insecticides.

**29. Surra :(*Trypanosoma evansi*)**

**Animal affected:** Horse, camel, cattle and buffalo

**Symptoms/lesions:** Fever, nervous signs, excitement, circling, apparent blindness, depression, loss of body weight and anaemia.

**Treatment/Control:** Blood examination is essential. Gipol : 12 mg, per kg B.W. i/m,  
Berenil : 0.8-1.6 g/100 kg B.W. i/m,  
Tevansi, Inj : 5-10 ml. S/C,  
Tribexin Prosalt (3 g, vial) : Dissolve in 10 ml. dist. water, 1.3 ml. per 45 kg B.W. S/C.

**30. Ascariasis:(*Toxocara vitulorum, Ascarisuum, Parascaris equorum, Toxocara canis and Ascaridia galli*)**

**Animal affected:** Buffalo/cow calf, young pig, horse dog, poultry.

**Symptoms/lesions:** Diarrhoea, loss of body weight, pendulous abdomen. In pigs, cough and difficulty in breathing.

**Treatment/Contol:** Faecal examination is essential. Lemasol powder : (20 g pouch) : 1-2 pouch per adult, cattle, 1 pouch per calf.  
Piperazine liquid (45%) : 30 ml/calf

**31. Parasiic gastroenteritis: (*Haemonchus. Trichostrongylus, Oesophagostomum, Ascarops, Physocephalus*)**

**Animal affected:** Sheep, goat, camel, pig.

**Symptoms/lesions:** Diarrhoea and severe emaciation.

**Treatment/Control:** Faecal examination is necessary. Curaminth, Panacur : 5-15 mg/kg B.W. orally. Lemasol Powder : 20 g/adult sheep or goat.

**32. Hook-worm Infection (*Ancylostoma caninum & A. braziliensis*):**

**Animal affected :** Dog

**Symptoms/lesions:** Diarrhoea,often blackish stool,anaemia, emaciation.

**Treatment/Control:** Faecal examination is essential. Helmonil tab. 1 tab (150 mg) 10 kg B.W., orally.

**33. Liver Fluke Infection: (*Fasciola gigantica*)**

**Animal affected:** Sheep, goat, cattle & buffalo.

**Symptoms/lesions:** Diarrhoea, emaciation, oedema of the throat.

**Treatment/Control:** Faecal examination is essential : Zaniil 10-15 mg/kg B.W., orally.

**34. Parasitic Winter diarrhoea Paramphistomiasis (*Amphistome* spp.)**

**Animal affected:** Sheep, goat, occasionally cattle.

**Symptoms/lesions:** Occur from October to March. Loose to watery diarrhoea, oedema of throat.

**Treatment/Control:** The Disease is caused by immature stages of amphistomes which can be detected in the fluid faeces.

Nilzan : 33 ml/50-100 kg B.W. for bovine & 10 ml/15-30 kg B.W for sheep and goat, orally.

Zaniil : 60 ml over 45 kg B.W. & for 15-30 kg 30 ml is highly effective.

**35. Intestinal fluke Pig Infection (*Fasciolopsis buski*):**

**Animal affected:** Pig

**Symptoms/lesions:** Diarrhoea, abdominal pain

**Treatment/Control:** As per Sr. No. 33.

**36. Blook fluke infection: (*Schistosoma* spp.)**

**Animal affected:** Buffalo and cattle

**Symptoms/lesions:** Loss of condition, anaemia, granulomatous growth inside nostrils.

**Treatment/Control:** Consult a veterinary doctor. Anthiomaline (M&B) 20 ml, deep i/m twice a week is highly effective.

**37. Tapeworms Infection (*Moniezia, Taenia, Echinococcus* spp.)**

**Animal affected:** Sheep, goat, catle & dog.

**Symptoms/lesions:** Vague abdominal trouble, diarrhoea and constipation, segments of the tape worm may be seen in the faeces.

**Treatment/Control:** Faecal examination is essential., Niclex tab. 1 g/20 kg B.W. for large animals & 100 mg/kg for dog.

**38. Mange (*Sarcoptes scabiei, Psoroptes ovis, Demodex canis*).**

**Animal affected:** Dog, pig, goat, camel, sheep and buffalo

**Symptoms/lesions:** Severe itching, falling of hair, scabs and crusts on affected skin, occasionally pustules.

**Treatment/Control:** Skin scrapping examination is essential. Clip hair and scrub with warm water and soap. Apply 0.55 malathion or 0.15% lindane or 0.5% Sevin as spray, swab or dip, thrice at intervals of seven days. 1% Trichlorophon (Diptrex) ointement in vaseline, Ivermectin at the dose of 200 mg/kg B.W. is very effective.

**39. Ticks infection : (*Boophilus, Hyalomma, Haemaphysalis, Rhipicephalus* spp.)**

**Animal affected:** Cattle, buffalo, camel, dog, sheep and goat.

**Symptoms/lesions:** Cause severe irritation, transmit many diseases, cause anaemia if the infestation is severe.

**Treatment/Control:** For exotic and crossbred cattle/sheep regular spraying/dipping is done with 0.5% Malathion or 0.5% Sevin or 0.2% Sumithion at monthly intervals during summer. In case of severe infestation above treatment be given thrice at 10 days intervals. For mild infestations spot application be made with 5% Sevin dust.

**40. Lice infestation :(*Haematopinus, Linognathus*)**

**Animal affected:** Buffalo, cattle, pig, camel

**Symptoms/lesions:** Cause irritation, loss of condition resulting in poor health.

**Treatment/Control:** Apply 5% Sevin dust at weekly intervals.

**OTHER DISEASES**

**41. Milk fever: (significant depression in the level of ionized calcium)**

**Animal affected:** Recently calved cows and buffaloes

**Symptoms/lesions:** Initially animal shows muscle tremors with sternal recumbency without temperature and sits with lateral kink in neck (opisthotonus). Later it attains lateral recumbency and is almost comatose with depressed circulatory signs. Bloat may also be seen. There is not fever.

**Treatment/Control:** It may be taken as an emergency case and veterinarian be contacted to administer calcium borogluconate I/V inj. Avoid drenching. However, it can be prevented by feeding ration rich in phosphorus and low in calcium and vitablend during late pregnancy. Avoid total milking of colostrum.

**42. Post-parturient haemoglobinuria**

**Animal affected:** Buffaloes/cattle

**Symptoms/lesions:** Animal passes coffee coloured urine after parturition. It may also occur during advance prgnancy. Gradual weakness, anaemia and loss of life if not treated.

**Treatment/Control:** Acid sodium phosphate 300 ml (20% sol) I/V and 60 g orally for 3 days or more. Haematinic mixture 10 g x 7 days, orally.

**43. Ketosis**

**Animal affected:** Cows/buffaloes

**Symptoms/lesions:** Loss of appetite after calving. Low milk production, gradual weakness. Affected cattle refuse concentrate.

**Treatment/Control:** Dextrose (20%) 500 ml i/v. Dexamethasone 4-8 mg i/m. Glycerol 200 ml daily, orally.

**44. Hypomagnesaemia**

**Animal affected:** Lactating cattle and buffalo.

**Symptoms/lesions:** Adult cattle develop sudden tetany. Lateral recumbency. Hyperaesthetic to touch. Loss of appetite and milk yield. In calves, champing of jaws, convulsion and prostratosis is common.

**Treatment/Control:** Magnesium sulphate (10%) 100 200 ml i/v followed by S/C or Mifex - 100-450 ml i/v.

**45. Respiratory Distress Syndrome (Horse)**

**Animal affected:** Horse, mule, donkey

**Symptoms/lesions:** There is increased respiration. The force of abdominal contraction is increased. The affected horse shows low tolerance to work, gradual weakness, anaemia and coughing, untreated animals usually die.

**Treatment/Control:** Deworm the animal. Give a course of penicillin/ streptomycin injection and haematinic mixture.

**46. Urea poisoning: (accidental intake)**

**Animal affected:** All animals

**Symptoms/lesions:** Severe abdominal tremors, dyspnoea, bloat, bellowing, violent movements.

**Treatment/control :** Vinegar upto 4 litres for cow or administration of 5% Acetic acid in repeat doses after 30 minutes.

**47. Lantana poisoning (*L. camara*)**

**Animal affected :** Cattle, sheep and goat

**Symptoms/lesions :** Lethargy, Ruminal stasis, Photosensitization, anorexia, constipation, jaundice.

**Treatment/Control:** Activated charcoal 2-4 kg, MgSO<sub>4</sub> 1 kg or MgSO<sub>4</sub> 500 gm + NaCl 500 gm. Rumenotonic drugs. Avil 20 ml i/m, Vit. A & B.

**48. Ohi poisoning (*Abizia stipitata*)**

**Animal affected:** Sheep & goat

**Symptoms/lesions:** There is severe ruminal stasis/tympany and constipation, Abdominal pain and hepatic dysfunction.

**Treatment/Control:** Stop feeding of leaves. Rumenotronics, laxative/purgative should be given, Liver extract is beneficial.

**49. Ageratum poisoning.**

**Animal affected:** Sheep, goat, cattle and buffalo.

**Symptoms/lesions:** Blood in the faeces, dehydration, weakness, liver dysfunction, anorexia.

**Treatment/Control:** Styptindon 5-15 ml i/m or other styptics, fluid therapy, liver extract i/m.

**50. Bracken fern Poisoning: (*Enzootic bovine haematuria*)**

**Animal affected:** Cattle

**Symptoms/lesions:** Blood in the urine, weakness, anaemia. Cancer of urinary bladder in later cases.

**Treatment/Control:** Stop feeding the bracken fern. Haematinics, Liver extract, Blood transfusion, Styptic therapy (Styptindon/chromostat).

**51. Nitrate/nitrite poisoning (Nitrate/nitrite rich fodders are maize, bajra etc.)**

**Animal affected:** Cattle, buffalo, rarely sheep & goat.

**Symptoms/lesions:** Respiratory difficulty, staggering gait, falling and sudden death.

**Treatment/Control:** Blood becomes chocolate brown in colour. Urine is positive for nitrate/nitrite. Treat with Vit. C and methylene blue.

**52. Hydrocyanic acid poisoning: (Jowar, Baru, linseed cake etc.)**

**Animal affected:** Cattle

**Symptoms/lesions:** Severe respiratory distress, death within a few minutes.

**Treatment/Control:** Blood is bright red in colour, give sodium thiosulphate and sodium nitrite injection.

53. **Piglet anaemia:** (Iron & copper deficiency)

**Animal affected:** Pig

**Symptoms/lesions:** Anaemia occurs mainly when pigs are kept indoors on concrete floors. Marginal deficiency of iron and copper and low level of molybdenum may make them more susceptible to infections.

**Treatment/Control:** 1. Use of iron dextran preparation for parenteral administration of piglets. 2. Application of an iron copper syrup preparation on teats of sow.

## VACCINATION SCHEDULE

### A. cattle/buffaloes/sheep/goat and horses

**Disease:** Haemorrhagic Septicaemia

**Vaccination:**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
(a) Alum precipitated vaccine	5 ml S/C	Ruminants any time during the year preferably before monsoon	6 months
(b) Oil adjuvant vaccine	3 ml/m	-do-	-do-

**Disease:** Food and Mouth Disease(FMD):

**Vaccination:**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
(a) Polyvalent tissue culture inactivated vaccine having O,A,CA <sub>22</sub> Asia-I strain	3 ml S/C	Ruminants - any time during the year preferably in March & Sept.	Biannual
(b) RAKSHA-FMD(Polyvalent tissue culture inactivated vaccine having O,A,C, Asia-I and A <sub>22</sub> )	3 ml S/C	-do-	-do-

strain)

**Disease: Rinderpest**

**Vaccination:**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
(a) Goat tissue vaccine (Live Lyophilised) for indigenous cattle only	1 ml S/C	Ruminants- Any time	Life long
(b) Tissue culture vaccine	-do-	-do-	3 year

**Disease: Brucellosis**

**Vaccination:**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
<i>Brucella abortus</i> (strain-19) live calfhood vaccination	5 ml S/C	All female animals at 6 months age	Life long

**Disease: Strangles**

**Vaccination**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
<i>Streptococcus equi</i> vaccine	2,3 & 5 ml S/C at 3x1 wk interval	Horses/ Mules	Annual

**Disease: Black quarter**

**Vaccination**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
Inactivated vaccine	Ruminants -3 ml s/c	Preferably before monsoon	Annual

**Disease: Sheep pox**

**Vaccination:**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
Tissue culture Sheep pox	Sheep- 1 ml	Any time during	Annual

Vaccine S/C the year

**Disease: Tetanus**

**Vaccination**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
Tetanus toxoid	All animals-10 ml i/m	On injury	Annual

**Disease: Anthrax**

**Vaccination**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
Anthrax spore vaccine	All animals 1 ml/sc	-	Annual

**Disease: Contagious caprine Pleuro-pneumonia**

**Vaccination**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
Attenuated vaccine	Goats-0.2 ml at the tip of tail	Any time	Annual

**B. Dogs**

**Disease : Rabies**

**Vaccination**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
a) Semple's vaccine (20%)	5 ml S/C at 3 months of age	6 m after first months	Annually
b) Raksharab	1 ml S/C 3 months & above	28 days after 1st	Annually
c) Low egg passage (LBP)	2 ml i/m or s/c 3 months	1 year	Annually

**Disease: Distemper, Hepatitis & Leptopiresis**

**Vaccination**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
Candure DHL	2 ml S/C	12 wk	Annual

Disease: Parvo Viral Infection

**Vaccination**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
PARVO DOG	1 ml S/C	12 wks	Annual

**C. Poultry**

Disease: Ranikhet disease

**Vaccination:**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
(a) F <sub>i</sub> Strain (Live, lyophilised)	1-2 drops intranasal/ intraocular	1-10 days old chicks	-
b) R <sub>2</sub> B strain (Live, lyophilised)	0.5 ml i/m	6-8 weeks age	-

Disease: Marek's disease

**Vaccination:**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
HVT vaccine	0.2 ml i/m or s/c	1 day old	-

Disease: Fowl Pox

**Vaccination:**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
Fowl Pox live vaccine	Prick method (0.1 ml i/m or s/c)	8-10 weeks of age	-

Disease : Fowl spirochaetosis

**Vaccination**

Name of vaccine	Dose and	Primary	Revaccination
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	route	vaccination
Killed vaccine	1 ml i/m	1 day old chicks

**Disease: Infectious Bronchitis**

**Vaccination :**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
Live vaccine	1-2 drops Intransasal Drops	1 day old chicks	-

**Disease: Infectious Bursal disease(Gumboro disease)**

**Vaccination :**

Name of vaccine	Dose and route	Primary vaccination	Revaccination
Live vaccine / Inactivated	0.2 ml s/c	Chicks 2-3 wks old	16-20 days
	0.5 ml s/c	Chicks above 6 wks.	

**Collection and despatch of materials for the diagnosis of infectious diseases**

If meaningful results are expected from any laboratory, the correct type of samples must be collected and rightly preserved to prevent their deterioration prior to arrival at the laboratory. Generally speaking, samples to be sent to a laboratory should be placed in a water-tight glass or plastic container. The container should be well packed to prevent breakage during transit, this can be achieved by keeping them in ice placed into the container. This will keep the specimen cool for eight and 24 hours depending on the external temperature. A vital point which needs emphasis is that the field veterinary officer should procure complete history of the cases and send it to the laboratory along with materials with the following information :

1. Clinical history including symptoms of the disease.
2. Animals involved
3. Breed, age, sex.
4. Numbers of animals attacked and total population of the susceptible animals, if possible.
5. Duration of sickness or outbreak.
6. No. of animals died.
7. Nature of feed, source of water supply, management, houses, pens, etc.
8. Post-mortem changes.
9. Time elapsed between death and collection of material.

10. Type of material collected and despatched (specify container or specimen, source of material giving case no. and name of owner, etc.)
11. Type of preservative used.

In case of poultry, suckling pigs, lambs, kids, rabbits etc it will be better if a couple of live animals (untreated), showing symptoms typical of the disease are sent to the laboratory for investigation of the disease through courier, taking all precautions to prevent the further spread of the disease during transit. It is very important particularly in case of infectious disease.

### **Microbiological examination**

When the sample is to be examined for microbes, the greatest care should be exercised to ensure that a true sample is obtained. This is particularly true when samples are taken through a contaminated area : for example, uterine swabs can easily be contaminated by the bacteria that normally inhabit the vagina. Great care should be taken to ensure that the swabs are adequately guarded and contamination is prevented. Always place each tissue in a separately marked sterile container. In all cases submit as many properly taken samples from as many sites as possible to ensure that there will be a good chance of casual organism being isolated. Samples can also be obtained by aspiration techniques. The fluid is withdrawn, transferred immediately to a sterile screw cap container and sent to the laboratory without delay. Milk samples or pieces of fresh tissue should be treated with the same aseptic precautions and it is advisable to refrigerate tissues to prevent undue microbial multiplication. Small pieces of tissue are prone to invasion so whenever possible submit whole organs for examination. Tissue and pus smears must be very thin, prepared from the freshly cut surface. In the case of organisms such as *Salmonella*, take sizable samples, e.g. 20 g faeces in a sterile container, in order to enhance the chances of isolation. When the materials are collected for bacterial diseases these points must be kept in mind.

The material for examination should be collected from sick animals as far as possible during the acute phase of the disease and in case of death, immediately after death or, when sacrificed, immediately after sacrificing the animals.

### **Blood**

- (a) Preparation of blood smears or films for microscopic examination.
- (b) Whole blood for cultural examination, transmission experiments and other laboratory studies.

In cows, buffaloes, horses, sheep and goats blood is preferably taken from jugular vein. In pigs the blood is obtained after cutting the end of trail or tip of the ear or from anterior vena cava. In dogs and cats blood is obtained from sphenus or radial vein. For fowls brachial vein (on the ventral surface of wing) is selected. Before collecting blood, the site should be properly prepared by removing hair (feathers in case of fowl) and subsequently disinfecting it. Some blood is allowed to flow through the needle, before it is collected. It is vital that all aseptic precautions are taken while collecting blood especially when it is needed for cultural examination.

For seriological studies, serum is procured by allowing the blood to clot, keeping it in a cool place. Serum as soon as it gets separated, is removed in a clean tube or bottle.

### **Faeces**

Faecal samples for microbiological examination should be collected with a sterile swab directly from the rectum or at the time of defecation and keep this swab in a sterile test tube/container.

### **Milk**

Milk for bacteriological examination is collected, taking usual aseptic precautions, in a sterile container. For isolation of mastitis organisms, milk is collected after discarding the first few streams of milk. For tuberculosis and brucellosis organisms, the strippings are preferred.

### **Urine**

Urine is collected at the time of micturition or obtained with the help of a clean and sterile catheter in a sterile container.

### Pus

For microscopic examination, smear is made on a clean glass slide and for cultural examination, it is obtained directly from the abscess in a sterile container, or if a sterile swab is available, it can be used and kept in a sterile container.

The materials to be collected would vary depending upon the disease and are being mentioned in a tabulated form, below.

### Bacterial diseases

Disease	Histopathological exam. (In 10% formalin)	Microbiological/Serological exam.
Anthrax*	Spleen, liver.	Spleen, venous blood soaked in tape or gauze and dried in a bottle. Sample should be marked "Case is suspected for Anthrax".
Brucellosis	Placenta and pieces from fetal organs	Intact foetus, placenta or stomach contents sent on ice. Paired serum sample.
Leptospirosis	Kidney, liver	Liver, kidney, urine, milk, blood on ice. Paired serum sample
Listeriosis	Brain	Brain on ice, stomach contents, vaginal secretion.
Tuberculosis	Pieces of affected lymph node/organs	Tubercle nodule in 25% glycerin.
Johne's Disease	Large intestines and mesenteric lymph node and iliocecal valve glycerin,	Faeces and rectal/ pinch/smears and intestines in 25%
B.Q.	Muscle pieces	Muscle pieces and exudate on ice.
Caseous Lymphadenitis	Affected lymph node(s)	Pieces of affected lymph node on ice.
Pasteurellosis	Lung, kidney heart, spleen blood smear	Heart blood, long bone (in putrified cases) pieces of affected viscera, venous blood in live animals.
Actinobacillosis Actinomycosis	Affected tissue pieces	Pus-biopsy material
Glander*	Affected lymph node	Pus, pieces of affected lungs.
Contagious Equine Metritis	Affected lymph node	Lymph node, urine and urethral swabs.
Swine Erysipelas	Pieces of organs showing lesions	Pieces of organs showing lesions.
Enterotoxaemia	Intestines, kidney and brain	Intestinal contents 100 ml with few drops of chloroform
CBPP	Lung	Lung & lymph node in 50% PBG.

CCPP	Lung	Pleural fluid & lung on ice or in 50% PBG.
CRD (Mycoplasmosis)	Pieces of trachea, lung & air sacs	Live bird from and brain
Spirochaetosis	Liver, spleen, blood smear	Whole blood, spleen.
Chlamydiosis	Infected organs alongwith placenta	Vaginal smears, placental cotyledons, faetal-stomach contents, liver spleen. lung etc. on ice, paired serum sample
Colibacillosis	Pieces of the affected intestine, heart	Heart blood, piece of affected intestine.

(Hajarre's Disease *E.coligranuloma*)

### Viral diseases

#### Collection and submission of specimens for virus isolation and characterization:

For isolation of causative viral agent and to characterize it depends on proper collection and preservation of the specimen(s). The knowledge of pathogenesis of viral disease is an important factor in order to collect the suitable tissue specimen. It is always better to collect the specimen as early as possible after the onset of the disease. The specimen collection for virus isolation from freshly dead animals is done when the material from live animals is not available.

#### Collection of specimen

##### 1. Whole blood

Whole blood samples are very good virological specimens for many diseases at the viraemic stage of disease.

Disease	Blood Preservative(s)
Blue Tongue	Oxalate-Carboic acid Glycerin(OCG) mixture, sodium citrate, heparin.
African Horse Sicknes	OCG
Rinderpest	Heparin
Equine Rhinopneumonitis	Heparin
Equine Infectious Anaemia	EDTA
Swine Fever	EDTA
Marek's Disease	Heparin

##### 2. Respiratory diseases

Naso-pharyngeal swabs, throat swabs are collected on sterilized wooden shafts with cotton, the tips are broken into a bottle containing transport medium. In dead animals, tracheal mucus membrane, throat swabs and pieces of lungs are collected. The transport medium used is tryptone phosphate broth (TPB).

The swab before use is moistened in Hank's balanced salt solution (HBSS) or TPB and is pushed in the nostril and then rotated, so that the swab is coated with nasal secretions. After removal the swab tip is broken in HBSS or TPB containing bottle.

##### 3. Skin disease

In pox diseases the vesicular fluid, scabs scales are collected in 50% phosphate buffered glycerin (PBG).

#### 4. Tongue, gum, snout epithelium

In Foot and Mouth Disease vesicular fluid is collected in sterile tubes and the vesicular epithelium from tongue, gum or snout is collected in PBG. In Rinderpest the gum scrapings are collected in 50% PBG.

#### 5. Uterine Biopsy

The material is collected with the help of biopsy catheter in PBG in viral infections like infections bovine rhinotracheitis, bovine virus diarrhoea etc. affecting the genital organs.

#### 6. Rectal swabs/stools

In enterovirus and rotavirus infections the rectal swabs are collected in TPB. The faecal samples are collected in sterile containers.

#### 7. Neurological diseases

In neurological diseases cerebrospinal fluid is collected with syringe by piercing between 3rd & 4th lumbar vertebrae. In dead animals brain in PBG is collected. In early infections blood is heparin is collected.

### Transport of specimens

Most of the viruses are sensitive to temperature and pH, therefore, these should be protected between collection and processing time. The specimens after collection are kept in sterile transport medium. The pH should be 7.2 containing antibiotics (crystalline penicillin 100 IU/ml, dihydrostreptomycin 200 mg/ml and mycostatin 100 ug/ml) to check bacterial or fungal contamination. The specimen tubes should be sent over ice to the laboratory and in the laboratory specimens are preserved at -20°C.

Disease	Histopathological (In 10% formalin)	Microbiological/ Serological
Rabies	Brain(Hippocampus in canines, Cerebellum in bovines)	Longitudinal intact half in 50% PBG
Rinderpest	Pieces of intestines, heart, mesenteric lymph nodes and spleen.	Whole blood in EDTA, spleen, prescapular and mesenteric lymph nodes in PBG.
Foot & Mouth Disease	Tongue, heart, rumen pillars, pancreas	Vesicular fluid or tongue scrapings in 50% PBG (about 2.0 gram).
Malignant Catarrhal Fever	Liver, heart, lung, lymph node, spleen, kidney, brain.	Lung pieces, lymph nodes and whole blood in EDTA.
Bovine Viral Diarrhoea	Mesenteric lymph nodes, intestine, pancreas	Blood, serum, mesenteric lymph nodes, mucous membranes of

		intestine, pancreas in TPB.
Infectious Bovine Rhinotracheitis	Lung, trachea, Liver	Respiratory exudate, and mucosal scrapings in 50% PBG. Paired serum samples.
Blue Tongue	Spleen, lymph nodes, muscle from coronary band, tongue etc.	Blood in OCG, spleen in 50% PBG. Paired serum samples.
Pox Disease	Skin portion and lung pieces. such. Paired serum samples.	Vesicular fluid, scabs or skin as
Equine Viral Abortion	Fetal liver, kidney, spleen, lung and heart & placenta.	Fetal tissue and respiratory exudate and placenta.
African Horse Sickness	Spleen, lung, lymph node 50% PBG.	Blood in OCG, spleen, lung in
Equine Infectious Anaemia	Lymph node, spleen, liver, bones.	Lymph nodes, liver, spleen in 50% PBG. Blood in EDTA.
Swine Fever	Spleen, kidney, lymph node, liver intestine, brain	Whole blood in EDTA, spleen, kidney in 50% PBG.
Scrapie	Brain	Brain in 50% PBG
Parainfluenza	Lung pieces	Lung and respiratory exudate in ice.
Canine Distemper	Brain, lung, spleen, trachea, urinary bladder	Brain, lung, spleen and respiratory exudate in 50% PBG.
Canine Parvo Virus	Intestine, heart muscle, spleen	Intestinal epithelium, heart muscle, spleen, faeces in 50% PBG.
Infectious Canine Hepatitis	Liver, lung, kidney	Liver, lymph nodes in 50% PBG, urine etc.
Newcastle Disease	Brain, lung, spleen, proven-	Spleen, lung, brain on ice or

	tricus, caecal tonsil, heart.	in 50% PBG.
Infectious Bronchitis	Lung, kidney, oviduct	Lung, trachea in 50% PBG.
Infectious Laryngo Tracheitis	Trachea, lung	Respiratory exudate, lung, trachea in 50% PBG.
Avian Encephalomyelitis	Brain tissue, spinal cord, proventriculus, pancreas.	Brain & spinal cord in 50% PBG.
Infectious Brusial Disease	Bursa of fabricious , spleen, kidney	Bursa of fabricious, spleen kidney in, 50% PBG.
Marek's Disease (Fowl follicle (Paralysis)	Brain, bracheal & sciatic nerve & skin feather follicle	Whole blood in heparin, feather follicle as such.
Lymphoid Leukosis	Liver, ovary & other affected organs.	Liver, ovary and other affected in 50% PBG.
Egg Drop Syndrome	Ovary, liver	Ovary, liver in 50% PBG. Paired serum samples.
Bovine Spongiform Encephalopathy	Brain	Brain in 50% OBG.

## Transport media

### Phosphate Buffered Glycerin (PBG)

It is prepared by mixing equal parts of phosphate buffered saline and neutral glycerin (pH 7.2-7.4).

### Phosphate Buffered Saline (PBS)

Sodium chloride (NaCl)	8.00 g
Pot. chloride(KCl)	0.20 g
Di-sod. hydrogen phosphate (Na <sub>2</sub> HPO <sub>4</sub> )	1.15 g
Pot. dihydrogen orthophosphate (KH <sub>2</sub> PO <sub>4</sub> )	0.20 g
Distilled water	1000ml.

The final pH of PBS is adjusted between 7.2 to 7.4, before autoclaving.

### Oxalate-Carbolic acid-Glycerin(OCG) Mixture

Potassium oxalate	5.0 g
Phenol(Carbolic acid)	5.0 g
Glycerin	500 ml
Distilled water	500 ml.

The pH is adjusted to 7.2 before autoclaving.

### Tryptose Phosphate Broth(TPB)

It is used as a transport medium for nasal, eye, rectal swabs etc :

Tryptose	20.0 g
Dextrose	2.0 g
Sod. chloride	5.0 g
Di-sod. hydrogen phosphate	2.5 g
Distilled water	1000 ml.

The pH is adjusted to 7.2 - 7.4 before autoclaving.

Antibiotics (pencillin @ 100 i.u./ml, dihydrostreptomycin @ 200 ug/ml and mycostatin 100 ug/ml) are added before collection of swabs to check bacterial contamination.

### Mycotic diseases

Mycotic infection eg *Aspergillosis*, *blastomycosis*, *coccidiomycosis* & *cryptococcosis*:

1. Affected tissues in sterile container without any preservative for culture.
2. Affected tissue pieces for histopathological examination in 10% formalin.

### Cutaneous mycotic infections:

Skin biopsy for culture and histopathological examination.

## IMPORTANT PARASITIC DISEASES OF DOMESTIC ANIMAL AND BIRDS

Disease (Parasite)	Symptoms/Lesions	Treatment/Control
<b>A. Cattle &amp; Buffaloes</b>		
1. Fasciolosis ( <i>Fasciola gigantica</i> )	Initially constipation followed by diarrhoea, emaciation, dullness and Weakness, oedema of the throat.	Faecal examination is essential. Zanil 10-12 mg/kg.B.W. Fasinex 12 mg/kg. B.W. Infection may be avoided by grazing livestock on higher grounds(snail-free)
2. Paramphistomosis ( <i>Amphistome</i> spp.)	Profuse fluidy diarrhoea and weakness, dehydration	Faecal examination is essential. Disease is caused by immature states which can be detected in fluidy faeces. Nilzan:33ml/50-100 kg.B.W. Zanil:30 ml over 45 kg B.W. 30 ml upto 45 kg B.W.
3. Ascariasis ( <i>Toxocara</i> )	Calf-hood diarrhoea growth retar-	Faecal examination is essential Piperazine liquid: 30mg/calf

	<i>vitulorum</i> )	rdation, weakness.  Buffalo calves are more susceptible.	Morantel: 10mg/kg B.W.
4.	Gastrointestinal nematodiasis ( <i>Haemonchus</i> , <i>Ostertadia</i> , <i>Strongyloides</i> spp.)	Diarrhoeic faeces loss of condition and weakness.	Faecal examination is essential Albendazole: 7.5 mg/kg B.W. Morantel : 10mg/kg B.W.
5.	Tropical bovine theileriosis ( <i>Theilaria annulata</i> )	Pyrexia 40-41. 5°C Lachrymation, swollen sup.lymph-nodes, haemoglobinuria may occur, anaemia.	Blood examination is essential Tetracycline :5 mg/kg B.W. Butalex 2.5 mg/kg B.W.
6.	Babesiosis ( <i>Babesia bigemina</i> )	Pyrexia, coffee coloured urine, anaemia, severe weakness, more serious in exotic breeds.	Blood examination is essential Trypan blue(Ethicare):1-4 g with i/v drip Berenil:0.8-1.6 g/100 kg B.W.

### Sheep and goat

1.	Fascioliasis ( <i>F.gigantica</i> )	Loss of appetite, anaemia, mucous membranes become pale bottle jaw, weakness and dry skin, wool falls in patches, digestive disturbances. In acute cases sudden death with bloody discharge from natural orifices.	Faecal examination is essential Triclabendazole:10 mg/kg B.W. Oxyclozanide:15 mg/kg B.W. Clioxanide:20 mg/kg B,W. Rafoxanide 7.5 mg/kg B.W.
2.	Paramphistomiasis ( <i>Amphistome</i> spp.)	Profuse fluidy diarrhoea/dysentery. weakness dehydration, bottle jaw, immature stages may pass in Faeces.	Faecal examination is essential. Niclosamide:50-9- mg/kg B.W. Rafoxanide:15mg/kg B.W.
3.	Haemonchosis ( <i>H.contortus</i> )	Anaemia, weakness, dehydration and sudden death.	Faecal examination is essential. Fenbendazole: 5mg/kg B.W. Albendazole:50mg/kg B.W. Norantel tartrate:10mg/kg B.W.. Levamisole:5mg/kg B.W
4.	Other parastic gastroenteritis	Digestive disturbances, oedema of dependent parts, anaemia. Weakness dehydration.	Fenbendazole:5mg/kg B.W. Levamisole:5mg/kg B.W.

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5.	Coccidiosis ( <i>Eimeria</i> spp.)	Blood stained diarrhoea, anaemia, weakness, death, particularly in young Animals.	Amprosol : 30 g/25 litre water for 5-7 days Codrinal : 4 g/lit of water for 2-4 days.
6.	Myiasis (Larvae of Dipteran flies)	Sheep stands with its head down, patch of discoloured, greyish-Brown moist wool with an evil odour Foul smelling Liquid exudes from Wounds.	Ivermectin:200 mg/kg B.W. Butacarb (.05%) spray Coumaphos (.05%) spray

### C. Horse, Pony & Donkey:

1.	Parasitic gastroenteritis ( <i>Parascaris equorum</i> , <i>strongyle</i> spp. <i>Oxyuris equi</i> .)	Soft and muddy faeces, weakness, dehydration Anaemia	Faecal examination is necessary 1. Piperazine:90 mg/kg B.W. 2. Mebendazole:8.8 mg/kg B.W. 3. Fenbendazole:7.5 mg/kg B.W. Ivermectin @ 200-250 ug/kg B.W.
2.	Stomach bots ( <i>Gasterophilus equi</i> )	Digestive disturbances	Ivermectin @ 200-250 ug/kg B.W.

### D. Dog and cat

1.	Toxocariasis ( <i>Toxocara Canis</i> , <i>T.cati</i> )	Infection found in young animals Animals either pot bellied or Tucked up abdomen, coat is dull, emaciation, anaemia, Digestive disturbances.	Faecal examination is essential. Piperazine adipate:100 mg/kg B.W. Fenbendazole:20 mg/kg B.W.
2.	<i>Ancylostomiasis</i> (Hook-worm Infection)	Mostly occurs in summer. Anaemia, oedema, general Weakness, faeces Diarrhoeic and Contain bloody Mucous. Mucous Membrances become Pale	Faecal examination is essential 1. Tetramisole:20mg/kg B.W. 2. Mebendazole:30 mg/kg B.W. 3. Fenbendazole:20 mg/kg B.W.
3.	Mange ( <i>Demodex</i> spp.)	Lesions usually found on head and Fore limbs. There Is loss of hair, Skin becomes Thickened, wrinkled with mousy odour. Colour of skin Becomes coppery-red.	Skin examination is essential. 1. Benzyl benzoate(20%) emulsion for local application. 2. Benzyl cresol(0.5%) emulsion for local application. 3. Closantel:5 mg/kg B.W. followed by 2.5 mg/kg B.W. at weekly interval.

### E. Rabbit

1.	Coccidiosis	Diarrhoea, weight	Faecal examination is essential
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( <i>Eimeria</i> spp.)	loss, reduced intake of feed and water, death in Heavy infection.	1.Sulpha dimethoxine:0.5-0.7g/lt.water 2.Bifuran:200 mg/kg of feed 3.Toltrazuril:15 mg/lt water
2. Mange( <i>Psoroptes cuniculi</i> , <i>Sarcoptes scabiei</i> )	Loss of hair,intense, pruritus, animals become weak. If there is ear canker, Then rabbit shakes Its head and some-Times may turn it Towards affected side.	Skin examination is essential 1. Benzyl benzoate as emulsion after mixing with equal part of soap and methylated spirit and applied locally after cleaning 2. Ivermectin:200 ug./kg B.W.

#### F. Poultry

1. Ascariasis ( <i>Ascaridia galli</i> )	Mostly in chickens of 1-3 months of Age. Birds become Anaemic, weak and Suffer from diarrhoea. Egg production is Decreased in laying Birds.	Faecal examination is essential 1. Piperazine adipate:300-400 mg/kg of feed. 2. Piperazine citrate:440 mg/lt of water 3. Mebendal (Mebendazole 0:50) 4. Tetramisole hydrochloride
2. Coccidiosis ( <i>Eimeria tenella</i> , <i>E. necatrix</i> and other species)	Caecal Coccidiosis occurs in young birds usually 4 weeks old. Chicks stop feeding,huddle, blood appears in Droppings. In Intestinal coccidiosis there is watery Diarrhoea containing Blood, birds cease to Feed, become weak and Egg production goes down.	Faecal examination is essential 1. Bifuran:125 g/kg of feed 2. Codrinal:4g/lt,water for 2-4 days or more (treatment) 1 g/lt.water daily(for prevention) 3. Amprolium soluble powder (1g.containing 200 mg) 60 g/100 lt. of water(in mild outbreak) 60 g/25 lt. of water(in severe outbreak)

#### Deworming Schedule in Animals

Drug	Species	Dosage	Remarks
1	2	3	4

#### I. Cattle, buffaloes, sheep, goat and horses

##### A. For Nematodes (Round worms)

1. Piperazine	All animals	220 mg/kg b.wt. orally. Repeat after 14-21 days	Effective mainly against large round worms.
2. Panacur (Fenendazole 25% powder)	-do-	5 mg/kg B.wt. orally	Also effective against tape worms in double dose (10 mg/kg)
3. Analgon (Albendazole) 25% w/v suspension and 1.5 g bolus	C,B,H	20 ml/100 kg B.wt or 1 bolus/ 300 kg B.wt	Also effective against flukes & tape worms in higher doses(10-15 mg/kg B.wt.). Should not be

				used in early Pregnancy.
4.	Curaminth (Tetramisole HCl)		Dissolve 10 g of powder in 30 ml water and give as below :	
		C & B	150 ml/100 kg B.wt. Max.650 ml.	
		S & C	15-30 ml orally . Max. dose 60 ml	
5.	Helatac (4% Perbendazole)	All Animals	30 mg/kg B.w. orally.	Milk from treated animals is not fit for consumption for 3 days.
6.	Lemasole (Levamisole) Inj 75 mg/ml or as powder	-do-	Powder 7.5 mg/kg B.Wt. orally. Inj. 1 ml/kg B.Wt. S/C	
7.	Nilverm (Tetramisole HCl)	-do-	15 mg/kg B.Wt. Max. dose of 15 gm cattle and buffalo.	
8.	Thibendal (Thiabendazole)		Dissolve 20 g in 100 ml water	
		C&B	0.5 ml/kg B.Wt Orally	
		S&G Orally	0.5 ml/kg B.Wt	
9.	Banminth (Morantel citrate) 118.8 mg and 0.594 gm bolus and 2.4% solution	C&B S&G	6 mg/kg B.Wt or 1 bolus/100 kg B.Wt. 1-5/20 kg B.Wt.	
10.	Wormin bolus (Mebendazol) 100 mg & 500 mg tablet	All animals	5-10 mg/kg B.Wt orally	Avoid frequent repetition in sheep to minimize danger of development of resistance. Also effective against tape worms (dose 10 15mg/kg B.W.
<b>B. For Trematodes (flukes)</b>				
1.	Distodin bolus and tablet(oxyclozanide) 200 mg tab. ad 1.00 g bolus	C&B S&G	1 bolus/100 kg/ B.Wt. 1. tab./20 kg B.Wt.	Do not use in severe damage of liver or in advance pregnancy and stress. Effective against Liver fluke, paramphistomes and amphistomes.
2.	Zanil(Oxyclozanide)3.4% w/v	C&B	30 ml/100 kg B.Wt. Max. dose 100 ml Orally	-do-

		S&G	15 mg/kg B.Wt.	-do-
3.	Clozanc Oxyclozanide)3.4%		-do-	-do-
4.	Tolzan(Oxyclozanide)3%	-do-	-do-	-do-
5.	Ranide(Refoxanide)20% w/v	All animals	7.5 mg/kg or 10 g Ranide/ 250 kg B.Wt.	-do-
6.	Analgon (Albendazole) 2.5% w/v suspension ad 1.5 g bolus	Goat, Buff, Sheep & goat	10-15 mg/kg B.Wt.	Do not use in early pregnancy.

C. For cestodes (Tape worms):

1.	Cestophene	Goat, Buff, Goat & sheep	@ 0.2 g/kg B.W.	Repeat 3 weeks later
2.	Niltape	-do-	2.5-10 g orally	-do-

II. Dogs

Drug	Name	Efficacy against	Dose & route
1.	Piperazine	Pherazine adipate Piperazine citrate Piperex, Vermex	Ascarids 220 mg/kg B.W. orally Max. of 250 mg for pups under 2.5 kg B.Wt. 4 mg/kg B.W. or 1 ml/
2.	Disophenol	Ancylo 4.5%	Hook worms 4.5 kg B.Wt. S/C
3.	Mebendazole	Wormin, Zodex(100 mg tabs)	Hook worm, ascarids Taenia sp. 5 mg/kg B.Wt. orally daily for 5 days.
4.	Fenbendazole	Panacur(150 mg tabs)	-do- 10-20 mg/kg B.Wt.
5.	Albendazole	Analgon (2.5%) Albomar	Tape worm & Ascarid single dose. 150 mg tab orally for pups 50 mg orally
6.	Levamisole Hydrochloride	Katrax(150 mg & 50 mg tabs)	Ascarid and Taenia 150 mg tab orally for pups 50 mg orally single Dose
7.	Dichlorphen	Cestophene	Tapeworm 0.2 g/kg b.w. orally Repeat 3 weeks later.

## REPRODUCTIVE PROBLEMS AND THEIR MANAGEMENT

### ANOESTRUS

It can be of two types; one in which animal does not come in heat and the second, in which the animal comes in heat but does not exhibit signs externally. Unless condition is congenital, it can be managed easily. Good nutrition is the

prime consideration. Animal should be given required quantity of concentrate and mineral mixture, in addition to stomach full of green and hay. Care should be taken to save animal from internal and external parasites. Usually a cross-bred cow should come in heat between 18 to 24 months of age and after calving it should again be pregnant within three months. Target should be to get one calf per year from one animal.

### Repeat Breeding

Any cow not conceiving inspite of three inseminations is considered as repeat breeder. Animal owners can take care of this condition by themselves some extent. Firstly, a cow taken for insemination should be in perfect oestrus. That can be identified very easily by following observations.

- She mounts on or stands to be mounted by other animals.
- She bellows.
- There is discharge from vulva.
- Cow is restless, food intake is less and milk yield is reduced.
- In buffaloes, there is a very typical sign of frequent urination. If you observe a buffalo in estrus for about a minute, she will urinate 3-4 times in that small duration.

So, always get your animal inseminated, only when she is in good heat, **Remember that :**

- The discharge should be absolutely transparent. Presence of any colour is indicative of infection of genital tract. Such animals should be given suitable treatment before insemination.
- Normal duration of oestrus in cattle is around 19 hr. Any cow found in heat should be taken for AI in the middle or end of estrus. In other words, a cow detected in oestrus in the morning should be taken for AI in the evening. If the duration of estrus is longer, another insemination should be done 12 hr. after first one.
- Always get the animal inseminated from a competent person. Laymen or quacks spoil genitalia of animals and such animals become sterile and can not be treated.
- A veterinarian is the best judge to decide whether a particular animal is fit for insemination or not, So never insist or force him to inseminate the animal. If he suggests to some treatment before AI, follow it.

### Management of retained placenta

Placenta (sal) should be expelled by the dam within 6-8 hr of calving. Retention after 12 hr can lead to serious consequences. The important points to be considered in these cases are :

#### DO's

- \* Milk the animal soon after calving or allow the calf to suckle.
- \* Segregate the animal
- \* Clean the perineal area, udder of the animal with light potassium permanganate solution.
- \* Disinfect the shed.
- \* Cut the exposed part of placenta at the level of tail.
- \* Send a part of placenta and blood sample in ice to nearest disease investigation laboratory with the help of veterinarian.
- \* Call the veterinarian if afterbirth is retained for more than 8 hrs.

#### Dont's

- \* Never apply traction to the hanging part of placenta.
- \* Don't tie any heavy material or weight to this part.
- \* Don't handle placenta with bare hands and wash your hands thoroughly.
- \* Never use raw milk of such animal.

### **Management of prolapse**

#### **A. Prolapse of Vagina**

- \* Seen during pregnancy especially advanced stage
- \* Initially only a small portion may be exposed and if care is not taken the condition may become gradually serious.

#### **DO's**

- \* Try to make animal stand.
- \* Provide laxative diet.
- \* Keep the flore clean and provide proper drainage
- \* If animal has a tendency of prolapse, try to keep the hind quarters raised.
- \* When prolapse occurs, clean the exposed mass with clean cold water containing potassium permanganate and alum.
- \* Cover it with clean cloth and seek the help of a veterinarian.
- \* The diet of the affected animals should be supplemented with therapeutic levels of calcium and phosphorus containing preparation.
- \* Persistence of constipation, faecal and urinary incontinence needs an examination.
- \* Application of rope truss is beneficial.

#### **Dont's**

- \* Avoid excessive feedidng with low quality roughages.
- \* Don't repell the proapsed mass by fingers, shoes or slipper.

#### **B. Prolapse of uterus**

- \* Seen immediately to 6-8 hrs. after calving
- \* Entire uterus is overtred and exposed to environment.

#### **Don't**

- \* Keep the prolapse lifted above the pin bones with a clean towel or cloth.
- \* Clean the exposed mass with clean cold water containing potassium permanganate and alum.
- \* Pain killer can be administered.

### **Don't**

- \* Don't keep the prolapse mass uncovered.
- \* Avoid the presence of any contamination where the animal sits.
- \* Don't replace the prolapse mass by shoes or slipper.

### **Management of uterine torsion**

This is the rotation of the uterus alongwith its contents along the longitudinal axis of the dam. It mostly occurs during first state of labour but sometimes may occur during later stage of gestation. Irrespective of stage, this condition inhibits the expulsion of foetus.

Depending on the degree and duration of uterine torsion there is reversal of signs of parturition like shrinkage of pelvic ligaments and udder indicating the death of foetus.

### **Don't**

- \* Any case exhibiting colic in advance stage of gestation needs to be checked for uterine torsion.
- \* Immediately consult a veterinarian if first stage of labour exceeds 2-6 hrs.

### **Dont's**

- \* Don't roll the animal unjudiciously without ascertaining the direction and extent of uterine tersion.
- \* No drug either for increase in uterine contaction or cervical dilation should be used which may rupture the uterus.

### **Management of Dystocia**

Gestation period of the cows varies from 270 to 295 days. The signs of approaching parturition are relaxation of pelvic ligaments, let down of milk and turgidity of teats.

### **Do's**

- \* After rupture of first water bag if faetus is not expelled with in 2-6 hrs indicates dystocia. Immediately call a veterinarian.

### **Dont's**

- \* If a part of foetal body is presented in the vagina, donot pull the faetus without thorough gynaecological examination.
- \* Don't cheep off the exposed part of foetus.
- \* No drug for contracton of uterus should be given.
- \* A repeated gynaecological examination by quacks further aggravates the condition of the animal and makes it difficult to manipulate the dystocia.

### **Management of abortion**

It is the expulsion of the foetus between 150 to 270 days of gestation in cattle. The foetus is generally dead or dies within 24 hrs of expulsion. Abortion is preceeded by a reddish vulvar discharge.

### **Do's**

- \* Isolate the animal from rest of the herd.

- \* Animal aborting in last trimester of pregnancy should be got examined by a veterinarian as the dam might fail to expell a large foetus, which is delatireous to the subsequent fertility of the animal.
- \* For diagnosis send a part of placenta, faetus as such and blood sample in ice to nearest disease investigation laboratory.

**Don't**

- \* Contents of abortion are not to be handled bare handed.
- \* Milk should not be used unboiled.
- \* Don't wait longer than 12 hrs if the placenta is not shed.

**FIRST AID IN ANIMALS**

First aid is the immediate treatment of injured animals or those suffering from sudden illness. First aid is given to an animal in order to achieve three objectives -

- (i) To preserve life;
- (ii) To minimise the suffering and
- (iii) to protect the condition of the patient from deteriorating further. While dealing with an emergency, four cardinal rules to be followed are :
  - (a) Do not be panicky.
  - (b) Maintain the airway
  - (c) Control the bleeding, and above all
  - (d) Approach the veterinarian for immediate treatment.

**DIFFERENT CONDITIONS AND THEIR MANAGEMENT**

Condition	Symptoms	Management
1. <b>Bleeding:</b> caused by injury or when vessels are affected by disease	Bleeding from any blood part of the body	Number of methods are used (a) Direct digital pressure on wound or over bleeding point, both are quick and effective And require no equipment except a finger or thumb. (b) Pad and pressure bandage pad of gauze, swabs or over laid by cotton wool is applied to wound and bandaged firmly. (c) Pressure points - press the bleeding blood vessel against a bone. Three points are bractial, femoral and coccygeal artery.
2. <b>Wound:</b> An injury in which there is forcible break in the continuity of soft tissues	a) Open Wound- break in the covering of the body i.e. skin and mucous membrane.	The aim of the treatment is to arrest bleeding if any and to treat shock and prevent sepsis. Different steps include - (i) Remove any dressing applied in hurry,

	<p>b) Closed Wound - When injury does not penetrate the body thickness of skin to cause a break.</p>	<p>(ii) Remove the cause of injury (iii) Control the bleeding (iv) Remove contaminated foreign bodies. (v) Clip the hair around the wound carefully. (vi) Suitable dressing should be applied preferably sterile gauze overlain by cotton wool and bandage. (vii) Treatment for shock especially with fluid therapy.</p> <p>b) Closed wound treatment consists of cold compression and firm bandages to limit swelling in early stages. If the swelling has already developed hot fomentation will relieve pain.</p>
<p>3. <b>Snake bite :</b> Poisonous snakes have sacs of venom above their fangs. When they bite, venom is pressed into the wound enters the blood vessels and is carried throughout the body with blood stream.. Snake venom Contains various Poisonous substances, some of which affect Nervous system, other inhibits the function of blood vessels and impairs blood clotting.</p>	<p>- General intoxication shows within to 90 minutes after bite. - Victim may develop shock, decreases in blood pressure, stoppage of bleeding, local signs include presence of two small points on middle of swollen skin. Pain, burning sensation at sight of bite, reddening and swelling of the skin, - much thrombosis and bleeding of vein.</p>	<p>- Bleed the area of the bite 30 by pressing. - Paint the bite with tincture iodine. - Immediate tourniquet above the wound is essential. - If available, cauterize the bite with potassium permanganate, alkali or acid. - After first aid, take the victim to nearest Veterinary Hospital where antivenom serum is available.</p>
<p>4. <b>Wasp and Bee Stings.</b> Dogs and cats mostly Attacked.</p>	<p>Stings are usually around mouth, lips, throat and occasionally on feet. Stings in mouth may cause considerable swelling, excessive salivation and discomfort. Stings in throat leads to pressure in airway passage resulting in swelling on neck and suffocation.</p>	<p>Stings if present should be removed carefully. Wasp does not leave their stings in the wound but bees do. If stings present in side the mouth then wash with sodium carbonate whereas if sting present on surface of body, use methylated spirit or apply washing soda or ammonia solution.</p>
<p>5. <b>Burns and scalds.</b> Burn is an injury to body caused by dry heat such as a fire or a piece of hot material. A scald is an injury caused by hot water, tar, oil or steam.</p>	<p>i) Extensive burns and scalds : These are extremely painful and animal requires interference.</p>	<p>i) Extensive burns and scalds : In many cases, a suitable narcotic/general anaesthetic will be needed before local treatment may be carried out.</p> <p>- First aid measures must be to prevent and limit shock by keeping the animal warm, ensuring rest and offering small volume of fluid. Warmth may be provided by blankets and shielding from draughts.</p>

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<p>ii) Less extensive burns and scalds : superficial layers of skin are involved.</p>	<p>- Direct heat causes considerable pain in damaged areas.          - Splinting can be used to limit movement if there are severe burns to limbs.</p> <p>ii) Less extensive burns and scalds : Most important first aid measure is to cool the affected area. This decreases pain and heat in the tissues immediately. Flushing the burnt area with cold running water and if possible ice cubes could be used. Scalds are best treated with copious volume of cold water. If caused by water soluble fluid e.g. boiling milk or jam, plain cold water will remove the fluid and cool tissues          - If caused by fat or oil, the fat must be removed first. Detergent solution should be poured on the area to loosen the fat. The wound should be gently cleaned with sterile saline to remove loose and charred remnants of hairs before a dressing is applied.</p>
<p>iii) Electrical burns : These are seen on pups that chew through electric cables and also in case of electrocution of animals.</p>	<p>- Do not touch an electrocuted animal until the electric supply is disconnected.          -Minor burns may be alleviated by cold compression but corticosteroids may be needed in cases of more extensive burns.</p>
<p>iv) Chemical burns: These resembles the heat burns but take several hours to develop.</p>	<p>Copious volume of water should be used to wash the chemical of the skin. Mild detergent May be used to ensure complete removal of the chemical.          - If the chemical is a known alkali, a weak acid solution should be prepared and used to wash away the chemical.          - If chemical is known acid, conc. solution of sodium bicarbonate or washing soda should be used.          - Paraffin, petrol and oil should also be removed from coat as they can cause extensive inflammation. Heavy duty cleaner e.g. cooking oil should be smeared on the affected area. Lumps of tar in furry feet can be clipped away with scissors or loosened by smearing the</p>

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			area liberally with butter and bandaging the dressing in place overnight. The following day, the tar may be removed by detergent washes.
6. <b>Fractures:</b> It occurs when bone is broken. The nature of injury may vary from a crack to a complete break.	Pain, swelling, lameness, crepitude, wound may or may not be there.		<p>Handle the broken bone as minimum as possible. Under no circumstances, resetting of limbs or reduction of fracture be attempted.</p> <p>- Support for the fracture should be applied as soon as possible to limit movement and prevent further damage.</p> <p>(i) Bandaging: Bandage the affected part firmly to unaffected part using healthy body as a splint.</p> <p>(ii) Splinting : Splint is a device which restricts the movement of an injured part, and may be anything from a rolled up magazine to a plaster of paris splint.</p> <p>-Haemorrhage in a compound fracture should be controlled by applying a dressing if possible. Digital pressure must only be used with care as this could displace the fragments and cause complications.</p>
7. <b>Dislocation</b> Dislocation is a persistent displacement of articular surfaces of bones which form a joint	Articular surfaces have no longer any contact with each other. In partial dislocation articular surfaces still remain in partial contact		- No attempt should be made to reduce the dislocation, nor to apply splints or bandages. The patient should be rested in a confined space and cold compresses may be applied To reduce swelling.
8. <b>Injuries in mouth</b>	Pieces of sticks or bone some times become wedged transversally across the roof of the mouth between the molar teeth. Portion of soft Bone may become wedged on or between the teeth. Needless occassionally found embedded in tongue and fish hooks may penetrate the lips of tongue.		- Removal of foreign bodies should be attempted cautiously, as the animal often resent handling of mouth and general anaesthesia may be required. No attempt should be made to pull out a fish hook. Because of its barbed end, the shaft should be pushed still further into the the tissues until the barb comes out through a second puncture. The shaft of hook is then cut through and the two halves removes Independently.
9. <b>Epistaxis:</b> Bleeding from nose. Occurs due to direct flow to nasal bones mostly. Occasionally associated with	Bleeding from nose is not itself a serious haemorrhage.		- Animal should be rested as much as possible which helps to control the haemorrhages but in some cases, adrenaline swabs may be

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	severe skull fractures.		needed to treat the condition.
10.	<b>Teat obstructions.</b> Lactoliths or stone in the teat canal.	Difficult milking, stones move in teat canal during milking, sometimes obstruct teat canal and teat spninter.	Milking preferably be done with sterilized treat siphon under aseptic conditions. If stone is very small,force ful-miling remove it. For larger stones consult veterinarian.

## IMPORTANT ZONATIC DISEASES

Disease	Reservoir	Transmission	Symptoms in man	Treatment /control
Rabies	Dogs, Jackals, Wolves, Vampire, bats	Direct contact or through infected saliva  of masseter	Depression, excitation, hydrophobia, paralysis by dog, humane destruc- and larynx, respiratory failure, choking and death.	Symptomatic but inf- fective to save. Vacc- ination of dogs, Vacci- nation of person bitten  tion of stray dogs symptomatic.
Kyasanur Forest Disease	Primates, squirrel, porcupine, certain species or rats	Bites of infected ticks  diarrhoea,  haemorrhage	Fever, headache, mayalgi  prostration,	Vector control symptomatic.
Japanese Encephal- It is	Wild birds, rodents, cattle, pig	Bites of mosquitoes carrying virus convulsion, neck	Fever, chill, incoordination, mental stupor,  rigidity, coma	Vector control, vaccination in endemic areas
Influe- Nza	Horse, pig, duck, poultry, different species of birds	Inhalation  myalgia, respiratory	Fever, Chill, headache, to check secondary infection. trouble	Symptomatic, antibiotic therapy
Serub Typhus	Rat, mouse, mite	Bites of infected mite malaise, skin	Chill, fever, headache, rodent and vector rash.	Tetracyline. Personal hygiene,  control.
Murine Typhus	Rat, flea	Bites of infected flea	-do-	-do-
Q Fever	Cattle, sheep, goat, horse,dog camel	Inhalation, abrasion, contaminated milk, meat and products	Chill, headache fever, pneumonia, hepatitis, endocarditis	Tetracycline Disinfection of animal sheds. Pasteurization of milk, vaccination of farmers, dairy and slaughter house personnel in known endemic areas.
Indian Tick Typhus	Ticks, rodent,dog	Bites of infected tick malaise, skin	Chill, fever, headache,  rashes moving from extremities to the centre of the body	Broad spectrum antibiotics.
Tetanus	Soil con-	Deep or punctured	High-fever,	Tetanus immunoglobul

	contaminated with excreta from horse, sheep, goat, cattle	or contused infected with contaminated soil	convulsion, 'Lock-jaw'	in (human), long-acting penicillin, Erythromycin. Tetanus toxoid vaccination - Regular schedule or Immediately following Injury
Plague	Wild rodent domestic rat, flea	Bites of infected flea	Fever, enlarged, painful lymph glands of groin, axilla, cervical region (Bubonic form)	Sulphonamides, tetracycline. Chloramphenicol
		From infected person by inhalation	Toxic, septic-aemic form Pneumonic form personal precaution	Vaccination against Bubonic form, rodent and vector control,
Anthrax	Soil contaminated with secretions of infected cattle, sheep, goat, horse etc.	Inhalation, handling of meat, skin, hair of infected animal with abrasion or injury	Pneumonic form by inhalation Carbuncle type abscess when infected through cuts or abrasions. of hands, instruments	Antibiotics  Vaccination of animals, use of gloves, masks in slaughter house, Strict sterilization
Bruce- llosis	Goat, sheep, cattle, pig and dog animals,	Contact with aborted material of infected consumption of raw milk, meat and products	Asymptomatic , Acute-bodyache, pain in joints, fever, weight loss Chronic-enlarged lymph nodes of cervical or liver, orchitis, epididymitis for dairy and meat plant workers and farmers.	Antibiotics, good diet and rest. Screening of dairy and meat animals for segregation , vaccination of susceptible animals, disinfection of animal sheds, care
Salmo- nellosis	Carriers-human, domestic animals; reptiles, lizard, birds.	Contact with carriers, ingestion of contaminated food, water.	1. Diarrhoea, vomiting abdominal cramp, pyrexia 2. Septic conditions - pyelonephritis, arthritis, meningitis measures for sewage disposal, treatment of water.	Chloramphenicol, other broad spectrum antibiotics.  Strict meat inspection, hygienic rearing of food animals, sanitary
Lepto- spiro- sis	Rodents, rats, cattle sheep, pig, dog, deer, fox, squirrel	Contact with animals or infected material, ingestion of food, contaminated with urine of infected rat and eye complications	Fever, chill, rash, diarrhoea, pneumonia, nephritis. Reproductive organs and nervous system disorders, cardiovascular measures like proper cooking of food, clean drinking water.	Erythromycin, tetracycline, streptomycin. Rodent control, use of gumboots, gloves, in rice field, sugarcane cultivation and other protective
Taeni- asis	Cattle, pig	Ingestion of under-cooked beef or pork. Contaminated vegetables food	1. Occasional abdominal discomfort, indigestion, anorexia, debility	Niclosamide. Personal hygiene, use of sanitary latrine, hygienic rearing of pig

		items. (from pig)- epileptic fits, hydrocephalus, affects eyes, ears, hearts	2. Cyclicercosis cooking of meat.	and cattle. Proper
Hydati- Dosis	Wolf,jack- als,dog, eating in- fected orga- ns of sheep	Ingestion of con- taminated vegeta- bles. Direct con- tact with dogs,in- halation. cattle, pig goat.	Pain and disease syndrome depend- ing on location of cysts-angina pectoris,hepatis- tis,jaundice, colic encephali tis.	Mebendazole. Surgi- rgical removal of cysts.  Control of str- ay dogs and pet dogs from feed- ing on carcass organs or un- treated offal. Health educati- on for farmers slaughter house workers.
Leish- mania- sis (except kala-azar)	Dogs,jackals, rodents.	Bites of sand fly	Recurrent fever, anamia,enlarge- ment of spleen.	Sodium stibo- gluconate, Pen- tamidine iso- thionate.
Toxop- lasmo- sis	All domestic animals.mon- key,rodents, rabbits, pigeon,cat.	Ingestion of con- taminated food, water,under cooked meat.	Congenital - anaemia,hepatitis, jaundice,lymph gl- and enlarged,reti- no-chorioditis, convulsion,hydro- Cephalus,intracra- nial calcification, abortion. fever,rash,lymph- adenopathy,chorio- retinitis,brain disorders.	Spiramycin, Sulphonamides, Pyrimethamine.  Precaution for slaughter house personnel,pro- per cooking of Acquired meat,general sanitary prac- tices.
Tuber- culosis	Man, cattle, poultry	Direct contact consumption of contaminated milk, meat and products. (Man to animal to man)	1. Fever mainly nocturnal, chro- nic cough, chest pain, gradual emaciation with human strain, haemoptysis.  2. Extrapulmonary form with bovine strain-intestinal, bone and meningeal T.B.	Multidrug therapy- Rifampicin, Pyrazi- namide, streptomyc in etc.  B.C.G. vaccination, elimination of cattle by screening with tuberculin (PPD) test.

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## Acknowledgement

The livestock constitutes an important component of the rural economy. It contributes about 12 per cent to the agricultural economy. This contribution is made by way of milk, milk by-products, meat, wool, hides, bones, etc. A tremendous consciousness with regard to livestock keeping has grown amongst the farmers.

This edition of the Package of Practices for Animal Husbandry contains the latest information and recommendations on animal production and health of dairy cattle, goat, sheep, poultry, rabbitary and fishery. The recommendations have been discussed and finalized in the Animal Husbandry Officers' Workshop.

These recommendations have been provided by the scientists of various departments of the College of Veterinary and Animal Sciences and out-stations of H.P. Krishi Vishvavidyalaya through the co-ordination of the Director of Research. The assistance and co-operation of the research and extension scientists of the Vishvavidyalaya and Veterinary Officers of the State Department of Animal Husbandry and Chief Warden of Fishery in finalizing the recommendations is duly acknowledged. The computerization of the booklet by \_\_\_\_\_ is highly appreciated.

I hope the information so provided in this booklet will help the scientists, Veterinary Officers and the livestock keepers in adoption of the management practices for the animals.

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