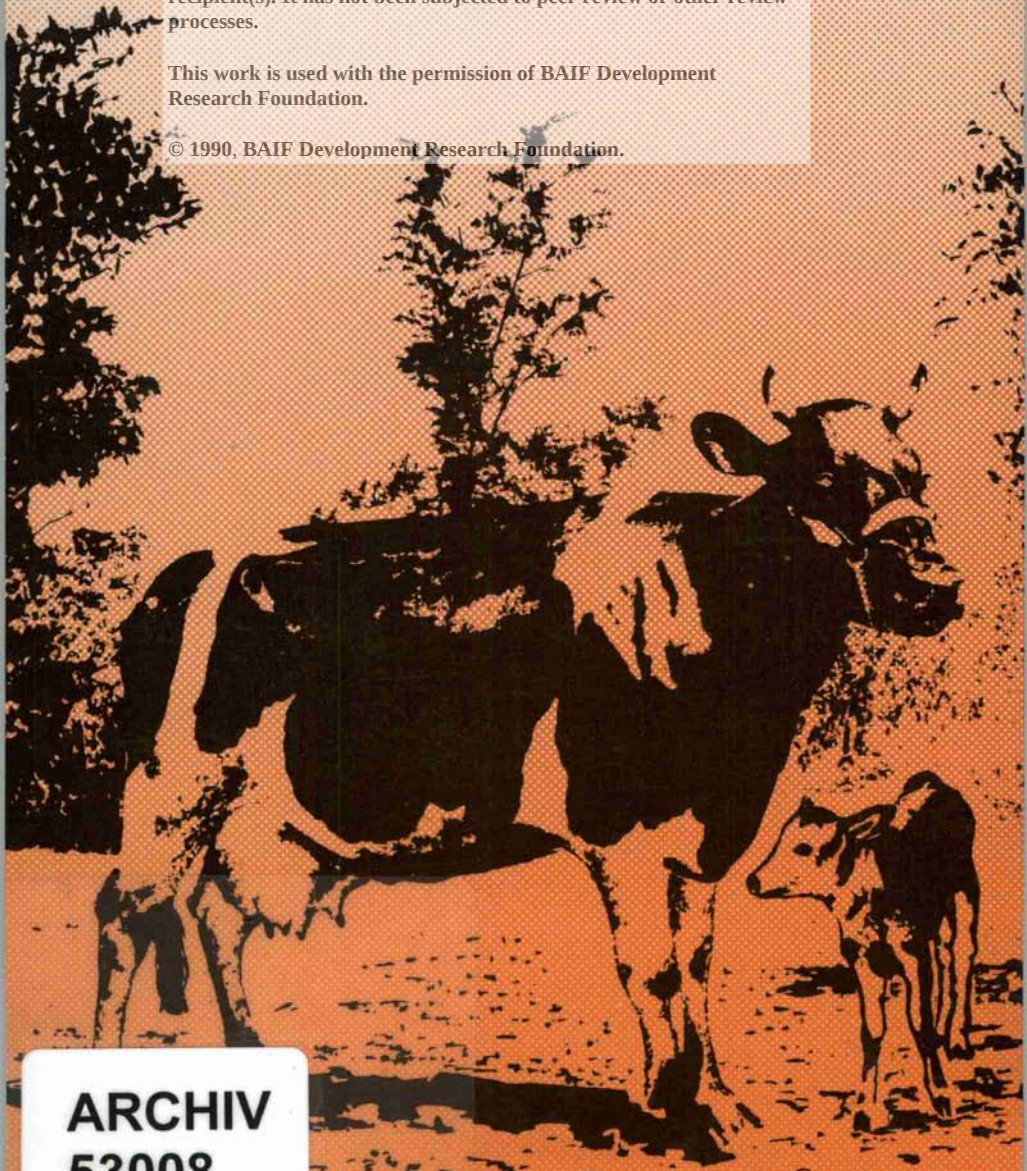
MANUAL ON CROSSBRED COWS



A BAIF PUBLICATION

MANUAL ON CROSSBRED COW

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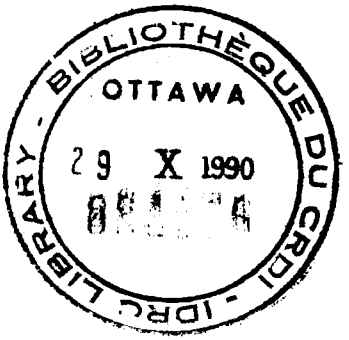

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We dedicate this book to
Dr. Manibhai Desai,
President BAIF Development Research Foundation, who visualised the dairy cattle development programme as a powerful tool for the socio-economic rehabilitation of the rural poor.

He pioneered the development of a pragramatic approach of transfering different facets of Veterinary Science to the door-step of the farmer.

CONTENTS

AUTHORS' PREFACE

This 'Manual on crossbred cow deals with care and management of crossbred dairy cattle, in fair detail.

It is a collection of experiences of cattle crossbreeding of BAIF at the village level in six different states for over twenty years.

Although opinions may differ on certain aspects of the subject, it would be generally agreed that sufficient practical data and theoretical information have been accumulated to tackle the subject. Thus this manual is not an exhaustive scientific treatise, but a practical guide which will be useful for dairy farmers, animal science students, bankers, veterinarians and also for policymakers.

We are sure, this manual will be liked and will be useful for those who love cows and believe that a crossbred cow is a tool for gainful self-employment.

We express our gratitude to late Dr. M.R. Marathe, a 'Champion Veterinarian' who captained our team of veterinarians since the inception of BAIF's Cattle Development Programme in 1970.

We sincerely acknowledge our thanks to Mr. N.G. Hegde, Vice-President, for his encouragement and valuable suggessions for bringing out this manual.

We also thank Nalini Murlidhar and Tinku Dhar for editing the manuscript; Nandita Khaire of Novagraphics for designing this book and Sujit Patwardhan of Mudra for printing of this book.

BAIF'S PHILOSOPHY AND GENESIS

Mahatma Gandhi's dreams of rural upliftment bore fruit at Urulikanchan in 1946. He camped at the tiny hamlet with the intnetion of establishing a Nature Cure Ashram to improve the health condition of the rural poor. The Ashram was an entry point for Gandhiji to undertake rural development. This responsibility was entrusted to his young co-worker, Manibhai Desai.

Manibhai Desai worked on various aspects of rural development. From 1946 to 1967 the varied experiences gained by him were worth sharing with needy families of rural India. As a consequence of this the BAIF Development Research Foundation was established at Urulikanchan on 24 August 1967.

BAIF aims for the socio-economic upliftment of the rural poor through the optimum use of technology for establishing a meaningful relationship between the five basic resources — Land, Water, Livestock, Vegetation and Man for generating gainful employment and to improve the quality of life.

BAIF today is engaged in identifying, selecting and developing appropriate technologies in the areas of agriculture, horticulture, dairy husbandry, non-conventional energy sources, human health and other rural-based vocations.

The first development programme of BAIF was initiated in 1970 through an intensive cattle development programme using the native non-descript cow as seed-bed. Adopting the technique of artificial insemination, the exotic germplasm was scientifically used to yield an altogether new crossbred dairy animal. At present, BAIF is operating the Cattle Development programme through about 450 centres in the states of Maharashtra, Karnataka, Gujarat, Uttar Pradesh, Rajasthan and Madhya Pradesh.

BAIF has gained rich experience in the scientific way of developing crossbreds. This book is an attempt to document it for those who are involved in rural development through 'crossbreeding'.

CROSSBREEDING: A TOOL FOR GAINFUL SELF-EMPLOYMENT

India is basically an agricultural country. About 70% of the people live in villages and their main occupation is agriculture. However, agricultural production is unpredictable as it depends exclusively on rainfall which is often scanty and uncertain resulting in poor crops. In the absence of assured irrigation, most of the villagers have limited employment opportunities in crop production. The problem of underemployment is more serious than unemployment.

The cattle, mostly nondescript and unproductive, contributes nothing more than a little organic manure. As the local cow does not produce sufficient milk, she is fed less, which results in low milk production. The vicious cycle thus goes on. Milk production is generally viewed as just a salvage operation, a minor unimportant activity.

It is a known fact that salvaging the livestock may at best permit survival, but can never offer prospects of prosperity. For prosperity, life based on production is a must.

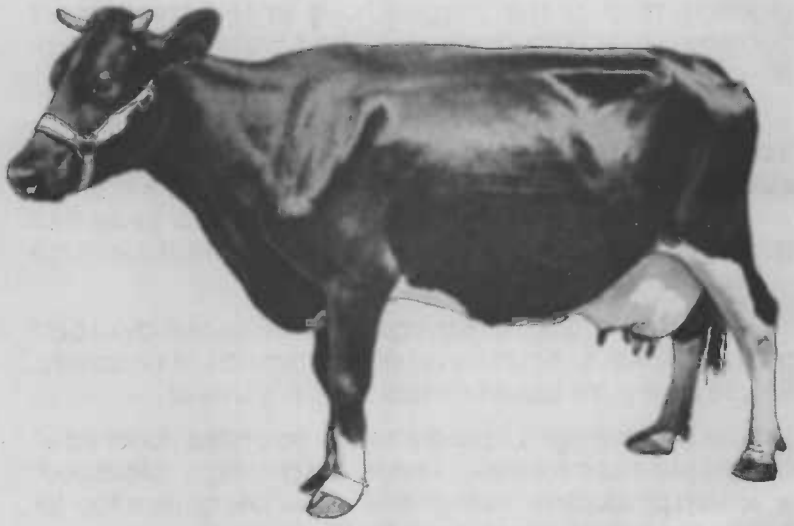
The nondescript, unproductive — so called 'local cow' can be used as a tool, successfully, for getting a 'crossbred' which is a productive asset. This new cow becomes a tool for gainful self-employment, even for the landless poor.

With experience of last twenty years in different states of our country, BAIF is convinced that the socio-economic betterment of the masses can be achieved through the crossbred cows produced at their door-steps, without inducing any risk or disturbing their cultural traditions.

When milk production is to be taken as an income generating activity, it is necessary to observe the principles of commercial production, high level of efficiency and low production cost.

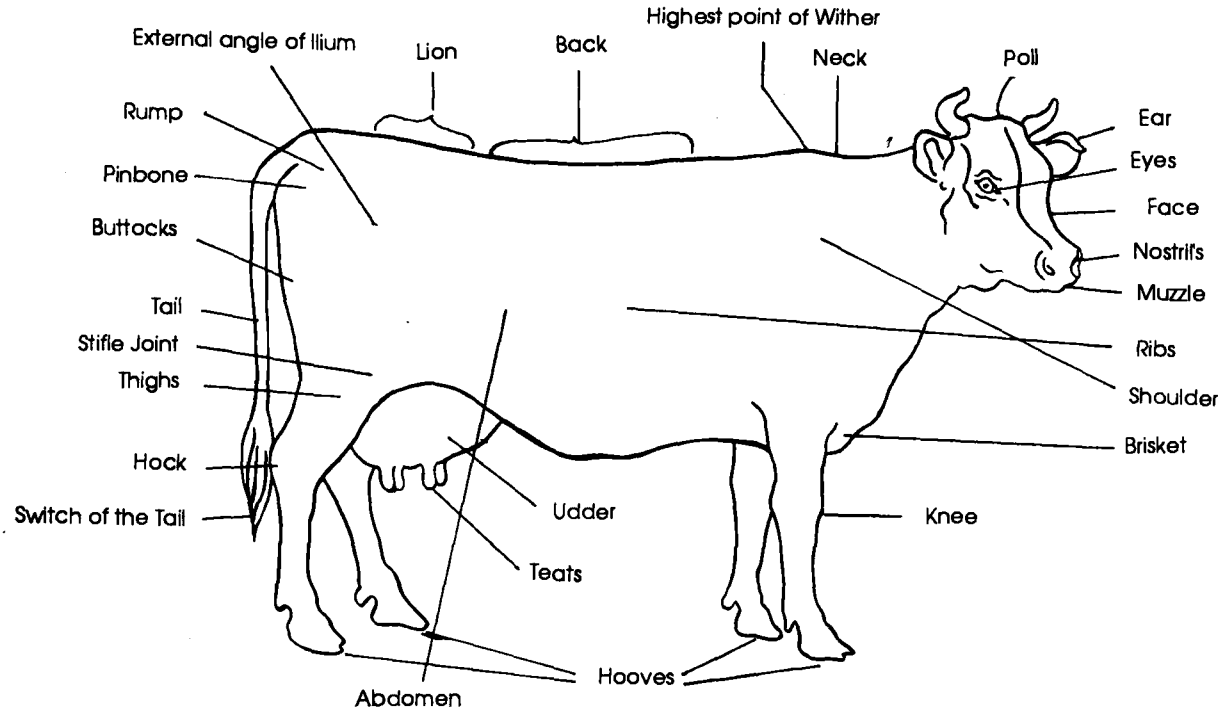
There is rapid improvement in livestock production with the advent of the progeny proving technique. This needs to be backed up by scientific feeding management and helthcare to exploit the potential of such outstanding gene-base to the optimum level. With such technology from one nondescript breedable cow, assets and profit worth Rs.60,000/- can be created in a period of ten years. This is very reasonable.

The cow is a status symbol for the Indian farmer and the entire family is involved in cow-rearing; let us give him a new cow, a powerful instrument for gainful self-employment, to bring prosperity and progress.



Pride of India

Cow No: HE 015. She produced 62.5 kgs of milk in a day.
Date of birth: 28.8.1975 Place: Uruli Kanchan
Birth weight: 33.0 kg Breed: Holstein Freisian



Body of a Cow showing different parts

Chapter

I

STATUS OF DAIRY ANIMALS IN INDIA

India is the seventh largest country in the world having 191 million cattle, 69 million buffaloes, besides 150 million sheep and goats (1982 census).

India produced 46 million tonnes of milk in the year 1987-88 and stands third in the world in the total milk production, next to U.S.S.R. with 102 million tonnes, and U.S.A. with 65 million tonnes. Yet the per capita consumption of milk in India is hardly 170 ml/day. As per the standards laid down by the World Health Organisation, one should get at least 200 ml of milk a day. In order to provide this quantity, India will have to produce 65 million tonnes of milk every year and this is a declared target to be achieved by 2000 A.D.

It is estimated that the above milk was produced as under:

52%	by Buffaloes	(30 million)
45%	by Cows	(52 million)
3%	by Goats	(figures not available)

In India, 26 different breeds of cattle have been identified. Out of these, only four are known to be the milch breeds: Sindhi, Sahiwal, Gir and Tharparkar (after partition the main tracts of 'Sindhi' breed went to Pakistan, India has only a negligible number of these animals). Eight breeds are recognised as dual purpose breeds, while fourteen are known as draught purpose breeds. The performance potential amongst milch breeds varies on an average from 900 to 1,200 litres in one lactation, with lactation period varying from 240-280 days.

The production level of dual purpose and draught purpose breeds is estimated to be roughly around 600-800 litres and 150-400 litres respectively.

Our major handicap is that, out of 191 million cattle, only 18% are well-defined into proper Indian breeds. Rest of them are categorised as 'Nondescript' or the 'Local (Desi) Cow'. These animals have poor growth rate, late maturity and low milk production. It is for these cattle, that a programme of improvement is needed.

For a profitable dairy farming the cow should possess certain additional qualities (economic traits) besides producing more milk. The main indicators of a good and economic dairy animal are as under:-

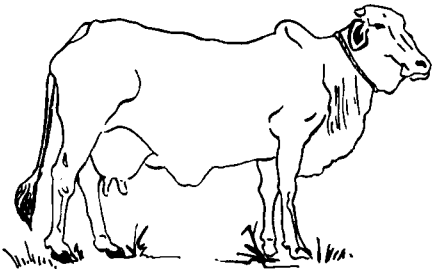
- Faster growth rate
- The age at first calving: lower (30-35 months)
- Lactational yield/lactation period: should be at least 2,200 to 2,400 litres/260-290 days, respectively
- Intercalving period should be between 12 to 14 months (in other words the animal should breed regularly).
- Efficiency of conversion of feed into milk should be: Above 60%.

Considering these points if we evaluate our milch breeds, situation even well-managed herds is as under:-

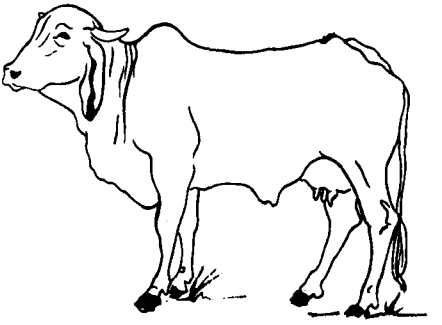
- Poor growth rate
- Age at first calving is between 40-45 months
- Lactational yield/lactation period, 900-1,200 litres/240-290 days
- Intercalving period is between 15 to 18 months
- Efficiency of conversion of feed and fodder into milk is: maximum 44%.

With such qualities, the Indian cow, even from a milch breed has proved to be unprofitable.

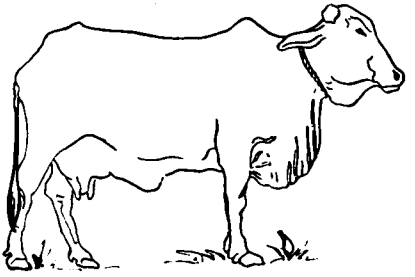
It has also been proved that genetic progress through selection in milch breeds of cattle is very slow, i.e. hardly 0.5 to 1% per year. This represents a total gain from 2.5 to 14 kg milk per year. Thus, it may take 50-60 years to reach the target production of 1,800 litres of milk from the present average of 900 litres.



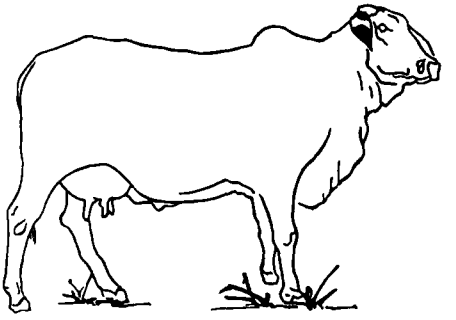
Sahiwal



Gir



Red Sindhi



Tharparkar

Indian Dairy Breeds.

The better alternative for increasing milk production is through crossbreeding. Introduction of superior germplasm from the breeds of temperate region has proved successful for faster growth, early maturity and high milk production.

The experience in different states of India shows that crossbreds are reasonably well-adopted to tropical environment. The results also suggest that economic traits and exotic inheritance between 1/2 to 3/4 was optimum for maximum production — depending upon feeding, management and climatic conditions.

The performance of crossbreds produced from the nondescript cows at village level has varied from 1,600 to 2,200 litres per lactation. This indicates superiority of crossbreds over the indigenous milch breeds of cows or buffaloes.

It is also observed that potential for milk production in crossbreds is much higher than is being tapped under the present feeding and management conditions.

Two exotic breeds popularly used for crossbreeding in India are Holstein Freisian (HF) and Jersey.

As per the 1982 animal census, the total population of female crossbreds in India was 2.87 million of which 1.564 million were in milk.

The highest recorded peak yield of Jersey crossbreds as of today, in India is around 42 litres, while for the HF crossbred it is 54.75 litres. The highest lactational yields have been recorded to be around 6,000 litres in Jersey crosses and around 8,500 litres in HF crosses.

Even if a cow produces 8-10 litres of milk per day, it is profitable to the farmers. (2,400-3,000 litres per lactation).

Chapter
2

EUROPEAN DAIRY BREEDS

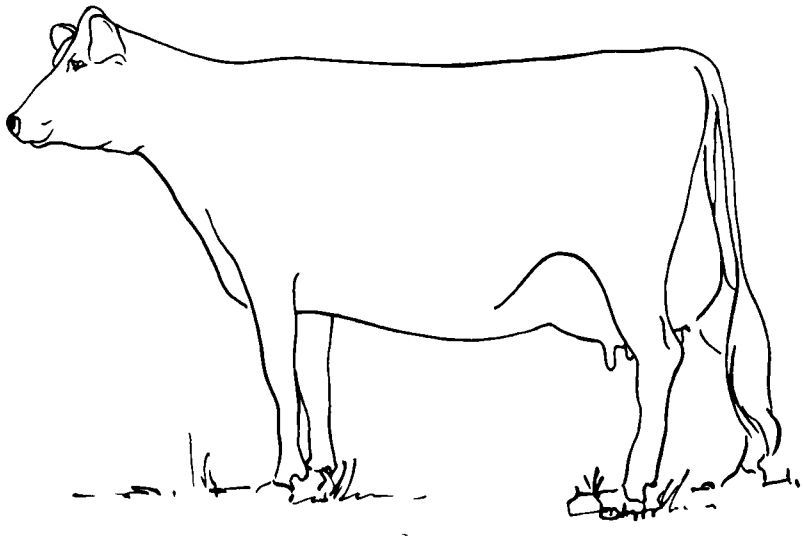
Perhaps due to the earlier advent of the industrial revolution in the Western countries, and rise in purchasing power of people, a substantial class of milk purchasers was created in Europe. Milk production in turn acquired a commercial overtone and in its wake, the dairy farmers became conscious of the need to raise production efficiency and earn more profit.

A systematic and scientific breeding of cows is being practised in Europe for over hundred years. This resulted in developing and establishing good cow breeds with definite qualities and characteristics suitable for dairy business.

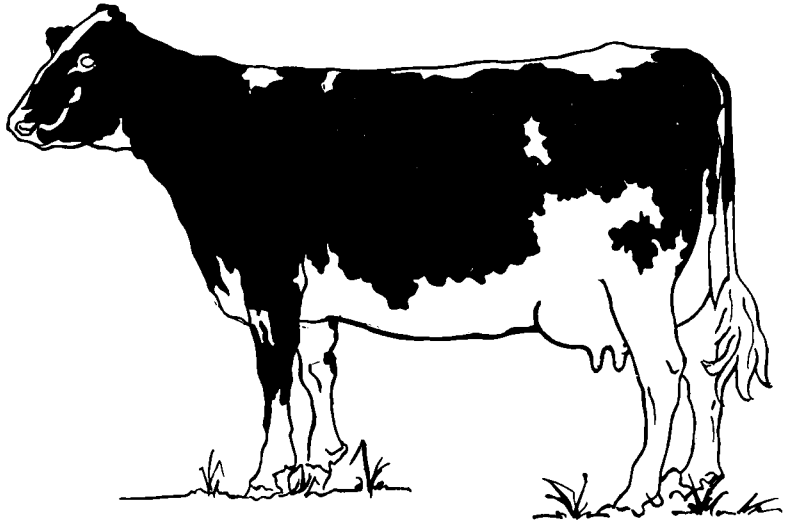
Holstein Freisian of Netherlands, Jersey of England and a few other breeds became popular all over the world.

Progeny testing programmes for knowing the efficiency of breeding bulls through the performance of their daughters has given a tremendous push to improve the qualities of dairy cows. Nowadays selection of cows is being done for particular shape and placement of udder, strength of hooves and total size of the body, besides milk production and breeding efficiency.

There is a difference in the animals of Europe (Bos taurus) and India (Bos indicus) because these are two distinct species, adapted to different agro-climatic conditions. It is because of this that the animal husbandry practices for the two species differ.



Ideal Jersey Cow



Ideal Holstein Freisian Cow

The difference in the two species is as under:

Difference	***Bos indicus* (Desi/local)**	***Bos taurus* (European)**
1. Hump	Big hump	No hump
2. Dewlap	Broad-big, loosely hanging	Almost absent
3. Skin	Loose, having large surface area	Tight
4. Ears	Large, drooping	Small, erect
5. Sweat glands	Large size-many	Small size-few
6. Feet and hooves	Strong	Weak
7. Heat-tolerance index.	High	Low

In Europe, dairy farming has become a specialised, intensive and scientyfically practised activity, with milk production as the main aim. Thus few breeds of Bos taurus like Holstein Freisian and Jersy have become more popular as dairy breeds.

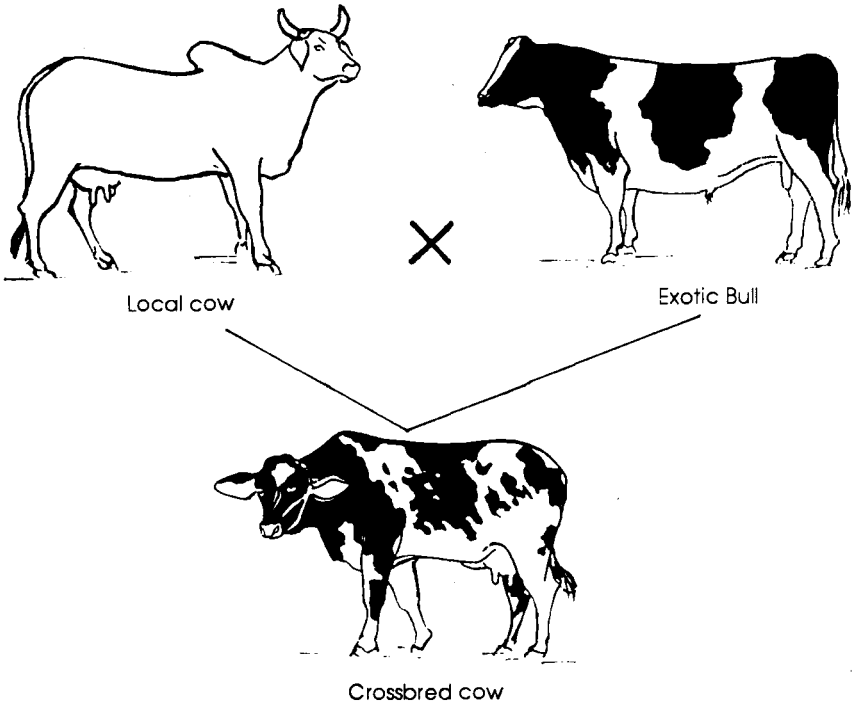
By using frozen semen of good European breed bulls — on indigenous local cows, we can get good dairy traits in their progeny.

The desirable dairy traits in the European breeds — which can be incorporated in the crossbreds are as under:

Characters	**Indian milch breeds**	**Exotic milch breeds**	**Crossbreds**
1. Ageat first calving (months)	40-45	20-24	30-35
2. Lactational yield (litres)	900-1200	3500-6200	1800-2200
3. Lactational period (days)	240-290	290-320	280-310
4. Dry period (days)	90-120	60-80	60-70
5. Intercalving period (months)	15-18	12-13	12-14

It is evident from the above that economic traits as a dairy animal of the crossbreds are much more superior to any Indian milch breed.

This is the advantage we have in crossbreeding.



Cross Breeding of a local Cow

Chapter
3

PRODUCTION OF A CROSSBRED COW

When any Indian cow is mated with an Exotic (European breed) bull, the calf born is known as 'crossbred'.

If the mother is from the milch breeds of India, obviously the crossbred born will give higher yield, ranging from 2,000 to 3,000 litres per lactation. However, even the crossbreds born to non descript cows are capabel of producing more milk, depending on the overall management, particularly the feeding.

It is the experience of many farmers that breeding local cows for getting crossbreds is better than purchasing crossbreds from other areas. This is because the crossbreds born to a local cow adapt well to the local agro-climatic conditions and feed supply. However, quite often the programme is neglected because of the long waiting period for producing a crossbred cow in milk, from an indigenous cow. Generally it takes 40-45 months to generate new milk, after initiating the crossbreeding programme.

Breeding of a Local Cow

Cows should be bred by Artificial Insemination (AI) and not by the natural way for following reasons:-

In Natural Service:

- A farmer has to take the cow in oestrous to the bull wherever the bull is available or viceversa.
- Some bulls are large sized and the natural service may cause injuries to the cow.

- In the natural service, the bulls may transmit veneral diseases from one cow to another, particularly contagious abortions.
- Selection of bull with high potentiality is difficult.

Besides these disadvantages, under natural service:

- A Bull's service can be used only till it is living.
- A bull's service is used for impregnating only one cow at a time.

In **Artificial Insemination**:

- A bull's semen collected at each service can be used for a large number of cows. By the use of frozen semen technology, the bull's semen is preserved in liquid nitrogen (at minus 196°C) and can be stored for many years.
- A good bull's semen can be transported from one place to another, even from country to country.
- A bull does not transmit veneral disease, as there is no physical contact between cow and bull.

Besides these advantages,

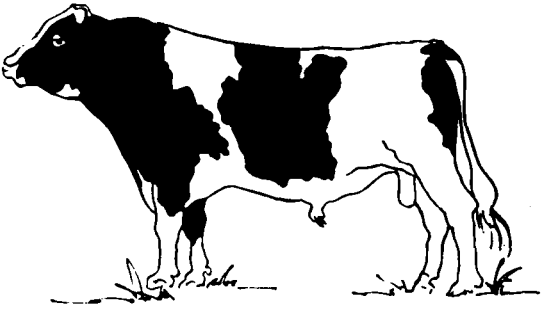
- In Artificial Insemination the semen (sperms) is deposited in the cervix or just inside the body of the uterus. This facilitates better conception.

  (In natural service, the semen is deposited mostly in the vagina of cows)
- AI makes it possible to select bulls through progeny testing.
- AI facilitates a widespread use of superior sires for genetic improvement.
- Cost per AI will be low as the number of breeding bulls, to be reared is small.

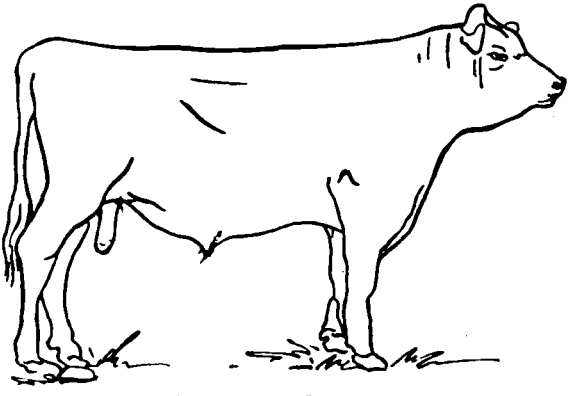
For Artificial Insemination the latest and most accepted method world-wide is 'frozen semen' technology. In this method the semen, after collection from the bull, is diluted and evaluated for sperm quality. It is then packed in small plastic tubes called as 'Straws'. These straws are preserved in

liquid nitrogen kept in special vessels, known as cryogenic containers. The temperature of this liquid nitrogen is minus 196°C, nearly 200 times cooler than that of ice. The semen remains in this frozen state for years. The frozen semen straws must always be preserved appropriately under the level of liquid nitrogen in cryogenic container.

In the liquid semen method, also known as 'chilled' semen method, after collection and evaluation, the semen is stored under the cover of ice in a thermos flask. The limitations in this method are that the semen is effective only for 72 hours or 3 days. Thus it is observed that the number of inseminations required per conception with use of liquid semen are much more as compared to those with the frozen semen.



Ideal Holstein Freisian bull



Ideal Jersey Bull

Chapter
4

SELECTION OF BREEDING BULLS

The performance results of crosses with various breeds from temperate regions suggest that in India, Holstein crosses have proved to be superior to other breeds in terms of total quantity of milk produced. The Jersey breed being smaller in size than Holstein, and having high fat content (4-6%) appears to be the second choice of the farmers.

A practical guideline for selection of exotic breed can be: A farmer having adequate supply of green fodder may choose Holstein crosses; while a farmer with limited fodder facilities may opt for Jersey crosses. However, this cannot be made a rule, as both the breeds appear to have adapted equally well in India at the farmers' door. One can keep 60% HF crosses and 40% Jersey crosses. The milk of both of them can be mixed, so that one can get more milk as well as the acceptable level of fat for fetching a good price.

Selection of a Bull:

It is not advisable for an individual farmer to keep a breeding bull.

Once the policy decision is taken at the state government level about the selection of the breed, obtaining good bull's semen will depend upon its availability either from government agencies such as breeding centres or other agencies involved in the supply of frozen semen from good bulls.

Agricultural universities, voluntary organisations, private institutes etc. also maintain "Bull Mother Farms". At Bull Mother Farms, animals of pure exotic breed are maintained scientifically and breeding bulls are selected from whom semen is obtained.

How are Breeding Bulls Selected?:

Initially bulls are selected on the basis of their mother's milk yield and their father's performance. After testing them for Tuberculosis, Johne's, Brucellosis and other diseases, their semen is collected. Bulls are trained for this purpose. This semen is used for breeding the cows. The bulls are then put to very critical, scientific and methodical testing on the basis of performance of heifers born out of their semen. It takes 5 to 6 years to evaluate a bull in this way. The bulls tested and proved by this method are known as 'Proven Sires'. Very few institutes, however, subject their bulls to such critical tests before using the semen for breeding.

Selection of bulls by this method is more authentic and reliable for incorporating the genes of production in their progeny. Thus individual farmers and dairy owners should use the semen supplied by such institutes for their cows. It can be done either through dairy cooperatives or similar agencies. This will increase the production level.

In cases where such facilities do not exist, for an organised herd (50-100 breedable cows) keeping two exotic bulls (obtained from reliable institutes, disease free, with good performance record) for natural breeding may be advised. Such bulls should not be used for more than two and half years from the date of start of their service (A heifer born through this bull should not be covered by the same bull). Such bulls should be replaced by other bulls of the same breed and of superior quality. Bulls used for natural service must be free from diseases like Brucellosis, Tuberculosis, or Johnes' Disease.

However, it is scientific, more economical and safe to introduce artificial insemination method on the farm as early as possible.

Chapter
5

SELECTION OF A DAIRY COW

A dairy farmer should build up his own herd by breeding his own local cows, but when a farmer wants to start a dairy immediately, he has to purchase a crossbred cow available in the market.

Following guidelines will be useful for selection of a dairy cow.

(A) History Sheet/Pedigree Sheet:

It is a card/sheet which gives detailed information of the individual cow. It gives breeding history, milk yield — health record of the cow, besides performance records (milk yield) of its mother, father's mother etc.

Normally such records are available at the institutional level or organised farms, and at the time of sale of animals such a sheet is made available to the purchaser.

Unfortunately such type of record is not available with the farmer. In cattle markets where a good number of dairy cows are sold every week, such information is not available.

Thus selection of dairy cow, in the absence of history sheet, should be done as under:

(B) Production Potential:

Get the cow milked completely in your presence — for three successive milkings.

The average of these three milkings will give an idea of the production potential of the animal.

Besides this, one should observe

(1) How much time the animal takes to "let down" the milk?

(2) Whether all the four teats are functional;

(3) Is the flow of milk from each teat free and with full force? If the flow is in small streaks it will take more time and more effort to milk the cow. Such cows are known as 'hard milkers' and they should not be purchased.

(4) Whether the animal needs any particular type of feed or fodder at the time of milking. Normally a cow does not need a particular feed/fodder for letting the milk down, but some animals may require concentrated mix for letting down.

(5) Whether the cow allows only a particular person to milk or allows anybody to milk.

(C) Udder:

The milking part of the body is called as udder and it can be examined by palpating it. That is, observe the udder, feel it, stroke it gently, weigh it in your hands to check the following:

(1) The skin of the udder should be thin. It should be soft and should have fine silky hair.

(2) The four parts of the udder should be well demarcated.

(3) The teats should have as far as possible the same length. They should be well placed (equidistant from each other).

(4) The udder should be well attached to the abdomen. It should not be pendulous.

The tip of the teat should be at least 18 inches above the ground surface. If it is less, it indicates that the udder is pendulous (or hanging). Such an udder, with less ground clearance, is more prone to injury.

(5) The skin of the udder should have a good network of blood vessels. The front of the udder carries, on either

side, a tortuously big blood vessel. It is known as 'Milk Vein'. Big visible milk veins are indicators of good yielders.

While palpating there should be no unusual feel in the udder, like a hard lump.

(D) Lactation Number:

As far as possible, the animal should be in the second or third lactation.

An animal produces more milk with each successive lactation.

If the animal has given, say 1,000 kg, in the first lactation, it gives 15% more (i.e. 1,150 kg) in the second lactation. In the third lactation its yield rises 25% above the first lactation (i.e. 1,250 kg). It goes to the peak yield by the fourth lactation - at the fifth, it maintains the peak and thereafter it declines. This is the natural lactation curve of a crossbred cow.

When we choose an animal in the second/third lactation we can have the maximum production of the fourth and the fifth lactations. This means more profit.

The lactation number of the animal can only be known reliably from well-kept records. Otherwise it is not possible to find it. Alternatively the age of the animal should be ascertained from the teeth of the animal (with the help of a veterinarian) and the probable lactation number can be judged. (For animals which breed regularly at regular intervals one can by knowing the age of the animal decide the lactation number. But such animals are very few).

(E) Parameters for Selection:

a) The animal should be alert. Its eyes should be bright and its muzzle wet.

b) It should walk freely.

c) It should sit and get up with ease.

d) It should not be too fat or too lean. (Its last three ribs should be seen, if it is in milk.)

e) It should show three typical wedges of the body as under:

Wedges are nothing but imaginary triangles that can be drawn on the animal body by joining three points. They are:

(1) Lateral wedge — by joining the point over upper extremity of the shoulder to the point of pin bone and then to the point of stifle joint. This wedge indicates — good barrel (stomach capacity).

(2) Dorsal Wedge — by joining the point of wither to the two points of external angles of ileum. This wedge indicates a good capacity of abdomen as well as good space for internal reproductive organs and udder.

(3) Posterior Wedge — by joining two points of external angle of ileum with that of mid point of two hind teats. This wedge suggests broadness of udder which indirectly suggests a good capacity for milk production.

Whatever the selection criteria may be used, a cow is selected mainly on the basis of milk given, any other criterion comes next.

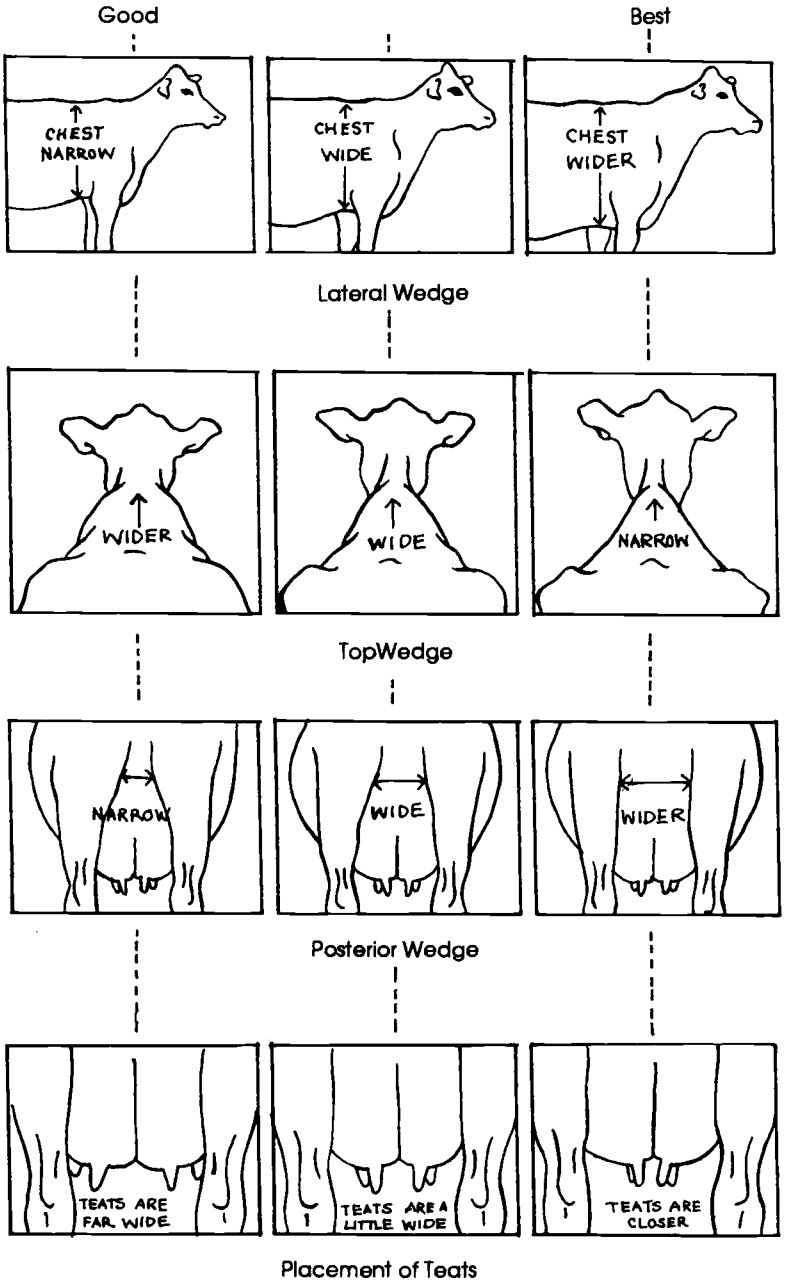
The quality of a cow is proved in the bucket and not in the portrait. A cow may be blind or deaf, but as long as it gives the expected amount of milk in the bucket, it is worth buying.

Remember these Points:

1. Whorls of hair on the body, coloured patches of different number — size and shape, do not carry any authentic information relevant to the selection of an animal. So do not base your selection on such criteria.

2. In the market, the owner normally gives information on the peak yield given by the cow. This is not the average daily milk yield by the cow.

   Peak yield is the maximum yield given by the animal when it reaches the maximum (After calving within 20 to 40 days). This peak yield is maintained for a good


Good
Best
CHEST NARROW
CHEST WIDE
CHEST WIDER
Lateral Wedge
WIDER
WIDE
NARROW
TopWedge
NARROW
WIDE
WIDER
Posterior Wedge
TEATS ARE FAR WIDE
TEATS ARE A LITTLE WIDE
TEATS ARE CLOSER
Placement of Teats

number of days (in good cows). Thereafter the yield drops down at the rate of 10% per month.

Normally 66% of the peak yield is the average yield of the animal. Thus in order to ascertain lactational yield, one has to know the average yield first; then by multiplying it by the number 300, one can know the estimated lactational yield (300 days is considered standard lactation period).

3. If the milk record is available for the first 100 days, then one can estimate expected lactational yield as under:-

   Milk given in the first 100 days is about 40% of the total. Therefore 100 days' yield x 2.5 gives estimated lactational yield.

   Milk given in first 120 days is about 50% of the total. Therefore, 120 days yield x 2 gives expected lactational yield.

4. Both hind teats give 55% of the milk while both front teats give 45% of the milk. However, this is not rigidly seen..

5. Cows reaching to the peak early and maintaining it for a long time give good lactational yield.

6. If the history sheet is available - try to ascertain the yield of the dam and sire's dam. Sometimes figures are given in litres, sometimes in pounds (lbs). Litres are approximately equivalent to kgs.

7. Do not mix the newly purchased animals in your herd. Keep these animals separately for 7 to 10 days and then tie them in your herd. Observe newly purchased animals during this time.

   If you observe that any animal is sick, then take the advice of the Veterinary doctor.

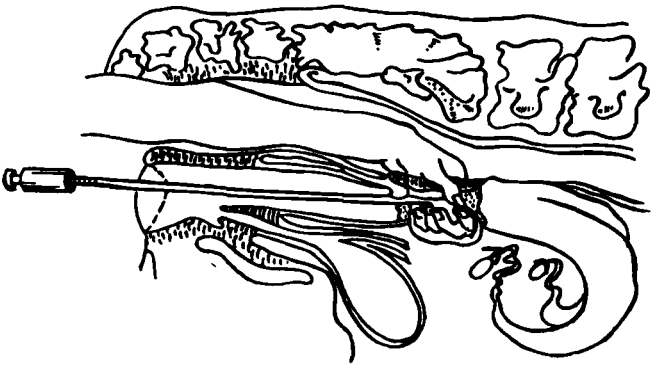
8. If you get advanced pregnant heifers or cows from a good sire and dam, give preference for purchase.

9. A first calver should give at least 75% of the milk of the herd average. Second calver 85% and third calver should give 90% of the herd average.

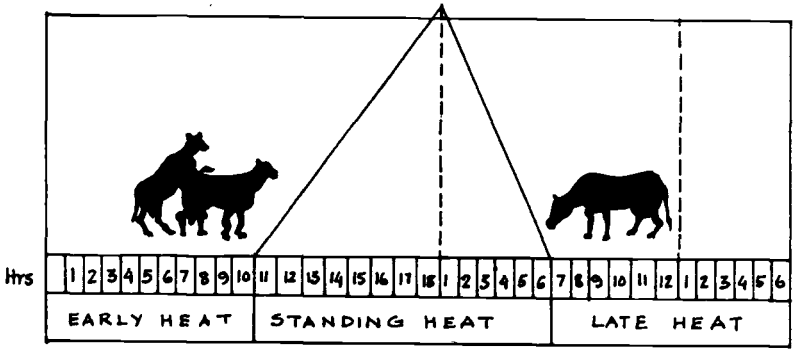
10. It is advisable to insure the crossbred animal at least for the first year. Once the farmer learns to manage the crossbred cow better and gets all facilities in time, for vaccinations and health control, the risk is minimum.

    In an area where animals can be insured in groups, a dairy cooperative should be involved. More information regarding this can be had from the insurance company.

11. Identify the purchased animal. This can be done either by putting ear tag, or tattooing (ear or under the tail) or by branding. Recording of identification marks (see annexure) makes a permanent reliable record. Consult your local vet. for this.



Artificial Insemination



Proper time of insemination

Artificial Insemination

Chapter
6

OESTROUS CYCLE AND TIME OF ARTIFICIAL INSEMINATION

The first signs of oestrous are manifested when the animal attains physiological maturity. In Indian cows puberty is attained around 25 to 30 months of age, while in crossbreds it may be as early as nine to twelve months, but usually it is between 15-20 months.

When the cow is apparently healthy with adequate feeding, she comes in oestrous every 21 days (19-24 days), when not pregnant. The oestrous period is around 24 to 30 hours.

When in oestrous, the cow exhibits some characteristic symptoms.

- She becomes restless and urinates frequently.
- Her vulval lips are swollen. Vaginal mucus membrane becomes bright red and moist.
- There is a discharge looking like a young child's saliva or the white of an egg. It is crystal clear, and it hangs out.
- Initially the cow mounts (jumps) on other cows.
- Thereafter she allows other cows to jump on her body. This is known as 'standing heat'. This is the proper time for insemination. At the end of oestrous some cows may show blood in discharge, which is a normal phenomenon.
- A cow in oestrous may bellow.
- There may be a drop in milk production.

Some cows particularly the indigenous cows do not exhibit these symptoms prominently. If the farmer is not a good

observer, he may not detect the animal in oestrous. As a result, the breeding programme of this animal is delayed by 21 days, incurring additional feeding cost.

It is observed that the majority of the cows exhibit the oestrous symptoms between sunset and sunrise. This is their natural reproductive physiological behaviour. It is therefore necessary to watch and observe the cows once in the evening, once late at night and once again early in the morning next day, for oestrous detection. The best period for insemination is the mid-heat period or 'Standing heat', i.e. between ten and eighteen hours after the onset of oestrous. The ovulation (the release of the egg) takes place after six to ten hours after the oestrous, and the egg must get fertilised within five to ten hours. The sperms have longer life and may survive in the genital tract for a day. Thus the time of insemination is very important for conception. After insemination the sperms must remain in the uterus and oviducts for about six hours before they acquire the capacity to fertilise ova. Insemination in the mid oestrous provides highest fertility.

When scientifically followed, the AI method gives better results. However, before insemination of a cow the farmer must know what is an oestrous cycle of his cow, what are the symptoms of oestrous and exactly when to call for the inseminator.

Thawing:

When frozen semen technology is used, it is absolutely essential to observe the principles of this technique.

At the time of insemination — even at the farmer's door, proper thawing of the semen is necessary. For this purpose, the semen straw should be quickly removed from the liquid nitrogen container and put into water having 37°C temperature and then used immediately. The exact temperature of the water (37°C) should be ascertained by using a thermometer dipped in the water. If this system is not followed, there will not be proper thawing of the straw, with the result that the cow may not conceive.

Some inseminators, for this purpose, carry hot water along with them in a thermos flask. This is a good practice.

Clean water is thus assured at appropriate temperature wherein the straw is to be thawed. Getting hot water readily at the farmer's door, does not guarantee its cleanliness and also involves more time.

Thawing the straw by rubbing it inbetween the palms is unscientific and is not advisable. Thawing of the straw at one place and carrying it in thermos flask to an other place for insemination is also unscientific and should not be encouraged.

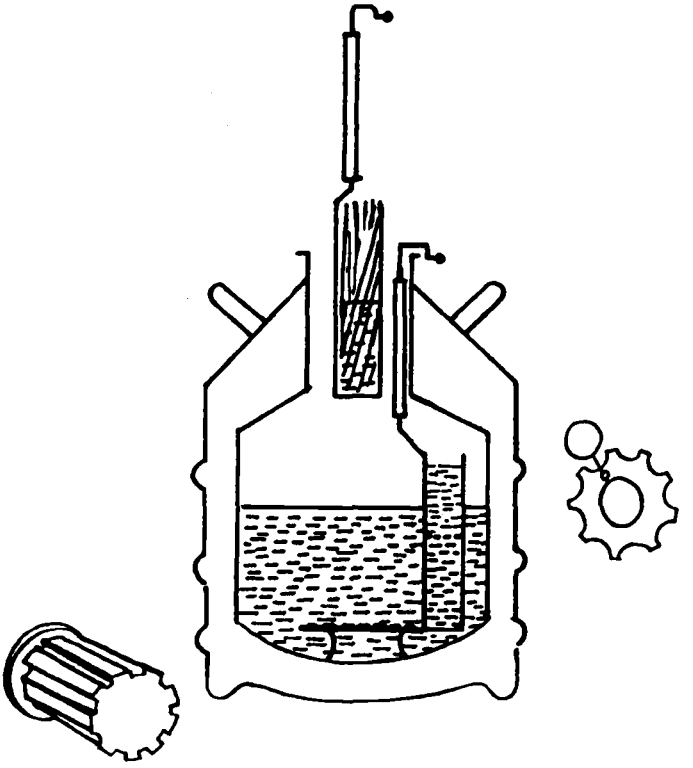
Under ideal management, a cow should give one calf every year (or every 12 to 14 months) if it has to remain economical and profitable. Therefore proper oestrous detection is most important, particularly after calving. A cow must conceive between 60 to 90 days (maximum upto 110 days) after calving. This will give us an intercalving period from 12 to 14 months.

When a cow is detected to be in oestrous, an inseminator should be summoned. After the insemination, she should not be sent out for grazing with the herd. This is because the cow in oestrous is likely to accept other scrub bulls and it may conceive from those bulls, even after the AI. Therefore, after insemination and before the expected date of oestrous, the cow should be tied up preferably for two days.

If the cow does not conceive, successively after two or three oestrous cycles, she should be thoroughly checked by a competent veterinarian and his advice should be sought. Otherwise such a cow will be unprofitable.

It should be kept in mind that 'reproduction is a luxury to the animal's body'. Unless the body is healthy the cow will not come in oestrous and will not conceive.

Observe the inseminated cow for two to three successive cycle dates and see whether she shows symptoms of oestrous. If she does not show symptoms of oestrous, she is likely to have conceived. Get her examined by a veterinarian to confirm pregnancy, eight to ten weeks after AI.



Cross Section of Liquid Nitrogen Container

Chapter
7

MANAGEMENT OF A PREGNANT COW AND CARE AFTER CALVING

A pregnant cow is an asset to the farmer, but the farmer may neglect it primarily because she is dry.

A good dairy cow becomes pregnant within 60 to 90 days after calving and continues to give milk for 300 days. Such a cow is in milk is being managed well by the owner. But when this cow goes dry, she needs special treatment and care, particularly in the last eight to nine weeks before calving.

A pregnant cow has certain obligations, as under:-

(a) She has to provide adequate nutrients e.g. proteins, carbohydrates, fat, minerals etc. to the growing calf. The growth of the calf in the last eight to nine weeks is four times more than the earlier growth.

(b) She has to store certain amount of energy in the body before calving. With this stored energy she has to manage the milk production after calving. When the cow calves, her whole body is triggered to produce milk. This is a natural phenomenon. If the cow does not have stored energy in the body at the time of calving, she will not produce the milk as expected. In early lactation the cow produces more milk, but cannot eat to make up the production. The milk produced is on stored energy in the body.

(c) If the cow is a heifer (first calver) she has to take care of her own growth besides taking care of the calf.

(d) She has to prepare for the next lactation, for production as well as continued performance.

It is, therefore, necessary that the cow be given high quality proteins, easily digestible carbohydrates and sufficient quantity of minerals and vitamins.

If this is not done, what will happen?

1. The cow may remain weak and will give poor yield after calving.
2. She will give birth to a weak calf, which may grow into a cow or a bull.
3. Calving may be premature.
4. The cow may retain the placenta after calving (because of its weakness).
5. She may suffer from prolapse of vagina, or prolapse of uterus and may suffer from milk fever, ketosis, etc.
6. There may arise breeding problems: such as delayed oestrous or weak oestrous. This will completely upset the breeding calendar of the cow, causing frustration to the owner.

Therefore the following care of pregnant cows should be taken:-

(A) Drying of the Cow:

A cow must be dried on completion of seven months of gestation. She must be given rest for two months.

Some good dairy cows give milk till they calve, even though they are pregnant. This should not be allowed.

Drying of the cow should be done as under:-

i) Give limited, measured quantity (half) of drinking water.

ii) Do not give concentrates and greens. Give only dry fodder, temporarily.

iii) Tie the cow separately from the herd.

iv) Stop milking abruptly.

In this way, the cow will be completely dry within five to ten days. When above operation starts on the 211th day of

pregnancy, a cow will be dry by 220th day). As the gestation period of the cow is 280 days, 60 days will be left for calving. After the last milking, wash the udder — dry it by a clean cloth and then push the antibiotic ointment tubes in each teat. This will take care of the udder during the dry period. This is known as 'dry-cow-treatment'. After doing this, dip the teats in Idophor iodine solution, which is commercially available in the market.

(B) Feeding of the Cow in Dry Period:

After drying, the cow should be given good feed: slowly and steadily.

i) Give green fodder, as much as the cow can eat or at least 25 kg per day. (For a good size cow). It should be a mixture of leguminous and non-leguminous fodder, preferrabally in the proportion of 2:3.

Leguminous fodders: Lucern, cow peas, dolicos, subabul, centrocema, stylo, ceretro etc.

Non-Leguiminous fodders: Maize, sorghum, para, Guineagrass, blue panic, rhodes, anjan, etc.

ii) Concentrates are required to be given to the cow as under:

Eighth month (30 days) — 1 to 1 1/2 kgs/day

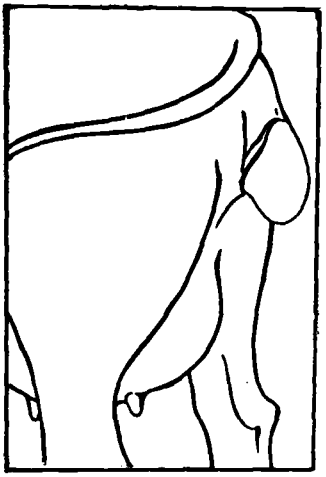
Ninth month (30 days) — 1 1/2 to 2 kgs/day

Last few days — 2.5 kgs/day

She should be given minerals, along with above concentrates at the rate of 25 to 30 gms/day. (This schedule is for a cow weighing 500 kgs.)

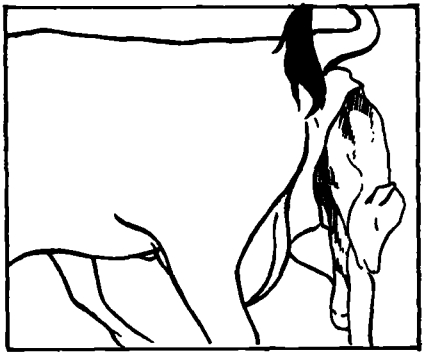
During the last ten days before calving, cows should be given wheat bran (1-1.5 kg/day). This will keep their bowels clean and provide additional phosphorus which will be used by the body.

After the calving, the cow should be given feed according to yield.



Water bag has come out

Face and Forelimbs have come out



Process of Calving

Remember these Points:

1. A cow should put on sufficient body-weight during the dry period. Thus she should gain additional 60 to 80 kgs. of body-weight in these two months.

   Under such conditions, none of the ribs will be seen or exposed.

2. 'Dry cow treatment' must be given to all the dry cows at the time of drying. This ensures protection of the udder during the dry period.

Care of the Cow after Calving:

The pregnancy period of the cow is generally between 274 to 280 days. As pregnancy advances, the abdomen of the cow becomes enlarged, the udder also increases in size. She becomes sluggish and lethargic.

As the calving date approaches, we see the following signs:

(a) Pelvic ligaments relax and become loose.

(b) Vulval lips get swollen.

(c) There may be yellowish white discharge from the vulval lips.

(d) Udder and teats are full and turgid. They may leak.

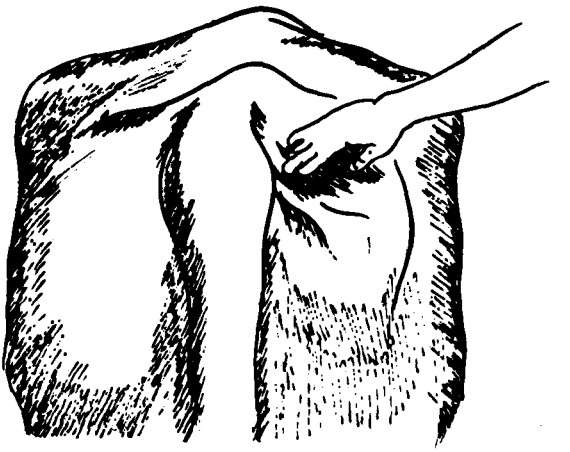
Before the due date of calving, shift the cow to a separate place which is dry, calm and clean. Provide grass bedding.

As the calving time approaches the cow becomes restless and thereafter starts straining.

Majority of the cows calve normally, while only three to five percent cases may need assistance.

The heifers (primipara) may require four to twelve hours (sometimes more) for complete calving process, while cows take one to two hours.

The placenta is dropped down in four to six hours.



The point where cows 'drop in' the relaxation of the Pelvic Ligaments prior to calving

Remember these Points:

1. Ascertain the expected date of calving from the vet. doctor. Observe the cow for a few days before the expected date of calving. A responsible person should be present at the time of calving. Most of the cows calve after sunset till sunrise next day. Avoid presence of dogs nearby, otherwise they may injure the calf or cow by pulling the placenta.
2. If the udder is leaking, milk it out partially, to ease the pressure, even before calving.
3. If the heifer, after straining for one and half hours, does not' show any symptoms of calving, contact your vet. doctor. If a cow, after straining for half an hour, does not show any symptoms of calving, contact your vet. doctor for assistance.
4. Even if the placenta does not drop down even for 24 hours, do not worry. Cut the hanging piece at the level of the vulval lips and put antibiotic pessaries in the

uterus. Do not extract the Placenta or wash the uterus. (Uterine douche).

5. After calving, the cow loses body-weight at 0.5 kg/day. This is a normal phenomenon. Thus in the first two months it may lose 30 to 35 kgs. If the cow loses more weight, contact your veterinarian.

6. After calving, if there is a decline in the milk production (but body-weight is not lost) give proteins. If there is a decline of body-weight as well as milk, give proteins along with carbohydrates for energy.

Chapter
8

HOUSING OF THE COW

The basic requirement of a cow is shade and shelter. She needs to be provided additional protection in the extremities of climate.

In the beginning, for one or two cows, the farmer need not construct a pucca shed. A shed could be erected with locally available material. It should provide sufficient space and adequate shade.

The principles for housing will be as under:-

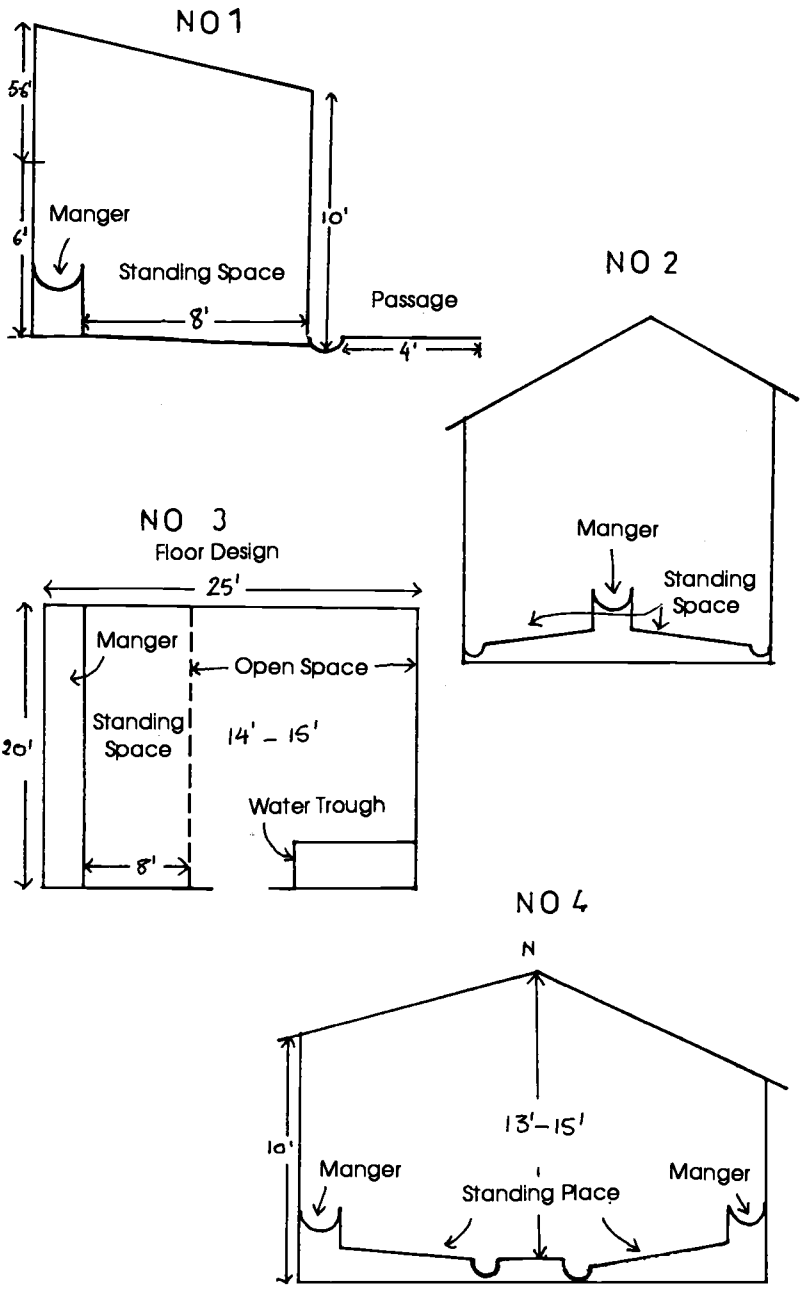
(1) Location of the shed should be on a high, well drained land.

(2) Each adult animal should be provided, at least 3 m^2 space. A standing space of 2 meters in length by 1.5 meters in breadth per cow is sufficient.

(3) The walls should be 1.5-2 meters high and cement-plastered. This will make them damp-proof.

(4) The ideal roof should be three to four meters high. This will allow good ventilation. It should be supported by iron angles or M.S. pipes (10 cm diameter Grade II). The roof may be made of suitable material.

(5) The floor should be with even surface, without any cracks or crevices. It should not be slippery or porous, and should have a slope of 3 cm/meter towards the gutter. It should be properly drained to remain dry and clean. It may be made of over-burnt bricks or rough cement flooring. Properly puddled mixture of mud-sand and lime is a good and impervious material for the floor.



Designs of various Cow sheds

(6) At the rear end, there should be a shallow-flowing quick pucca drain about 22 cms wide.

(7) The manger (feeding space) should be at the height of about one meter; having front height of 50-60 cms and depth of 25-30 cms. Cement half-pipes can also serve as mangers.

(8) All the corners of the walls, troughs and drains should be rounded.

(9) A water tank will be needed when more number of animals are kept. A pucca constructed tank should accommodate (120-150 litres) of water/day/animal.

(10) Initially, for one or two cows, water can be given in shallow vessels or buckets. When more number of animals are kept, provision of water troughs should be made.

(a) Water troughs may be made out of glazed half-cut hume pipes.

(b) Water troughs should provide sufficient standing space for each animal. It should accommodate sufficient water.

(c) Water troughs should provide fresh and cool water. It is better to provide a roof above the trough to minimize contamination from the tree leaves and dust.

(11) It is advisable to whitewash the inner walls of the water trough with lime regularly to prevent growth of moss.

(12) The manure-pit should be away from the byre so that the menace of flies can be avoided. The dung should be used for bio-gas as far as possible. (The heap of dung should be at least 25 metres away from human habitation).

(13) The pipe line which supplies water to the water troughs should be 30-40 cms deep under the ground. This will prevent the water from getting hot in summer.

(14) The places where summer temperature is higher than 40°C, shady trees can be planted, to provide shade on the roof and around.

Thatching of roofs by straw/hay or tree leaves in summer helps to keep the byre cool. Thatch should be about 15-20 cms thick.

(15) If sufficient water is available — sprinkling of water on the roof in summer will also help to cool the byre.

(16) North light roof truss is advisable, when more number of animals are to be accommodated (over 40 animals).

(17) In extremes of cold, as in North India, direct breeze on the body of the animals should be avoided. This can be done by putting gunny curtains on the sides of the byre.

It is very likely that animals will drink less water when the temperature of the water is less than 10°C in winter. The owner should ensure that animals drink sufficient water, by providing warm drinking water.

(18) Housing requirements for crossbred cows is suggested as under:-

Age Group	Manger space (m)	Standing space (covered area) (Sq m.)	Open space (Sq m)
4 - 6 months	0.2 - 0.3	0.8 - 1.0	3 - 4
6 - 12 months	0.3 - 0.4	1.2 - 1.6	5 - 6
1 - 2 years cows	0.8 - 1.0	1.8 - 2.0	11 - 12
Pregnant cow	1.0 - 2.0	8.5 - 10	15 - 20

(19) Group the animals such as milking cows, dry pregnant cows, growing animals, etc. This will avoid competition for food.

Chapter
9

FEEDING OF A COW

The crossbred cow has a genetic potential for high production as well as capacity for adaptation to the tropical climate. It is therefore necessary to provide nutritional diet for her best and sustained performance.

Chronic shortages of feed and fodder, besides poor nutritive value of commonly available feeds in India have lowered the productive capacity and fertility of the livestock. One estimate in this matter says that even with the existing population of indigenous cattle (including buffaloes), overall productivity could be increased by 20% to 25% if they are adequately fed. Shortages of feed stuffs in India are estimated at 44% in concentrates, 38% in green fodder and 44% in dry fodder.

In warm tropical countries, the effect of temperature indirectly affects feed intake, especially when the ambient temperature exceeds 25°C. Combined with heat stress, the composition of the diet also plays an important part in reduction of the feed intake. It was found out that more the proportion of roughage in the ration, the more the reduction in the dry matter consumption.

Animals fed with high protein, high energy rations will have difficulty in eliminating the body heat, especially in fatty animals because, the heat loss from the skin is lower.

Since major ingredients of concentrates like cereals are needed for human consumption, animal production based on feeding of agro-industrial by-products and crop residues can provide better profit margins.

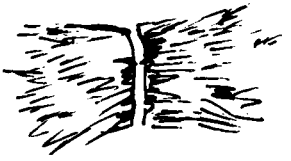
Various unconventional feeds have been tested for their nutritive values. Among them mango-seed kernel,

Concentrate Mixture

Mineral-Mixture

Chuni

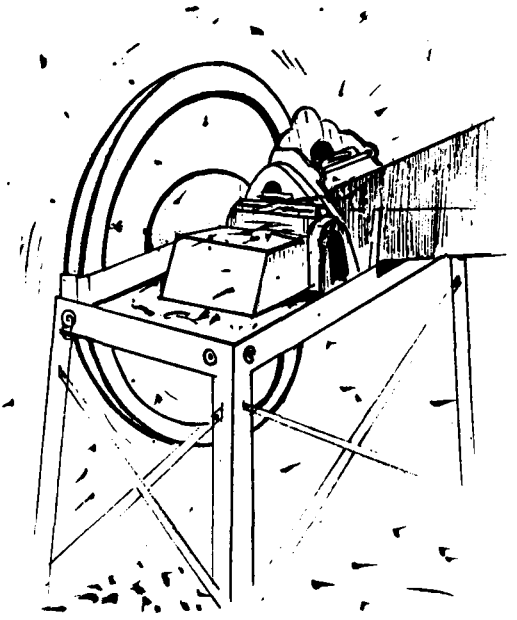
Green Fodder



Dry Fodder

Oil cake

Variety of Feeds



Chaff Cutter

neem-seed cake, salseed meal, mahua cake, babul pods, penewar seed, tamarind seed, Prosopis juliflora pods, rain-tree pods, jamun seed, guar seeds have been found to be useful as cattle feed.

Industrial by-products like molasses have been successfully used as a supplement in the ration after mixing it with two percent urea. However, such use is restricted because of Central Excise rules.

The use of cereal straw as a staple fodder is known to the farmers for centuries. Its nutritive value can be improved by chemical, physical or biological methods: amongst them treatment with urea seems to be very practical and needs to be popularised among farmers.

When we come to the feeding of an individual animal, the following principles are to be observed.

(A) Feed the animal in proportion to the milk yield. Animals giving more milk will require more feed and they should be fed accordingly.

(B) A balanced feed should include protein+energy+ minerals+vitamins.

These nutrients are needed for the following purposes:-

i) Proteins are needed for milk production, for synthesis of different enzymes-hormones and secretions. They are also useful to build up the body tissues.

ii) Energy is necessary for making the appropriate use of the protein. In the case of deficiency of energy, proteins cannot be utilised properly.

iii) Fat is essential in a small proportion, to store certain essential vitamins and energy.

iv) Minerals are useful for the building up of bones and teeth, besides being essential for maintaining the tone of the muscles. They also take part in certain processes of protein synthesis and neuromuscular transmission.

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* Therefore the heat tolerance of animals fed on high plane of nutrition is lower than those fed on lower-plane. The high producing animal is thus much more susceptible to heat stress and efforts are required to reduce the heat stress on such animals. Low fibre rations produce lower disposable heat (heat increment).

(C) Feed should be available locally. Animals thrive, adapt and produce well on locally made feeds and fodder.

(D) The feed should be so composed, that it would be palatable to the animals.

(E) The total cost of feed and fodder should not exceed 65 to 70% of the income from the sale of milk. If the cost exceeds this limit, it will reduce the profitability.

Considering the above principles, let us find out what are the different constituents of the total feed.

Feed Constituents:

(1) **Concentrates**:- These are the mixtures of crushed cereals, oil-cake, and bran; in different proportions.

At the village level, a farmer can formulate his own concentrate mixtures if he knows the formulae as under:-

(a) Grains	30%
Oil-cake	35%
Bran	33%
Minerals	2%
(b) Cereals	30%
Pulses	15%
Oil-cake	20%
Bran	33%
Minerals	2%
(c) Ground-nut cake	17%
Bran (Wheat)	20%
Crushed cereals	40%
Cotton-seed cake	20%

Cereals, jowar, maize, barley, oat, rice. Oil-cake: groundnut, linseed, cotton-seed. Pulses: moong, gram, urid, tur, guar, cowpea.

The farmers can use any one of the mixtures. Though nutritionally they are on par, costwise mixture a is slightly more expensive.

Nutritionally one kg of concentrate mixture is approximately equivalent to five kgs of greens (leguminous). (One should remember that even with feeding of good quality greens in abundance, cows cannot produce milk beyond a particular limit, say seven to eight litres/day. This is because the capacity of the cow to consume the bulk to meet the total quantity of protein is limited. That is why for high producing animals, we have to use green fodder, dry fodder, and concentrates in appropriate proportion).

The concentrate mixtures presently available in the market contain mixture of grains, cake, bran, urea and molasses. Urea happens to be a source of protein (non-protein nitrogen source) while molasses supplies energy. These are available in pellet form or mash form.

(2) **Green Fodder**:- mainly should constitute leguminous and non-leguminous types, in proportion of 1:2.

I) Leguminous: Lucern, burseem, cow-pea etc.

II) Non-leguminous: Maize, sorghum, oat, hybrid Napier.

(3) **Dry Fodder**:- Hay, straws of sorghum, wheat, rice, etc.

How Much to Feed:

(1) The quantity of feed is to be given on the dry matter basis.

A cow eats two percent of her body-weight on dry matter basis (See annexure VIII). When she produces milk, this intake increases from 2 to 3.5% (in very high producing cows it may be as high as 4.5%).

A cow yielding five to ten litres of milk per day needs feed equivalent to 2 to 2.5% of the body weight, while a cow giving more than ten litres of milk needs 2.8 to 3.5% of the body weight on a dry matter basis.

The dry matter of different feeds vary as below: (DM=dry matter)

I) Straws — 90% DM

II) Greens — 20 to 25% DM

III) Concentrates — 90% DM

(2) While feeding a normal cow the dry matter should come from the following sources

60-65% in the form of fodder.

35-40% in the form of concentrates.

Example: If the cow is to be given 10 kgs of dry matter then 6 to 6.5 kgs of dry matter should come from fodder, and three to four kgs of dry matter should come from concentrates.

Amongst the total fodder given, two-thirds should be in the form of greens and one third should be dry fodder.

Based on these principles the following table gives a few examples of feed combinations.

(1) There are four types of mixtures suggested on the rule of thumb.

(2) If the cow still appears hungry, provide her with dry fodder of inferior quality as much as her needs.

Minerals:-

Minerals are essential for dairy cattle for growth, production and reproduction. They comprise essential macro — and — micro minerals such as: Potassium-Sodium-Calcium-Phosphorus-Magnesium (Macro-minerals), Copper, Cobalt, Zinc, Iron, Molybdenum, Selenium, Manganese, (Micro-minerals).

These minerals are available commercially in powder form or brick form. They are available also through feed and fodder. However, the quantity so obtained is variable, hence it is better to supplement the ration. Minerals can be mixed in concentrates or the bricks can be put in front of the cows so that they lick them as and when they desire.

The dosage of commercially available mineral mixture is twenty gms/day/cow. Common salt should be given in addition to mineral mixture, at one to two percent of the total ration.

Many firms manufacture these mineral mixtures by using different raw materials. Thus the sale price varies from Rs. 4 to Rs. 14 per kg. Incorporated raw materials in such cases should

Daily Fodder and Feed requirements for production (in kgs)

Milk Production per day

Types/Names of Fodder and Feeds	5 litres/day				10 litres/day				15 litres/day			
	a	b	c	d	a	b	c	d	a	b	c	d
A) Non leguminous greens (any one) (i) Maize (ii) Millet (iii) Sorghum (iv) Gajraj (v)Para grass etc.	-	20	25	50	-	25	10	5	-	-	25	10
B) Leguminous greens (any one) (i) Lucern (ii) Cowpea (iii) Burseem etc.	18	-	-	-	20	-	10	5	15	-	-	15
C) Dry fodders (any one) (i) Sorghum (ii) bailed straw (iii) Wheat bhusa etc.	7	1	-	-	6	-	4	5	6	4	3	2
D) Concentrate Mix. (any one) (i) Ready made (ii) Home made	-	3	2	-	2.5	4	3.5	5	7	10	6	6

be critically evaluated, as some of the raw materials do contain Calcium, Phosphorus and Magnesium. Certain minerals may be present in the mixture but are not available for absorption. The mineral mixture should contain either Di-Calcium phosphate or Mono-ammonium calcium phosphate, or sterilized bone meal. However when Rock phosphate is used it does contain good quantity of phosphorus, but it should be defluorinated: because natural rock phosphate contains more fluorine which is toxic.

Vitamins:-

Cattle meet all their requirement of vitamins from natural feeds. Vitamin A, D and E are available from feeds and fodders and vitamin C and B-complex are synthesised in the tissues. Thus under proper feeding conditions, supplementation of these vitamins is not necessary.

Water:-

(1) For milk production, water is the most essential input. Water not only plays a vital role in the day-to-day functions of dairy animals, it also helps to maintain body temperature.

(2) Dairy animals suffer more quickly and severely from lack of water. Restricted water intake lowers feed intake.

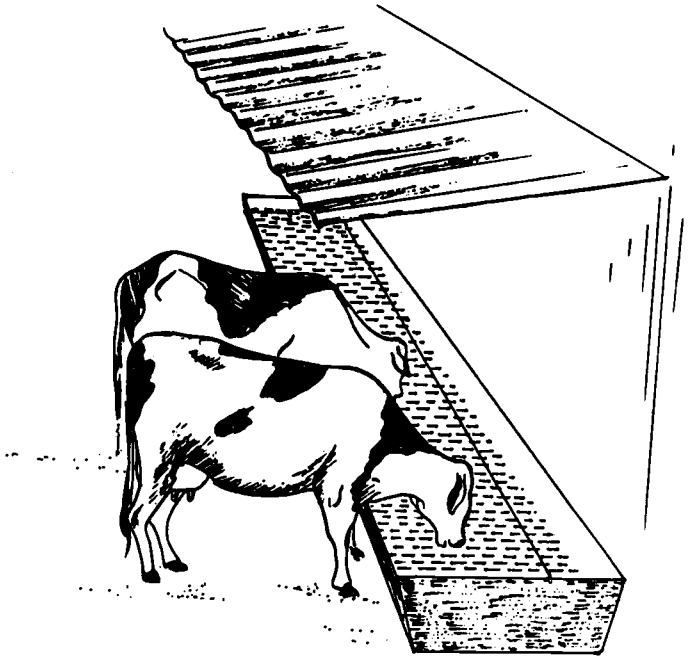
(3) Water intake largely depends upon body-weight, type of feed, age, milk yield, ambient temperature, and humidity.

(4) Animals should be given fresh and cool drinking water. A provision for 120-150 litres of water should be made per day per animal. An animal drinks four to five litres of water per litre of milk production.

(5) In winter in north India, the water should be of a temperature acceptable to the animals — say between 15^0 to 18^0C.

(6) Animals, if accustomed to, can drink saline water upto 10,000 ppm (one-half to one percent).

(7) As the ambient temperature rises, the consumption of water increases. In summer, therefore, it is not the quantity of the water but its temperature which is important.



Water troughs

(8) Hardness of the water is not a problem for the livestock as such. However, water should not contain toxic contaminants.

(9) The estimated water intake is as under:

(Free water consumed+water contained in feed — excludes allowance for milk production)

Body-wt. (kgs)		Litres per day at temperatures	
		20°C	**30°C**
Heifers	50	3.6	5.3
"	100	11.0	16.3
"	200	20.0	26.5
"	300	27.3	37.0
"	400	35.2	46.2
Cows	400	26.5	27.0
"	500	31.0	32.0

(10) If the pH of water is below 5.5 it may cause acidosis in cattle.

(11) Total dissolved solids tolerated by cows are 15000 to 17000 ppm.

(12) Tolerated sulphates level is 350-600 ppm. Exceeding this level will result in diarrhoea.

(13) Iron level tolerated is 3 ppm. If more, animals may not drink such water.

(14) Nitrates more than 100 ppm will harm the animals.

(15) The coliform count of the water should be low.

Practical Tips:-

1. Animals eat two to three and half percent of their body-weight on the dry matter basis, in general. Thus a cow weighing 400 kgs will eat 8 to 14 kgs on the dry matter basis. If this has to be provided through green fodder:

   The green maize fodder contains 70-75% water and 25 to 30% dry matter. Thus a cow weighing 400 Kgs. will need

   $$\frac{8}{0.25 \text{ kgs}} = 32 \text{ kgs of green maize fodder.}$$

2. Feed intake varies with age: the older the animal, the more the body weight and the more it will eat. Calves have a better intake being active and in the growth process.
3. There is variation in the feed intake between the breeds; and also there is individual variation in intake of food.
4. In two animals with the same body weight, thinner animals eat more than fatter animals.
5. In recently calved animals, the feed intake varies as under:

First	month	after	calving	81%	of	average	intake	
2nd	"	"	"	98%	"	"	"	
3rd	"	"	"	107%	"	"	"	
4th	"	"	"	108%	"	"	"	
5th	"	"	"	109%	"	"	"	
6th	"	"	"	108%	"	"	"	
7th	"	"	"	101%	"	"	"	
8th	"	"	"	99%	"	"	"	
9th	"	"	"	97%	"	"	"	
10th	"	"	"	93%	"	"	"	

(Average feed intake is taken to be as 100%).

6. Cows can distinguish certain tastes such as sweet, bitter, sour, etc. They avoid food tasting bitter and prefer sweet taste.

7. The intake varies with the nature of the feed. Animals consume more fodder if it is chaffed. If grains are finely powdered, the intake will be more. However, such feed gets excreted fast, and therefore, less time for digestion. If the size of the crushed grains is less than 2 mm; the rumination is reduced. It is, therefore, better to convert such feeds into pellet form.

8. Green fodder intake is comparatively more than either silage or dry fodder of the same variety. It is, therefore, advisable to feed the fodder when it is green.

Quality of the Feed and Fodder:-

1. If the feed and fodder is digested early, the animal eats more. It is seen that in good quality fodder, digestibility is upto 70%, while in low quality fodder it is only 40 - 50%.

2. Feed intake also varies with the digestibility of the feed.

3. Fodders with lower protein content are normally eaten less.

4. Higher fibre content in the fodder affects the digestibility.

The farmer gives fodder — which is cut in different stages of its growth. The digestibility and chemical composition of the fodder varies with the stage of cutting.

Intake also varies with some of the abnormal ingredients present in certain fodders. Bad smell and taste are unacceptable to the animals.

5. If animals are given the freedom to eat the fodder and drink the water as and when they feel like the intake is more. (Management point:- animals are kept loose and mangers are full of fodder round the day — so also the water-trough.)

6. Following non-traditional feeds and fodders are acceptable for dairy cows:

   a) Mango-seed kernel (*Mangifera indica*) upto ten percent of the total, it can be given in the feed.

   b) Babul pods (*Acacia nilotica*) can be mixed in the feed of young stock upto 20% of the total feed.

   c) Ambadi-cake (*Hibiscus canabinus*) upto 20% of the total feed.

   d) Tamarind seed (*Tamarindus indica*) can be given in powder form upto 20% of the total feed.

   e) Warai bran (*Panicum millaceum*) can be given upto 30% of the feed in lactating animals.

   f) Raintree pods (*Albizia saman*) can be incorporated in the feed upto 10 to 15%.

   g) De-oiled salseed meal, and Mahua cake can be fed to the dairy cattle.

   A number of tree leaves can also be fed to animals, as supplementary feeds: the important ones are:-

   Gauj (*Millatia auriculata*)

   Kudzuvine (*Pueraria thumbergiana*)

   Tut (*Morus alba*)

   Marorfali (*Helecerus isora*)

   Kutchanar (*Bauhina variegata*)

   Siras (*Albizia lebbeck*)

Bel (*Aegle marmalos*)
Jharberi (*Ziziphus numularia*)
Banj (*Quercus incana*)
Bans (*Dendrocalamus strictus*)
Pakar (*Ficus infectoria*)
Sainjana (*Moringa olifera*)
Pula (*Kydia calycina*)
Pipal (*Ficus religiosa*)

Cheaper and Nutritious Feed:-

It is possible to make the best use of bagasse and molasses in the areas of sugar factories. The following mixture can be made:

Bagasse 62%, Molasses 17%, Ordinary concentrates 18%, Minerals 2%, Urea 1%.

Vitamin powder A & D @ 200 gms/tonne.

Method: Spread the bagasse on the ground (10-15 cms layer). Dissolve urea in water, then add molasses — so that thickness of molasses will also reduce. Spray this mixture on the bagasse evenly. Mix the mixture while spraying. (Farmers can do it by hand. When it is to be done on larger scale machinery can be used).

Animals will relish this mixture very well.

In other areas, one can substitute bagassse by: a) Groundnut shell (husk) b) Maize cobs (degrained) or c) Leaf meal.

Animals may eat such mixture a little at the beginning. However their intake increases once they are accustomed to it.

About this feed, remember:

- Do not use molasses if it has a fungus growth.
- Do not use molasses if it is fermented.
- Feed only fresh mixture, never keep it for the next day.
- Ensure proper mixing of urea and minerals.

Bagasse can be made more palatable and digestible by steam treatment, wherever readymade steam is available. Under the pressure of steam at seven kgs/ cm^2 for 30 minutes, lignin and cellulose bonds are destroyed. The feed made in this manner is easily acceptable to the animals.

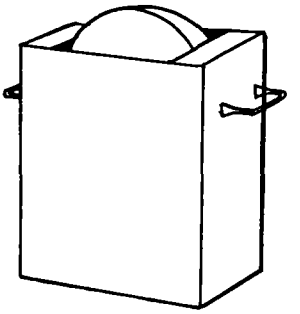
One can also steam-treat hybrid sorghum straw, or bajra or paddy straw by the above method, for improving its palatability.

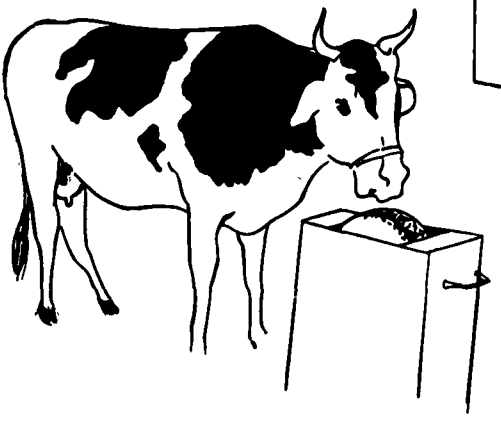
Remember these points:

(a) Nutrient requirement for growing cattle, maintenance of cattle and requirement per kg production of milk, should be calculated for individual cow (see table in annexure) and feed should be given accordingly.

(b) Control of internal parasites by appropriate medication will be more helpful for proper utilisation of feed by the animal. High returns maybe expected from increased inputs of feed energy — if measures are taken to control the disease.

Rolling Wheel with a broad surface





Cow licking Molasses Urea Mixture

Chapter
10

CALF REARING

Care of the calf starts right from the time it is in the womb of the mother-cow. The development of the calf in the last two months of pregnancy in the mother's womb is four times more than the earlier growth. Therefore a cow needs to be fed, additional nutrients in the form of concentrates about 100 kgs spread over the last two months of pregnancy. This additional feed will take care of the growth of the calf. If this is not done, the growth of the calf will be poor.

Care at Birth (0-15 days):-

When the calf is born, the first care to be taken will be feeding of colostrum to the calf. The colostrum contains antibodies which are essential for the calf, as it does not get any protective antibodies when it is in the womb of the mother. The colostrum is rich in antibodies besides vit. A, and it must be given as much as the calf can drink within the first four hours of its birth. Because if the colostrum is fed after four hours, the ability of the calf to absorb antibodies reduces. After eight hours of birth, it reduces to nearly 60%.

There is a misconcept among farmers not to milk the cow till the placenta has been expelled. However, this is absolutely wrong. Dropping of placenta has no relation with milking the colostrum. In fact, when colostrum is removed, it facilitates the expulsion of placenta.

After the birth of a calf, disinfect the navel chord with Tr. Iodine. Remove the horn-buds between ten to fifteen days of age. This is easy and less painful to the calves. The horn-buds are removed by hot iron or by using caustics. Horns are given to the cow by nature for self protection. Since the cow is

domesticated they are not required. If they are allowed to grow they may grow in an awkward direction and may cause injury to the other animals. This removal of the horn-buds can be done by a trained assistant.

Feeding:-

The calf needs to be fed with milk around eight to ten percent of the body-weight. Body-weight can be calculated by measuring the girth of the calf at chest with the use of measuring tape. (See annexure No. VIII).

It is recommended that for the first two to three days, the calf should be kept near the mother, and thereafter it can be kept separately which is known as "weaning". If this is practised, calves should be fed either in buckets or by a bottle. The feeding utensils should be absolutely clean and the milk should be given at the body temperature of the calf (38^0C).

Milk should be given to the calf upto the age of two months. Thereafter milk could be stopped. At three weeks the calf can be offered bran (wheat or rice), and a little green grass. The calf will slowly start to nibble at it and will learn to like it. It is better if the calf takes to fodder early. This will stimulate growth of its compound stomach and start its functioning. The calf starts rumination, when its rumen starts functioning.

The schedule of suggested milk feeding:-

First week	1 to 1.7 litres of milk twice/day
Second and third weeks	2 litres of milk twice/day
Fourth week	2 to 2.5 litres of milk twice/day

Calves of good birth weight (25 to 30 kgs) will need this feeding schedule. Calves with less body-weight may require less milk.

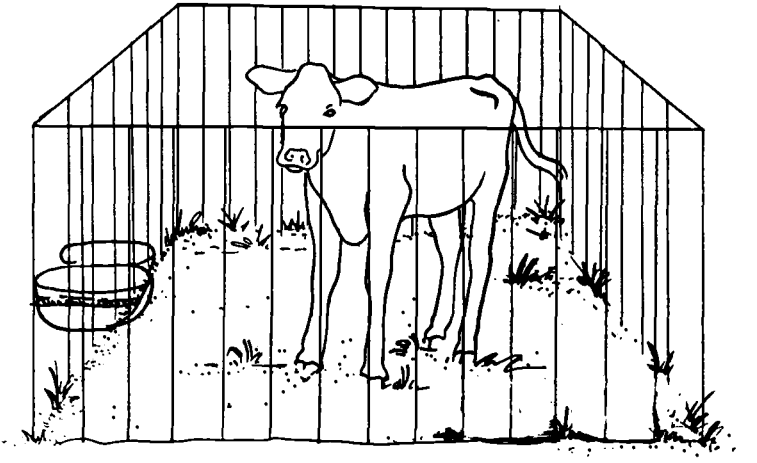
The feeding time should be observed strictly, and can be fixed to suit the farm routine. It is advisable to feed the calves individually. Calves should be observed closely about their health.

As the calf shows more interest in nibbling and eating crushed grains, bran and hay, proportionately reduce the quantity of milk to be fed. The feeding milk can be stopped

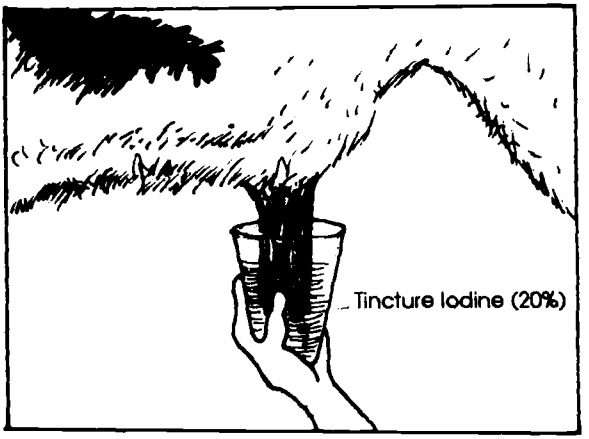
completely, when a calf can consume one kg of such meal a day. The hay should be given as much as it can eat. The meal containing bran and crushed grains can be continued upto 12 weeks of age, thereafter a mixed diet of concentrates, dry and green fodder should be given. There are commercial concentrates available for the calves. They can be given instead of home-made meal. However, no sudden change in the feeding schedule should be made.

Many preparations are suggested as an alternative to milk e.g. skim milk, reconstituted milk, buttermilk, etc.; but at many places their availability is not assured.

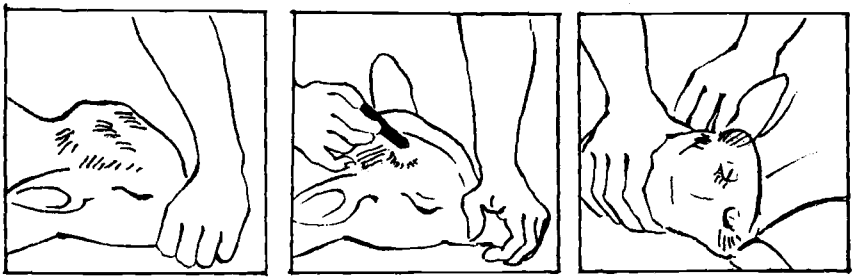
Under the village conditions, feeding of milk twice a day and putting a small quantity of concentrates, along with available greens is sufficient for a growing calf.



Calf in a cage



Umbilical Cord treatment



Removal of horns when they are in bud

Water:

The calf should get fresh, clean and cool water as and when it feels like drinking. Regularity in feeding and watering is essential for normal growth of a calf.

Preventive Health Cover:-

1. The calf should receive its first shot of Foot and Mouth Disease vaccine at the age of 45 days. Thereafter the booster dose should be given at the age of four months. This should be repeated every six months.

2. Other vaccines like Rinderpest, Haemorrhagic Septicaemia, and Blackquarter should be given at the age of six months as first dose, thereafter once a year. There should be an interval of 21 days between two vaccinations. One can use a combined vaccine for HS+BQ.

   These vaccines must be carried out on every calf, and grown-up animals in the byre.

3. Control of external parasites such as ticks, lice, mites, etc. should be undertaken regularly. These parasites are not only a nuisance but they suck the blood and while doing so, introduce germs of certain diseases like Theilariasis, Babesiosis, etc.

   The ticks can be controlled by regularly spraying insecticides (Sumithion or Malathion). These sprays of insecticides can be repeated every fifteen days. Spray the medicine after feeding and watering of the animals.

4. Deworming: Calves harbour different types of worms in their body. The worms are the parasites. They rob the nutrients which otherwise could have been used by the calf. This makes calves sick and weak. Their resistance to the disease is lowered. It is advisable to deworm the calf at the age of one month, thereafter once in every three to five months. Oral medication or injection of newer-broad spectrum anthelmintics can be used as per the advice of the local veterinarian.

Common Ailments:-

The common ailments of the calves are as under:-

(A) Scoures or loose motions. It is common in the second or third week, caused by bacterial infection, worms, or viral infection.

The remedy is to stop feeding and give the calf only water and electrolytes. (Water+Salt+Glucose)

Thereafter give half milk and half water (boiled and cooled). Meanwhile any commercial preparation containing pectin and kaoline can be given orally. When the calf shows fever with scouring, it is better to consult the veterinarian.

(B) Swelling of umbelicus — After birth, the navel cord should be painted with Tincture iodine liberally for 3 to 4 days (till the cord dries). If this is not done, infection may enter the cord, and it may get swollen. This needs treatment from a veterinarian.

Calf Feeding Schedule (Day 0 to Six Months):-

Age	Colostrum litre	Whole milk litre	Calf starter kg	Green hay kg
1st week	10% body-wt. for three days	2.5 - 3.5 (4th to 7th day)	-	-
2nd week	-	3 - 3.5	-	-
3rd week	-	3.5 - 4	0.050	0.1
4th week	-	3.5 - 4	0.050	0.2
5th week	-	@ 8% of body-wt.	0.200	0.5
6th week	-	@ 6% of body-wt.	0.300	0.5
7th week	-	@ 4% of body-wt.	0.300	1.0
8th week	-	@ 2% of body-wt.	0.500	1.0
3rd month	stop feeding milk		0.500	2.0
4th month	-	-	0.750	3.0
5th month	-	-	1.000	4.0
6th month	-	-	1.500	7.0

Milk Replacers

These are cheaper substitutes for milk. Calves can be given a milk replacer after one week of age.

(a) Milk replacer is cheaper than milk. However, it should be prepared out of those ingredients which can be digested by a calf. A calf can digest lactose and milk protein.

When appropriately made it should contain butyric acid, citric acid and antibiotics.

(b) When it is made, mix it with milk in proportion as under:

1/2 litre milk + 1/2 kg replacer + 3 litres water; for a calf of 45 kg body-wt.

(c) One can rear a calf on 115 litres of milk, and milk replacer instead of 300 litres of milk alone.

The formulae for milk replacer are as under:-

Milk Replacer

Formula I		Formula II	
Lucern juice (Lucern extract)	55%	Wheat	10%
Linseed cake	30%	Fish meal	12%
Coconut oil	7%	Linseed meal	40%
Linseed oil	5%	Milk	13%
Mineral mix.	3%	Coconut oil	7%
Vitamin mix	q.s.	Linseed oil	3%
		Citric acid	1.5%
		Molasses	10%
		Mineral mix	3%
		Butyric acid	0.3%
		Antibiotic mix*	0.2%
		Vitamin mix	0.015%

*Antibiotic mixtures like Auriomycin powder.
Vitamin mixture contains vitamin A 800 U.O and vitamin D 200 I.U. per kg feed.

Calf Starter

The formulae for calf starter are suggested as under:-

	I type	II type
Grains	30%	30%
G.N.C.	25%	27%
Wheat Bran	5%	10%
Rice Polish	5%	5%
Milk powder	25%	20%
Molasses	7%	10%
Minerals	2%	2%
Salt	1%	1%

Note.: Milk replacers and calf starters are advocated in commercial units. Those are not practicable for small units/or individual farmers because of unavailability.

Remember these Points:-

1. Arrange the calving of the cow in a clean and dry area, with adequate bedding.
2. Immediately after birth, dry the body of the calf with clean dry cloth, clean the mouth and remove the mucus. See whether all the orifices of the calf are normal. Keep the calf in front of its mother. The cow will lick it. This helps good cutaneous circulation of the calf.
3. Disinfect the navel cord and surrounding area immediately after birth as follows:-

   Apply Tincture Iodine to the navel cord: normally 10 to 20% tincture iodine is used for this purpose. This iodine is to be applied till the cord dries (usually in three to four days). Take the iodine in a cup and dip the cord in it.
4. Introduce calf starter (having at least 22% crude protein) and lucern hay from age three weeks onwards, along with milk.
5. From sixth or seventh week onwards, the calf may be only given calf starter and lucern hay. Or alternatively.

If skim milk is available, feed it from the second week onwards @ 10% body-weight till the fourth week and thereafter @ 12% body-weight till three months age. Thereafter the calf may be fed with calf starter and greens.

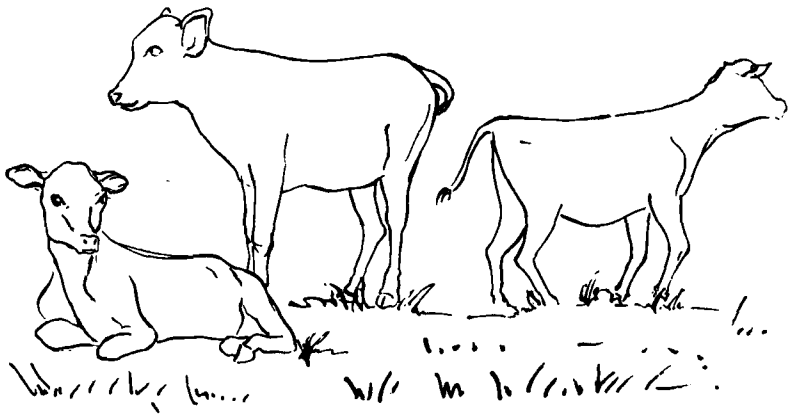
6. Housing: Dry-warm and hygienic surrounding should be provided to the calves. (Detachable pens made out of iron bars are convenient to use).

7. Do not mix young and old calves together. Upto the age of six months, a calf should be provided a space of 1.5 m x 2.0 m.

   The height of the feeding troughs and watering troughs for calves should be lower (25 to 40 cms).

8. In a well-managed herd the growth of the calves is more than 600 grams/day. Such heifers conceive at an earlier age.

9. Calendar for preventive vaccination in calves.



Young calves

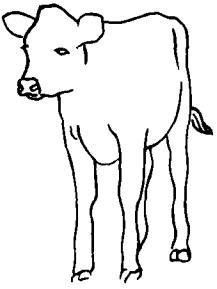
Feeding schedule of calf: (Six month age till conception) (in case of heifers)

		Common green grass kgs	Maize green grass kgs	Leguminous greens kgs	Concentrates kgs	Straw kgs
Age Six to nine months (per day) (100-150 kg body-weight)						
either	a	3	3	-	-	2.50
of	b	7	-	-	1	2.50
these	c		-	10	1 5	1.25
	d	-	6	-	1	2.50
	e	-	5	5	1	1.25
Age nine to twelve month (150-200 kg body-weight)						
Any one	a	-	12	-	1	2.5
of	b	6	6	-	1	2.5
these	c	-	-	-	3	2.5
	d	-	-	17	-	1.0
	e	6	6	2	-	2.0
12 months to conception (200-300 kg body-weight)						
Any one	a	-	15	-	3	3
of	b	17	-	-	3	3
these	c	-	-	15	5	2
	d	-	-	-	5	4
	e	6	6	-	5	2.5

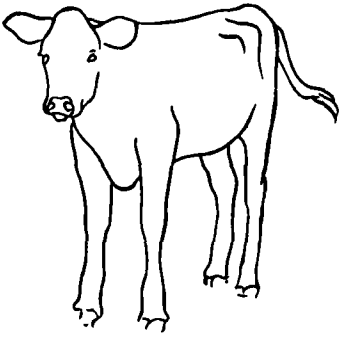
Calendar for preventive vaccination in calves.

Age of the calves	Weeks			Months				
Vaccine	1	5	6	4	6	7	10	12
Foot and Mouth Disease	O_1		O_2					O_3
Haemorrhagic septicaemia				O_4				
Black quarter				O_4				
Rinderpest (T.C.R.P.)				O_5				

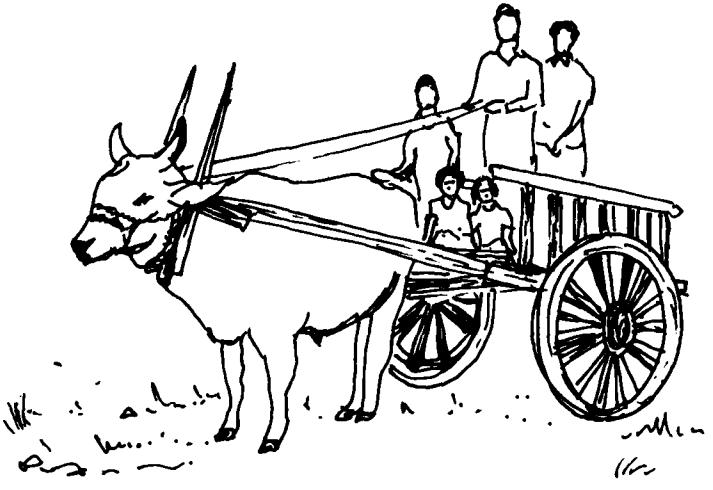
1. For calves born to unprotected mother.
2. Primary Vaccination in case of protected mothers.
3. Repeated every six months.
4. Give before monsoon.
5. To be repeated every year.



Calf of 45 days



Calf of 6 months



Crossbred Bullock at work

10. Remember, when the mother is regularly vaccinated against contagious diseases the colostrum of such mothers will protect the calf for the first six weeks of its life. Thus feeding of colostrum is important. In case the colostrum is not available from the mother, colostrum from another cow will do. Alternatively following mixture is given: (a) Milk 100 ml + Caster-oil 5 ml + white of two eggs, well-mixed, or (b) Serum from the mother is injected to the calf (15 to 20 ml) at a time.

11. When the calf is with its mother, see whether the calf can hold the teat in its mouth and suck, because some cows have bigger teats and the calf cannot hold them. If the teat gives thin streaks of milk, the calf will have to put in more effort for suckling.

12. After the calf has suckled, dry the mouth of the calf with a cloth. Otherwise it may develop the habit of licking its own lips for a long time, which can turn into a habit of sucking other calves. Wipe the udder with wet cloth, then dry it, when the calf finishes suckling.

13. Calves take first two to three weeks to adjust to the atmosphere. Thus in first two weeks their growth is slower. Thereafter they adjust well and grow at the rate of 600 gms to 1100 gm/day. Such female calves which grow well upto the age of six months develop into good cows.

14. Do not tie the calves for the whole day. Allow them to run and roam about in a closed compound. This will keep them fit and healthy.

15. A crossbred male calf can be useful for all types of agricultural operations. He has equally good pulling strength as compared to indigenous bullocks.

    A slight modification of the yoke makes the crossbred bullock useful for ploughing and other agricultural operations, harnessing to bullock cart etc.

    The crossbred bullock matures early, (because of fast growth rate) thus comes in use as early as one year and six months of age, when cared & reared properly.

In summer, these animals pant more. Using them for work in the cool hours of the day, clipping their body coat, and giving cold water bath is helpful at such times.

16. If good quantity of milk is available to the calf in the initial period of its life, the growth of such a calf is very good. Such heifers mature early, and produce more milk than those heifers which did not receive a good quantity of milk in young age.

17. In mature heifers, it is not the age but the body-weight which should be taken as a deciding factor for the first insemination.

    In Jersey crosses such weight is suggested to be between 200 to 230 kgs. (Girth more than 130 cms), while in HF crosses it should be around 300-320 kgs. (Girth more then 152 cms). This is 60% of the full mature body-weight.

    If the heifer conceives before attaining such weight, she may remain pregnant, but she will not give expected amount of milk in the first lactation. This is because the nutrients are diverted for body growth. Thus proper feeding as well as management of heifers is more important.

18. It is observed that, instead of weaning of calf from birth, restricted suckling appears to be more viable. Thereby milk yield has increased upto 30%, cows that continue to suckle their calves lose less body-weight and the growth of the calf is better.

Chapter
11

ANIMAL HEALTH:
I. CONTAGIOUS DISEASES

In dairy management, animal health has an important role. It is desirable that a livestock owner should be aware of common epidemic diseases of animals.

Nature has designed all living beings to maintain their own body in normal health. When man uses these animals for milk or for work, animals are subjected to various stresses. These stresses make animals more prone to infection. Thus it is our duty to provide adequate protection from infection and diseases.

In India most of the contagious diseases are under control, but they are not eliminated or eradicated.

The scientific approach to control contagious diseases is by undertaking regular preventive vaccinations. Thereafter care should be taken for tick control and dry cow treatment.

I) Contagious Diseases:

A) **Foot & Mouth Disease**:- It is a virus disease: it spreads through air, feed and contact. There are four types of viruses (strains) seen in this disease in India (A,O,C, and Asia I). Each type is capable of causing the disease. The symptoms are high fever (104°F to 106°F), salivation, and lesions (wounds) on the tongue and gums. The animal is unable to eat and drink. There are also lesions (wounds) in the cleft of hooves. The animal becomes lame. Bullocks can not work in the field.

Deaths due to this disease are rare, except in young calves (upto six months age) and in exotic animals.

However the loss is due to drop in the milk yield, and work power of bullocks. It is estimated that in India this loss amounts to nearly Rs. 1000 crores per year.

If the animal suffers from the disease once, the treatment helps only to prevent secondary infection; it does not cure the animal totally.

The best way to control the disease is, therefore, prevention with regular vaccinations. The vaccination is to be done at least twice a year; (March and September) irrespective of whether the disease prevails or not. The vaccine gives immunity only for six months.

The vaccine must be transported and stored at 4-10°C till it is innoculated, otherwise it loses its potency (effectiveness).

Crossbreds are high risk animals and should be protected preferably three times a year. Whenever we see an outbreak of the disease in the village, it is better to give an additional dose of vaccine for those who are not either ill or suffering from the disease.

All the animals in the byre or herd should be protected.

Rinderpest:- This is another virus disease. It spreads by contact. There is a high fever, eyes become red, there is watery discharge from the eyes. There are bran-like deposits on the gums. Animal gets watery diarrhoea — and dies.

Every year thousands of animals die in India due to this disease.

There is no treatment for this disease. For prevention, it is necessary to protect the animal by vaccination once in a year. The preferable season is winter (November or December).

Tissue culture — freeze-dried vaccine is the best one available.

The vaccine is in the freeze-dried form (in a powder form 'a cake') and along with it a separate diluent is supplied. The transport and storage of vaccine must be done at 4 to 10°C.

At the time of reconstitution of the vaccine, the diluent also must be cooled upto 10°C. After reconstitution of the vaccine it must be used within one and a half hour (under the cover of the ice) otherwise it will not be effective. The vaccine gives immunity for one year.

C) **Haemorrhagic septicaemia**:- This is a bacterial disease. The infection spreads through contaminated feed and water and by contact. The animal develops high temperature. The eyes become red. There is a nasal discharge and a swelling under the neck. There is a swelling of the throat and breathing becomes difficult and noisy. The animal suffers from pneumonia and dies. In a sick animal, the classical treatment even today is sulphamezathine injectable to be given intravenously (33.3% solution @ 300 ml I/V first day; 200 ml I/V 2nd day and 150 ml I/V third day). The treatment must be given in time. It costs around Rs. 200 to 300/- per animal.

To prevent the disease, it is better to vaccinate the animal regularly. The vaccines (see Annexure) are manufactured by the State Govt. and the BAIF laboratories.

The appropriate time of vaccination is before the onset of monsoon. The common vaccine gives protection for three months while BAIF's special vaccine gives protection for one year.

D) **Blackquarter**:- It is a bacterial disease. It spreads by contact. Young healthy animals are more affected than others. It is a soil-borne infection.

The animal gets high fever, its fore or hind quarters are swollen. When pressed we get a crepitating sound. Animal becomes lame, drops down and dies because of toxaemia.

When the animal is sick, it can be treated with massive doses of antibiotics, and the animal can get cured. The total cost for treatment comes to around Rs. 200-300/- per animal.

Prevention is best achieved by regular vaccinations. The vaccine is available from different sources. BAIF laboratories also produce this vaccine.

The vaccine is to be given preferably before monsoon.

Both Haemorrhagic Septicaemia & Blackquarter vaccines can be stored at room temperature (20°C). However if stored at 5-10°C, its shelf life increases.

Note:- Do not apply spirit/Tr. Iodine or any antiseptic at the site of the inoculation of the vaccine. If the skin at the site is dirty, wipe it or clean it and then prick the needle.

When the vaccine is purchased from a private manufacturer, the cost is as under. (When at a time 100 or more animals are to be vaccinated).

When regular vaccination is carried out, it covers the risk to the animals life by 72%-75%

Remember not to compromise about:-

A) Vaccine storage/transport must be done at appropriate temperature, failing which no protection is obtained.

B) Protect all the animals in the herd/byre.

C) The dose of vaccine for young and old, thin or heavily built animal is the same.

D) Use of separate needle, duly sterilised in boiling water is a must, for every animal. Do not apply spirit or Tr. Iodine.

E) Record Batch No. of vaccine/dt. of its manufacture.

F) F.M.D. Vaccine must be stored between 4-10°C, but it should not get frozen. (Frozen vaccine becomes useless).

G) R.P. vaccine must be preserved between 4-10°C and after reconstitution it must be put under the cover of the ice and then used.

II) Tick Control:

Ticks are small insects. They sit on the animals body and suck blood. They do not have wings. While sucking the blood, they introduce some germs in the animal body, which result in certain diseases. (Theileriosis — Babesiosis).

It is therefore necessary to spray acaricides on the animals.

The following acaricides (Tickicides) can be used, effectively (one of them).

Malathion 0.5% on animal body		0.5% on body
or		
Asuntal powder		0.2% on body
or		
Lindane		0.25% on body
or		
Tick-go powder (soluble)	Sevin	0.8% on body

After spraying the acaricides, wash the body of the cows after half an hour and then dry the animal. (See that the animal does not lick the body). It is better to use the acaricides once in fifteen days. The cost per operation comes to 40 paise, i.e. 80 paise/month i.e. about Rs. 10 per animal per year.

By controlling ticks, we can reduce the risk of diseases by additional nine per cent.

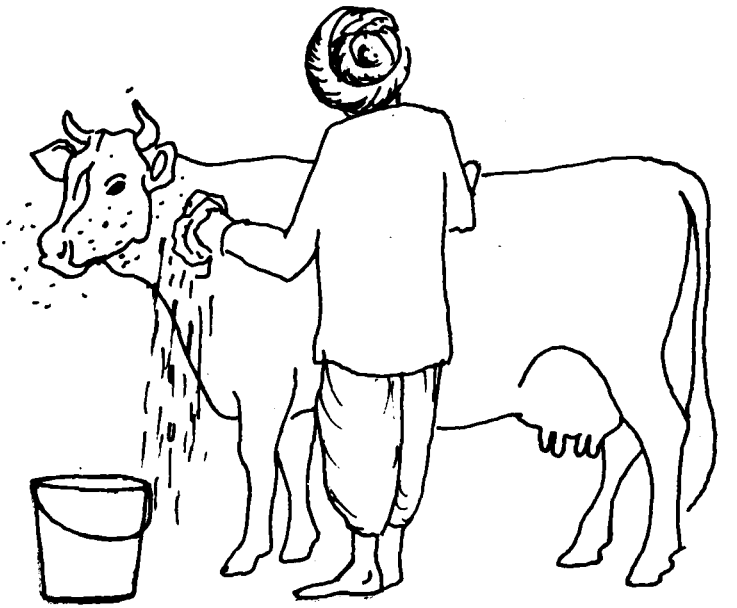
Dry Cow Treatment:

The present cost per tube is Rs. 8/- thus for four teats it comes to Rs. 32/-. If such care is taken, then the additional risk of nine per cent of the disease is covered.

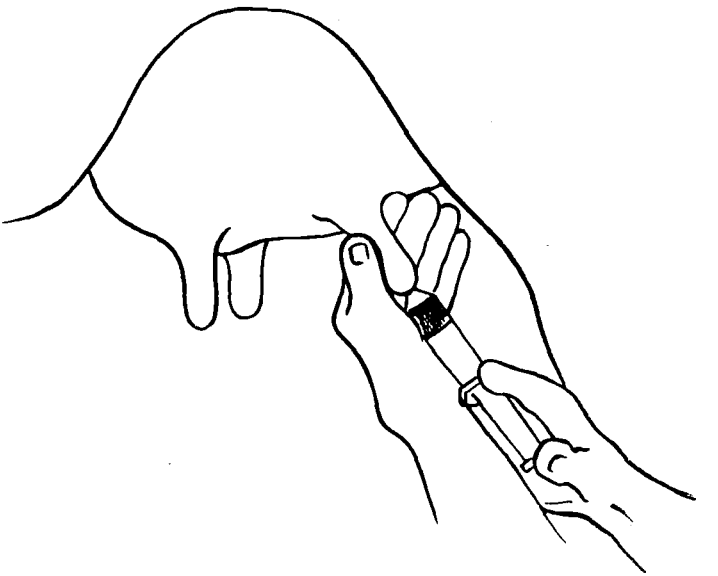
	Rupees cost	Risk covered
Thus		
a) Total vaccination cost (When vaccines are purchased from the market)	10.00	75%
b) Tick control	10.00	9%
c) Dry Cow treatment	32.00	9%
	52.00	93%

Approximate cost of vaccinations with schedule

Name of the Desease	Vaccination Schedule/p.a.	Preferable season	Cost/ dose	Total Cost	Site of injection
1. F.M.D.	Twice/year (minimum)	March Sept	@3.50/ dose, thus	7.00	s/c at the brisket or neck
2. R.P. (T.C.R.P.)	Once/year	Nov or Dec	1.00	1.00	s/c on neck
3. H.S.	Once/year	before monsoon	1.00	1.00	s/c on neck
4. B.Q.	Once/year	before monsoon	1.00	1.00	s/c on neck
				10.00	



Spraying of acaricide



Putting an intra mammary tube

Therefore by spending Rs. 52/- per animal per year or a rupee a week we can cover the risk of the cows life to the extent of 93%.

A farmer should be convinced about this.

III) Testing of animals

It is necessary to test the animals against Tuberculosis, Johnes and Brucellosis.

These diseases are highly infectious. There is no vaccine available against TB and JD. A vaccine against Brucellosis is available but farmers should seek expert advice before using it.

The testing for these diseases is done at the farmers' door by a veterinarian. The TB and JD antigen is injected in the skin of the animal and thickness of the skin is measured at 48 and 72 hours.

For Brucellosis, a drop of blood of the animal is mixed with the antigen on a glass or tile and result is obtained. Animals found positive for any of these diseases should be segregated.

Chapter
12

ANIMAL HEALTH:
II. COMMON AILMENTS

There are a number of common diseases and health problems observed in the normal life of animals, which don't require any special treatment, but by first aid or timely treatment, these ailments can be cured easily. Following are the importment problems:-

1) Tympany or Bloat:-

Symptoms: i) A para-lumbar, triangular fossa on left side of the affected animal bulges out. The skin over it feels very tight and tough, so much so that sometimes bony prominences of the pelvic girdle cannot be seen.

ii) The animal becomes uneasy, it starts stamping, and peddling by hind legs. It gets up and sits down.

iii) There is profuse salivation, and difficult respiration.

iv) It shows severe straining.

v) There is total suspension of rumination.

vi) There is total anorexia.

Treatment: i) If the left flank is pliable and not tense after pressing, then drench very slowly 500 gm to 700 gm of sweet oil (any available edible oil) along with 30 ml to 50 ml of oil of turpentine. If it is not possible then drench one to two litres of buttermilk with powder of Asafoetida (50 gm to 60 gms).

ii) Give vigorous massage to abdomen (flank region).

iii) Give sufficient exercise by forcing the animal walk fast or run.

iv) Tie a wooden halter a little loose in the mouth so that the animal starts chewing it: this will help in eructing out

trapped and accumulated gases in the rumen through mouth.

v) Palpate the oesaphageal passage from outside of the neck region — by applying gentle pressure with thumb & two fingers — to check if there is any choke.

vi) Injections of antiallergic/antihistaminics would be of greater use.

vii) Don't offer any feed, fodder, water, till animal starts rumination.

viii) Pull the tongue outside gently for sometime, by putting the hand in the mouth; waving of tongue forward and backward by grip holding, the animal may get relief.

ix) Prepare a carminative powder consisting of Asa-foetida 30 gm, + Ginger 30 gm, + Nux vomica 10 gm, + Soda bi-carb 50 gms and rub on the tongue. This powder could be given twice or thrice a day (30 to 50 gm/time) for two to three days.

x) In acute cases, when the left flank is tightly extended, the animal is in a recumbent position, there is acute dyspnea, don't wait for the doctor to arrive. Take a sharp kitchen knife and take a bold cut on the skin for about two to five cms in length on middle site of the extended flank.

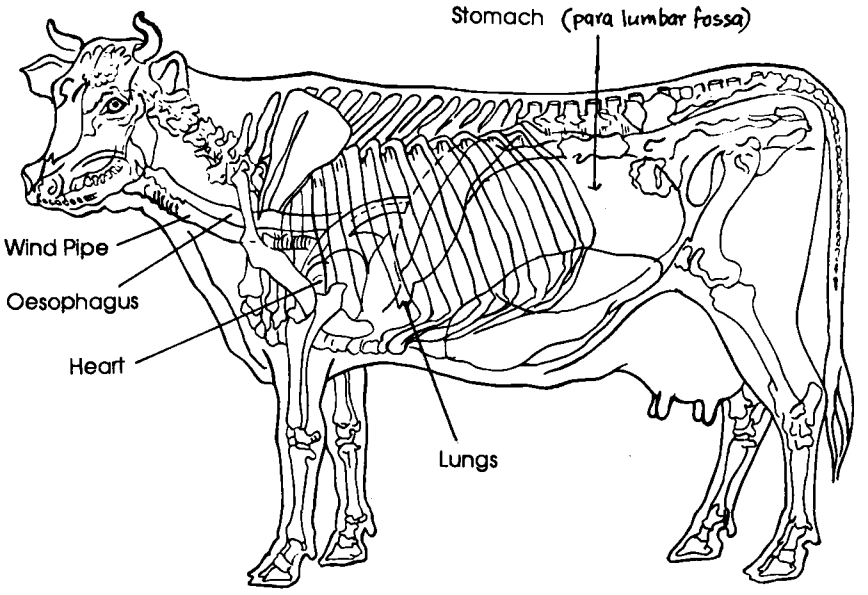
xi) Pierce it with full force in the rumen and relieve the pressure. Then call for the doctor. Do not worry about the wound.

2) Diarrhoea:-

Diarrhoea means loose dung or faeces. This is seen in all ages of animals, right from the first day of life of the animal till its old age; due to various and innumerable causes. Loose dung, with temperature, requires immediate attention, if there is diarrhoea due to indigestion it can be controlled in a day or two, in most of the cases.

A) **Diarrhoea in Calves:** already dealt in the section of calf care.

B) **Diarrhoea in Adult Cows:**



Internal Structure of a Cow

Symptoms: i) Abruptly starts passing watery dung, or

ii) Watery dung with some mucus, shreds of mucus membrane, or

iii) Watery dung with blood clots, or fresh blood.

iv) Animal may go off feed.

v) Milk yield will drop.

vi) In severe cases, the animal becomes very weak, unable to walk and stops rumination.

vii) In certain cases watery faeces carry a very bad (fetid) and abnormal odour.

viii) Loose and very coarse dung.

ix) Loose dung and high temperature.

Treatment: i) Don't offer any green fodder or concentrate mixture while animal is under treatment.

ii) Offer as much water with salt.

iii) Drench very slowly a mixture of following medicines.

Heavy Kaolin	100 gm	Once or twice a day along with one to two litres of buttermilk or warm water.
Pulv. Catechu	20 gm	
Creta Preparata	50 gm	

iv) If there is blood or mucus in the loose faeces, then add 30 gms (six to seven big tablets) sulphadimidine or 50 to 100 ml of Sulmet solution or eight to ten tablets of terramycin or steclin to the above mixture. All these antibiotics or antimicrobial medicines should be continued at least for three days even though symptoms of diarrhoea reduce after the first treatment.

v) In severe cases, supportive therapy is advocated. In milking/pregnant animals dextrose/normal saline etc. is to be given in large doses. Take the help of a doctor, in such cases.

3) Mastitis:-

It is a disease of the udder. When the udder is not properly washed and dried before milking; under unhygienic conditions of management the germs pass through the opening of the teat canal. If there are injuries or cracks to the teat skin, the germs pass through it. They attack milk-producing cells and destroy them.

Depending upon the virulence of the germs, their number and resistance of the animal (udder), the clinical symptoms are seen.

When severe, the udder gets hot, swollen and painful. The animal may have fever. In less severe cases, only the udder is swollen while the body is normal.

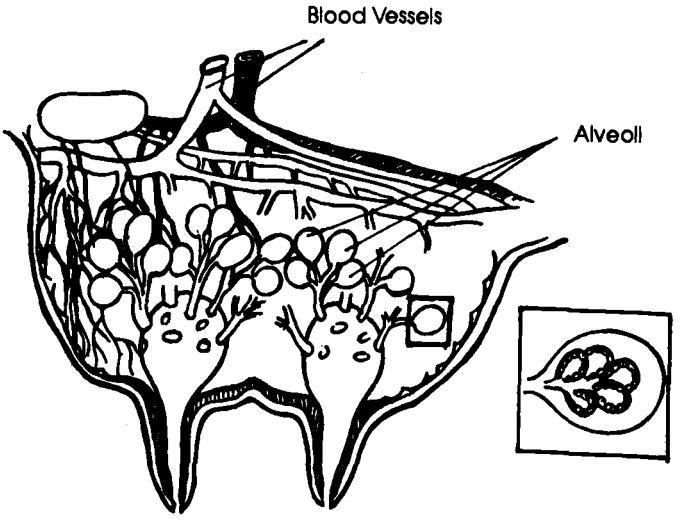
In any condition isolate the cow. Milk the affected quarter as frequently as possible. Collect this milk in a pot, put disinfectant in it and throw it away. (Do not milk the affected quarter on the ground).

Introduce ointment tube as per the advice of the doctor.

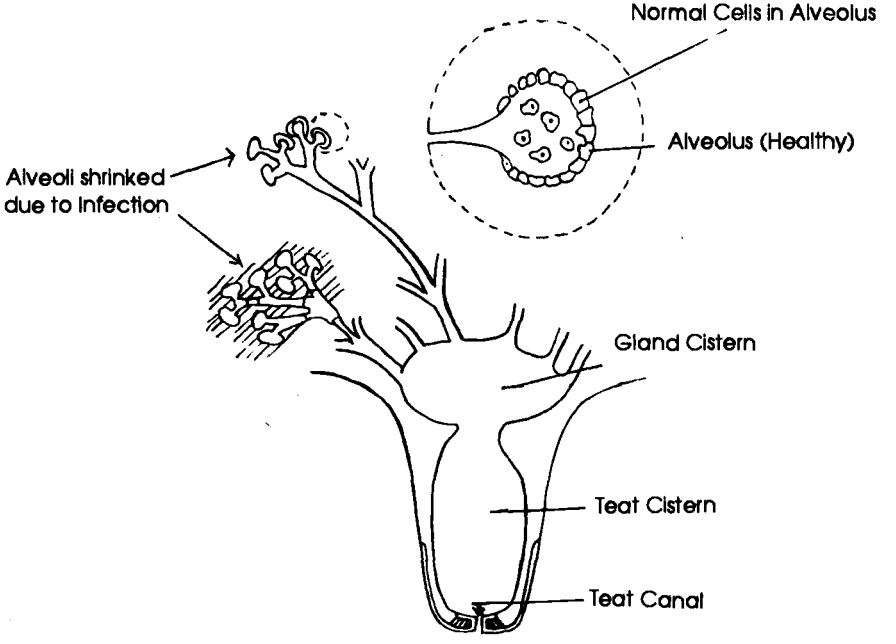
Remember — The udder tissue is as delicate as the eye. Take proper hygienic precautions every day. Follow correct procedure for proper milking.

4) Dry cow treatment:

When the cow goes dry, it is necessary to put antibiotic ointment inside the four teats, (after washing & drying the udder). Such an ointment is available in the market. This antibiotic ointment will take care of the udder during dry



Normal Udder



Diseased Udder

period. If this care is not taken it is likely that the animal may suffer from mastitis.

4) Wound Dressings:-

Different types of wounds are seen on an animal's body, due to various causes. Wound dressing is also an art. Before starting the dressing, a) it is necessary to ascertain the possible cause for it, see the type of wound b) dress it early: do not wait for dressing of the wound till it gets infested with lot of maggots. Maggot-infested wounds take more time to heal.

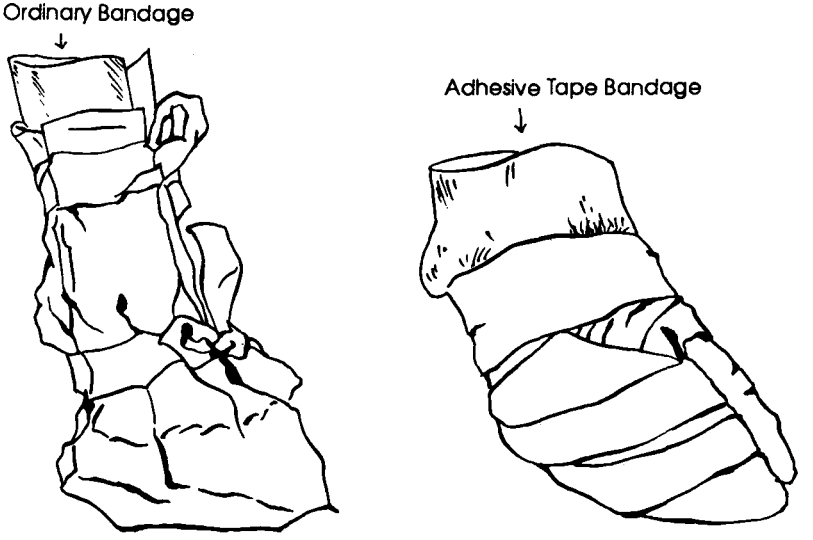
As far as possible, undertake dry powder dressing for bruised wounds.

For taking out deep-seated maggots in the wound — apply or insert a cotton swab of oil of turpentine first, remove it next day. We can see many maggots die out.

Clean the wound by any antiseptic lotion like potassium permanganate, savlon, Dettol, acriflavin, etc. While cleaning the wound - don't rub the wound side as it disturbs the healing process as well as destroys the fresh granulation tissue. The wound is to be mopped while cleaning. Protect the wound suitably.

Remember that Tr. Iodine does not stop the bleeding from the wound. For enhancing clotting of blood as well as stopping of blood oozing, use swab of Tr. Benzoine; or Turmeric powder, alum powder/or solution swabs. Sometimes tying Tourniquette above the wound may help to stop the bleeding. This is possible for the wound on leg, tail, umbilical cord, or teat etc.

a) **Wounds of hoof** (in the hoof cleft mostly): This wound gives a lot of pain to the animals if they are not taken care of properly and early. For dressing of these wounds, after cleaning with antiseptic lotions, use dry powder of salicylic acid and bandage the wound tightly. Always keep the animal on dry floor, if it is possible, apply coal tar on the bandage: don't open the bandage at least for four to five days. If that wound is badly bruised or is having pus, then antibiotic treatment is needed. This combined therapy will cure the wound earlier.



Bandaging of hooves

b) **Wounds of Horn**: Sometimes the core of the horn gets slipped off and profuse bleeding starts. At that time if wound is soiled, then mop the wound with antiseptic lotion, don't rub. Apply immediately turmeric powder with calcium carbonate, or cover the horn with a thin layer of cotton or clean strip of cloth and pour Tr. Benzoine on that and bandage tightly.

c) **Boils**: Sometimes at the site of vaccination or injections, some large hard swellings are seen — don't try to puncture it unless it becomes ripe or becomes soft. Apply iodine ointment by rubbing, give hot fomentation. When it is ripened, open it.

Insert a seton tape (of Tr. Iodine, Tr. Benzoine etc.) and block the hole, so that no flies will try to enter in the wound for laying eggs and thus avoids formation of maggots.

Antitetanus injections in cattle are not a must, as in horses, dogs or man. Cattle are least susceptible to Tetanus.

Chapter
13

WHY DISEASE OUTBREAK EVEN AFTER VACCINATION

Sometimes an outbreak of the disease occurs, even though the animals were vaccinated previously. In such situations, the dairy owner is worried as to why his animals should suffer from a disease despite proper vaccination.

Let us see the science behind vaccinations and immunity.

Nature has given 'resistance' to every animal body to fight diseases. 'Immunity' against disease is thus developed in the body for this purpose. There is a definite system for producing immune bodies. The organs like lymph-nodes, spleen and bone marrow take part in this production.

The immunity is of two types:

Non-specific and Specific

(I) **Non-specific immunity**:- This is a natural immunity — a common protective reaction of the body against any type of invasion. It does not fight against a specific foreign agent.

(II) **Specific**:- It is a specific reaction of the body to 'non-self' foreign agents. Immune bodies developed in this case react specifically against the invading agent.

When the animal body is attacked by bacteria or virus, the body tries to develop immune bodies (specific) — bodies or molecules of proteins which fight against foreign invading agents like bacteria or virus. When the quantity of immune bodies produced is enough, animals will overcome the disease. But if this quantity is inadequate, the animal will fall prey to the disease.

When we inject a vaccine in the animal body, we introduce either half-dead, inactive or killed organisms in the body. The body gets a stimulus, and starts preparing specific antibodies. When we vaccinate the animal regularly, the body system, which makes these antibodies is kept alert; with the result it is always ready to fight the disease.

However, preparation of these antibodies also depends upon:

(a) **Nutrition**: Animals receiving good nutrition produce good quantity of antibodies.

(b) **Stress**: Animals having less stress on the body produce more antibodies. Thus, production of more milk, advanced pregnancy or inclement weather/worms infestation are some stress factors that do not allow the animal body to produce sufficient quantity of antibodies.

(c) **Genetic Reasons**: It is also observed that under normal conditions even with all favourable factors (no stress on body, good nutrition) three to five percent animals do not produce enough antibodies. This is a normal fact owing to a genetic defect - of body system.

(d) **Vaccination**: Preparation of antibodies will also depend upon type of vaccine, its dose, its quality etc.

When you diagnose a disease in an animal after vaccination — check as under:

1) Whether this animal was definitely vaccinated or was missed-

2) Whether the dose of vaccine was adequate; whether the vaccine was stored properly, whether the cold chain was properly maintained-

3) Has the body system of the animal been kept alert by regular vaccinations?

When the answers to these questions are yes, then the body system is not preparing sufficient antibodies for (a) either there is body stress, (b) improper nutrition or (c) this animal probably belongs to that category of the above said genetically defective percentage of animals which do not respond adequately to the antigen (vaccine).

Amongst four major diseases, the vaccines against Rinderpest, Haemorrhagic Septicaemia, Blackquarter have powerful antigenic material. In other words, the vaccine made for prevention of these diseases contain active antigens. Therefore, a strong immunity for a definite period is developed. Thus if the above diseases are diagnosed even after vaccination, the most probable reason may be that either there has been improper storage or inadequate cold chain maintenance or improper method of vaccination.

In the case of Foot & Mouth disease, the situation is different. (a) It is not a powerful antigen, it is weak one. (b) It has varieties and sub-varieties of strains in the nature. Thus when we get an outbreak after vaccination, the fault is quite likely to be with the vaccine type, as well as with storage or vaccination lacunae.

When we vaccinate all the animals in the herd regularly without fail, against Foot & Mouth disease the body system is always kept alert. In this situation even though the quantity of the attacking germs (virus) is more the animal body will resist and at the most it may show minor symptoms. Regular vaccination, therefore, is always advisable.

To sum up:

1) Vaccinate all the animals regularly (primary, booster and repeat dose). The body will resist the disease, in 95 to 98% animals.

2) Avoid stress factors (worm load, other disease, other management factors).

3) After vaccination it takes three weeks to develop complete immunity. This fact should not be forgotten.

Finally, immuno-supressant factors e.g. worms, aflatoxin (a toxin produced by a fungus in the feed if present). Avoid them, otherwise even after proper and timely vaccinations we may not get adequate antibodies formed in the body.

Chapter
14

MANAGING THE DISEASE OUTBREAKS

It is likely that sometimes there may be an outbreak of the contagious disease. In such a condition, the veterinary department takes suitable measures to control the disease. However, a farmer should know what is to be done. He should not get disturbed.

(1) In the case of an outbreak inform immediately the local Government/Z.P. Veterinary doctor. Give him all the details of the symptoms observed, number of sick animals and number of animals dead; etc.

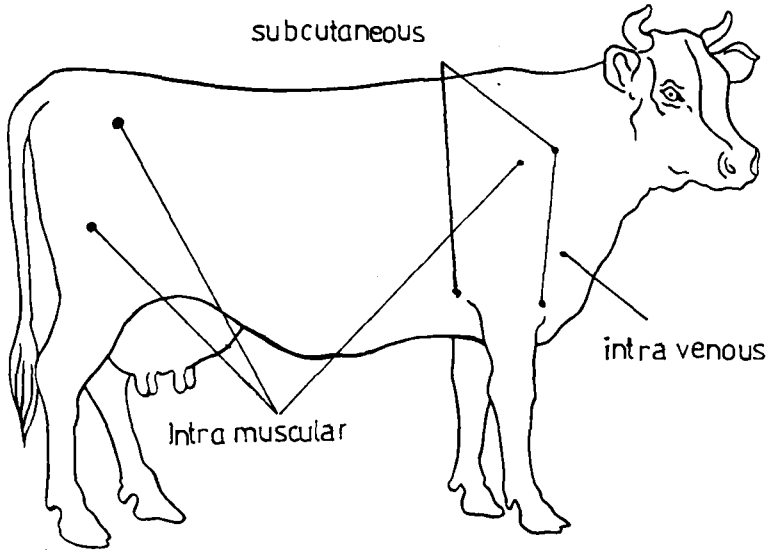
(2) Tie the sick animals away and arrange for their feeding and watering separately. Attendants looking after sick animals should not visit healthy animals.

(3) If any animal in the byre dies, do not dispose the body off. A veterinarian should be requested to have a post-mortem of this animal. (This applies to all cases except in cases of animals which have died of Anthrax). The veterinarian may collect certain material from the animal for laboratory diagnosis.

(4) Ask the veterinary doctor to treat the sick animals; if possible.

(5) Give all the information to the doctor (particularly if you have given any treatment earlier); cooperate with him for carrying out vaccinations in your area.

(6) Keep a daily watch on the animals to detect the spread of the desease.



Injection sites on the cow's body

Remember, controlling outbreak is a joint effort between the doctor and farmers and requires complete cooperation of the local people.

Vaccinations:-

In the face of an outbreak; vaccinations (against the particular disease) should be carried out from the peripheral villages; then in the villages immediately surrounding the affected village; and lastly in the affected village.

All these vaccinations are to be undertaken simultaneously. The principle behind carrying out vaccinations in the peripheral villages is that very few animals in this area are likely to be affected. Thus by vaccinating the healthy animals in this area a strong barrier is created against the further spread of the disease.

In the villages immediately surrounding the affected village, a few animals are expected to be sick. Thus protecting healthy animals in this area will also check the spread of the disease.

In the village where the outbreak occurs, protect the healthy animals. Those animals which do not have fever (check every animal and measure the fever by using a clinical thermometer) should be vaccinated.

The programme of vaccination must be carried out:

(a) using separate sterile needle for each animal;

(b) giving suitable adequate dose of vaccine;

(c) storing/transporting/reconstituting the vaccine and its diluents at appropriate temperature;

(d) covering every healthy animal;

(e) keeping all the required records;

(f) following all the instructions given by the doctor.

After carrying out all the instructions as suggested here the disease will be under control within 1 to 3 weeks time.

Chapter
15

DAILY ROUTINE OF A FARM

In order to gain good profit out of the dairy business, there should be certain checks — in the day-to-day routine observations. If these checks are made, the dairy unit can function smoothly.

In the daily routine, there are three major activities to be supervised.

1. Cleaning of Byre.
2. Feeding and watering of animals.
3. Milking of animals.

Other activities which require supervision once or twice a week will depend upon the size of the herd.

I. Cleaning of Byre:-

Collection of dung by hand in an iron basket and cleaning the floor by hard broom-should be practised twice a day. This should be done an hour before actual milking.

The disposal of dung should be done at least 80 to 100 feet away from the byre. The clean dung may be used for bio-gas, while dung mixed with other things like straw-fodder pieces may be used for compost.

At the time of cleaning of the byre, a close observation of dung/animal may give additional information — such as any discharge, colour and consistency of dung etc., particularly anything which may be abnormal.

Repair of cracks and crevices of the floor should be undertaken as soon as they are noticed, as these have direct relation to the injuries of the udder and feet.

Sprinkling of lime powder twice a month on the floor of the byre is advisable to check infection of udder (Mastitis).

The feeding troughs and mangers should also be cleaned along with the byre. While doing so, one can discern which animal has not eaten any feed/fodder.

Water troughs should be cleaned once a week and whitewash (lime-wash) should be given at least once in a month.

II. Feeding and Watering:-

Normally animals are given their quota of concentrates (separate or mixed with fodder) at the time of milking, while fodder is given round the day.

While feeding the concentrates, measured quantity should be given to each individual animal, based on age, milk yield, pregnancy etc. This quantity is normally divided in two parts and each half is given during the milking or twice a day. Since concentrate feeding is an important item, it is expected that the animal consumes it completely, (unless it is sick). For this purpose, the animal should not be given any fodder, at least an hour before milking.

Concentrate mixtures made at home by mixing different ingredients (except urea and molasses) can be fed by pre-soaking in water for four to twelve hours. Often it is completely mixed in water and is given in a liquid form.

Commercial concentrate mixtures should not be soaked, as they necessarily contain urea and molasses, and the taste and flavour change by soaking. While giving green fodder, the tied bunch should be loosened. It is preferable to chaff the fodder and straws before feeding.

While feeding baled hay, it is necessary to carefully untie the bale, keep away the wires, free the hay and

put it in the manger. (Alternatively, get the bales tied with plastic strings).

While feeding green grass separate weeds if any.

Watering of dairy animals should be strictly followed at specific time. Animals should be watered more number of times in summer (minimum four times) and two to three times a day in winter. The source of water should be assured, and it should be fresh-clean and in good quantity.

Every animal should be observed while drinking water. At times, some animals though they dip their mouth in the water, do not consume it, for various reasons. In such cases reason for not drinking should be found out and necessary remedies effected. The source of drinking water should not be far off (not beyond 250 feet). Otherwise animals will waste most of their energy in getting to the water. Old animals, lame animals, young stock and lactating animals should be given water in the byre.

III. Milking of Cows:-

Every dairy owner should be present at the time of milking. When individual cow record is kept for daily milk production, a slight variation in the yield gives indication of either change in the management or health. The milking timings should be observed strictly. The details for milking operations are given separately which should be followed.

IV. Other activities:-

A) Oestrous symptoms and breeding:-

It should be customary to observe the breeding stock thrice a day for timely detection of oestrous symptoms: a) in the evening b) late in the night c) early morning next day. Once the animal is detected to be in oestrous, the local veternarian should be contacted as early as possible. Artificial insemination with frozen semen from a 'Proven sire' should be insisted upon.

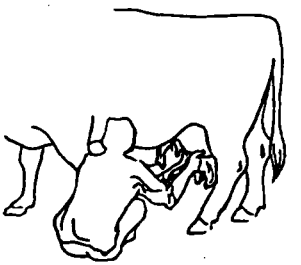
B) Preventive health cover:-

In preventive health cover, vaccinations should be carried out in proper season/time, with a proper dose. Records of all the vaccinations should be kept.

C) Grooming of cows (10 minutes/day/cow) will keep the body coat glossy. It reduces bacterial contamination of milk. It does not, however, increase the quantity of milk as some believe.

D) Animals which are confined to small yards need proper hoof-care. Trimming of the hooves once in four to six months in necessary. If proper care of hooves is not taken, animals may go lame. They also produce less milk for lack of proper hoof-care.

While washing the Udder massage it



Dry the Udder from the tip of teat upwards

Teat-dipping

Chapter
16

MILKING

Milking the cow is an art. Every member of the family must know milking. A dairy farmer should not depend upon hired hands.

The time for milking should be decided as to when and at what time the milk is to be supplied to the Society or to the customer. Once this time is fixed, try to keep to this time. Dairy animals are creatures of habit. Variation in the timings for milking will result in low production.

a. Clean the byre half an hour before milking. Keep the manger filled with feed/fodder.

b. Milkers should keep their nails trimmed and wash their hands.

c. Then wash the udder with lukewarm water. Better to add a few crystals of potassium permanganate in the water. While washing the udder massage it. (This will give a complete let down of fat).

d. Dry the udder with a clean, rough cloth. Drying is to be done from the tip of the teat upwards.

e. Now the teats will be turgid and the cow is ready to let down.

f. Milk the cow by gentle squeezing, as you remove the water from the sponge. It should be done quickly, completely and comfortably to the cow.

The whole milking operation must be finished within eight minutes, because during milking a hormone (oxytocin) is secreted by the brain of the cow which remains in blood circulation — only for eight minutes. This hormone makes the cow let down.

g. While milking the cow, do not press the teat by the thumb folded inside. The teats should be pressed by palm and the fingers.

There is no necessity to apply oil or ghee to the teat for milking.

A cow giving upto twelve litres of milk a day should be milked twice a day. A cow giving more than fifteen litres of milk a day should be milked thrice a day.

Cows giving more than 30 litres of milk a day should be milked three times a day by putting two milkers at a time. A good milker can milk eight to twelve litres in eight minutes.

h. A milker should be healthy. A person recently recovered from illness should not be allowed to milk the cow. (Milk is a good medium for transmission of germs).

i. Quietness or light music helps in letting down of milk.

j. If you have a more number of animals (more than 20) and all of them give good milk (more than 20 litres/day each), one can think of machine milking.

Machine milking requires 60 to 70 labour hours/cow/year. While hand-milking requires 130 labour hours/cow/year.

Remember these Tips:-

1. There should be equal time gap between two milkings as far as possible. If it could not be observed on a particular day i.e. scheduled milking time is not kept at the second milking, then milk high-yielding cows first and then other cows.

2. Everyday, while milking the animals, milk the animals in the following sequence:-

   a. Recent calvers

   b. Mid-lactation cows

   c. Late lactation cows

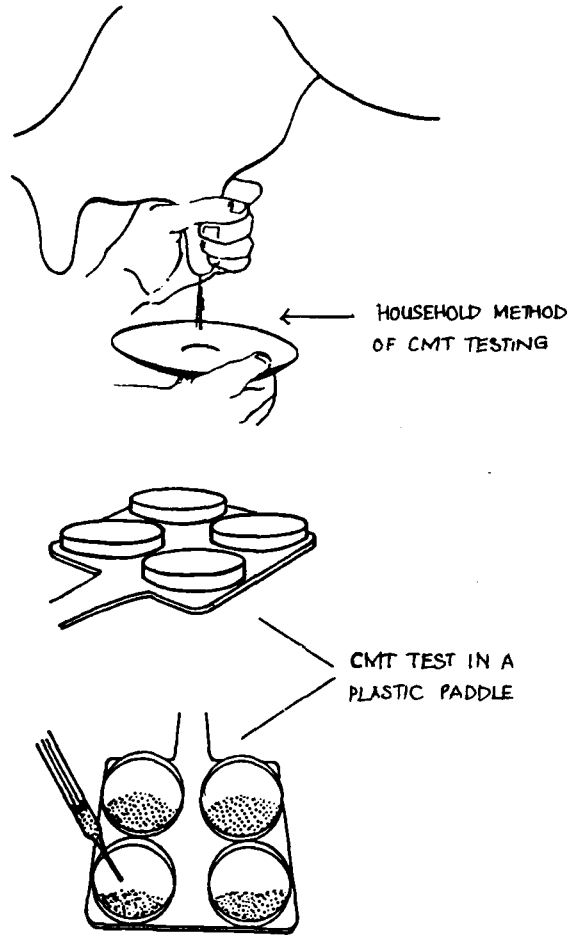
   d. Cows with Mastitis (one or more teats affected)

   Cows letting down earlier should be milked earlir than cows taking time for letting down.

3. After milking, dip all the four teats in a solution of Idophor Iodine (PIVIPOL).

4. Take immediate care of wounds, scratches on the teat or udder.

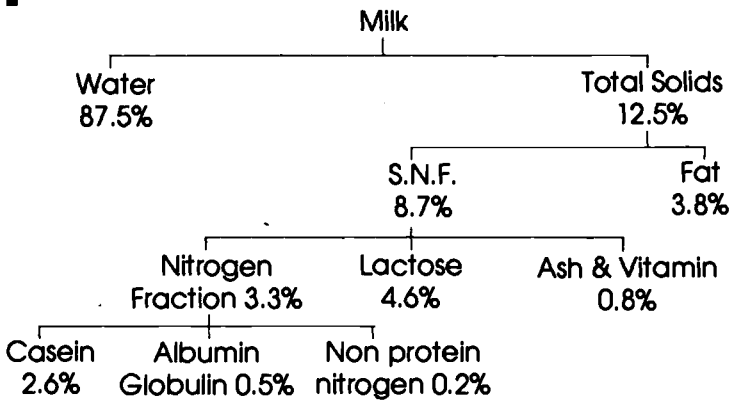
5. Have a practice of testing the milk of each cow from all four teats by California mastitis test reagent (M.D.R.of BAIF), twice a month. This will detect sub-clinical cases of mastitis early, and then timely measures can be taken (A farmer can undertake this test at his home, it is quite simple).



Chapter
17

COMPOSITION OF COW'S MILK

The average composition of cow's milk is as under:-



The quality of the milk depends upon its adequate composition. The total quantity of milk given and its fat percentage depends upon the genetic factor to the extent of 40%, while it depends upon management to 60% (feeding, environment and health).

(A) **Fat percentage**: It depends mainly upon breed. Jersey crossbreds give more fat in the milk. (Danish Jersey cows are capable of giving upto six to eight percent fat in milk).

(i) As the age of the animal advances, fat percentage falls at 0.3% per lactation.

(ii) Fat percentage is maximum in early period of lactation. Then it falls to the minimum at ten weeks, thereafter it again increases.

(iii) Fat percentage is inversely proportional to the quantity of milk given. Thus more the quantity of milk, less the fat percentage (dilution effect) and vice versa.

(iv) Fat percentage and Nutrition:

(a) Fibre percentage should be 16-18% (digestible crude fibre). It should be in a long form.

(b) If the total feed has 60:40 ratio for concentrate to roughage, the fat percentage reduces.

(c) Appetite of the cow must be satisfied.

(d) A diet with laxative effect will reduce fat. Certain feed ingredients (e.g. Pearl millet) reduce fat percentage.

(e) Good body condition at calving gives more fat in milk. Mastitis (sub-clinical) will reduce fat in milk. When udder is massaged before milking you can get more fat percentage.

(B) **Solids-not-fat (S.N.F.)**:- It varies from 8.5 to 9.5%

(a) In Jersey crosses it may be from 9 - 9.1% while in HF crosses it may be from 8.5 - 8.8%

(b) As the age advances, the S.N.F. percentage falls by 0.6% per lactation. First lactation S.N.F. is a good indication of the average.

(c) S.N.F. is maximum in early lactation. It falls to minimum at six weeks. Then again it increases. This drop is by 0.2% in early period.

(d) Energy in feed is important for getting appropriate S.N.F. When protein percentage is low, there is limited rumen fermentation and the S.N.F. is low.

(e) Poorer the condition of the animal, lower is the S.N.F.

If the cow is pregnant, then protein and S.N.F. levels start rising again during the middle of the sixth month of lactation.

(C) **Lactose**:- Percentage reduces as the age of the cow advances. The total protein percentage remains the same throughout the life.

Protein is maximum in early lactation, then falls to minimum by the sixth week.

Lactose is low in the colostrum, then it doubles by the end of the first week, it remains steady upto five to six months and then declines.

(D) Feeding has no effect on quantity or composition of milk ash. It is mainly governed by genetics. Even in extreme deficiencies, no change in calcium content is seen.

The mineral contents of milk are as under:-

Calcium	- 1.1 to 1.2 gms/lit.
Phosphorus	- 0.6 to 0.9 gms/lit.
Magnesium	- 75 to 130 gms/lit.
Potassium	- 1.5 to 1.9 gms/lit.
Sodium	- 0.5 gms/lit.
Chloride	- 1.12 to 1.76 gms/lit.
Sulphur	- 0.2 to 0.4 gms/lit.
Silicon	- 3 to 15 mcg/lit.
Iron	- 0.5 mg/lit.
Cobalt	- 1 mcg/lit.
Nickel	- 0 to 25 mcg/lit.
Copper	- 0 to 0.1 mg/lit.
Zinc	- 3 to 4 mg/lit.
Boron	- 0.1 to 0.2 mg/lit.
Aluminium	- 0.5 mg/lit.
Lead	- 40 mcg/lit.
Arsenic	- 30 mcg/lit.
Chromium	- 15 mcg/lit.
Selenium	- 5 to 67 mcg/lit.
Molybdenum	- 100 mg/lit.
Manganese	- 100 mg/lit.
Fluorine	- 0.1 mg/lit.
Bromine	- 0.06 to 2 mg/lit.
Iodine	- 40 to 70 mcg/lit.,

Vitamins

Carotene	- 300 microgrammes/litre
Vit.A	- 300 microgrammes/litre

Major Fatty acids

Butyrivc	- 3.2%
Caproic	- 2.1%
Caprylic	- 1.2%
Capric	- 2.6%
Decinoic	- 0.3%
Lauric	- 2.8%
Myristic	- 11.9%
Palmitic	- 30.6%
Stearic	- 10.1%
Oleic	- 27.4%
Linoleic	- 1.5%
Linolenic	- 0.6%

Milk fat is primarily of Triglycerides (about 95%) and small amounts of fatty acids — Cholesterol, and other substances.

Approximately one half of the milk fat is synthesised in the mammary gland from Acetic and Butric acids out of ruminal fermentation of feedstuffs.

Other portion of milk fat originates from either dietary fats or body fat stores. These two sources contribute longer chain fatty acids, which are incorporated directly into milk fat.

Chapter
18

PRESERVATION, STORAGE AND TRANSPORT OF MILK

Milk being a perishable comodity, it is necessary to keep it clean so that it can be preserved for a long time.

Every dairy farmer should be familiar with clean milk production, its preservation, storage and transport. This will maintain the quality of the milk and will fetch him a good rate.

1) Clean milk production begins from the milking operation of the cow. It starts from the care and cleanliness of the udder. This helps in getting clean milk.

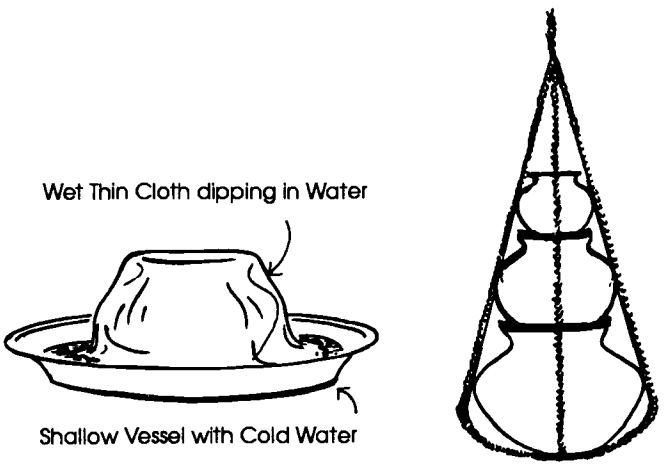
2) After getting the milk from the udder, it should be strained through either four-fold muslin cloth or nylon strainer of the same fineness of mesh.

3) Clean all the vessels in which milkers keep the milk (buckets), store the milk (cans, pots) and transport the milk (cans) every day, every time after its use, with good quality washing soda and warm water. Then these vessels should be rinsed in cold water twice/thrice. Thereafter these vessels should be inverted for drying on a draining board in such a way, so as to have free circulation of air in them. If free circulation of air is not allowed, the vessels will be tainted. (They will give bad odour).

4) Shining vessels without any dent or depression and having even and smooth surface are more hygienic.

5) The room where milk is kept in cans or vessels should be airy and should be used exclusively for this purpose.

6) When such a room is painted or sprayed with insecticides, open all the doors, windows, and do not keep milk in



Keeping Milk Cool (Household Method)

this room for at least 24 to 48 hours. Remember that milk absorbs any obnoxious smell quickly.

7) When cows accidentally eat onion, garlic, cabbage or raddish, the odour is passed on to the milk within 20 to 30 minutes. Do not allow the cows to consume them. In case they do, bring these animals outside in the open so that they will have free respiration. This helps in reducing the smell from the body and milk.

Certain variety of green grass, or silage can also taint the milk. So do not feed such fodder at least four hours before milking.

8) If the drinking water contains more of iron or sulphur, it may taint the milk.

9) Milk, when removed from the udder has its temperature equal to the temperature of the body of the cow, i.e. 38^{0}C. This temperature is favourable for the growth of bacteria in the milk. (Milk is a good medium for bacteria to grow). It is therefore necessary to cool the milk within one to two hours from its removal from the udder. The milk should be cooled below 10^{0}C (four to eight ^{0}C). Such milk can be kept for 24 hrs.

10) When small tanks (constructed in bricks and cement) are made, milk cans can be kept in cool water with ice in such tanks. This will keep the milk cool for over 24 to 30 hrs.

In the household methods, a vessel containing milk should be completely covered with a thin muslin cloth, which is wet, and this vessel should be kept in a shallow pan to which cool water is added. The cloth covering the vessel should be diped in the water, so that by capillary action this cloth will remain wet. When such a vessel is kept under the shade in an airy place, it will preserve the milk for 24 hrs.

It is observed that for cooling three litres of milk (from 38°C to four to eight °C) it requires at least one kg of ice.

Nowadays cold milk is packed in plastic bags, and such bags are stored in a refrigerator. Such milk can be kept for a period of one to two days.

11) Milk should not be stored in copper vessels, as it may spoil the milk.

Transport of milk:-

A man can, as a head load, carry 15 to 25 litres of milk in a vessel/or in cans locally made. However, the distance to carry such milk on head should not be more than six kms.

A man can carry on a bicycle in cans, about 60-80 litres of milk. However, the distance to carry such milk should not be more than ten to twelve kms.

On a motor-cycle, a man can carry 100 to 150 litres of milk in different vessels. The distance travelled by such means should not be more than 30-50 kms.

A three wheeler tempo can carry 600 litres of milk, a four wheeler can carry 1,000 to 1,200 litres of milk, while in a truck (five tonnes) in larger milk can we can transport 3,600 litres of milk. A larger truck (ten tonnes) can transport 4,680 litres of milk in milk cans.

The mode of transport involves certain cost. The cost involved in transport of milk should not be more than five to eight paise per litre.

The transporting operations should always be carried out during the cool hours of the day (evening to next day morning). The milk, when cooled upto 2 to 4°C can be transported in milk tankers (specially made which can keep the milk upto 8°C) and thus carried over a distance of 300 to 400 kms.

Remember:-

(1) At room temperature upto 30°C, the milk may not get spoilt for initial three to four hours. Thereafter it must be either boiled and cooled upto 4°C. After boiling, milk can remain in good condition for six to eight hours. Thereafter it needs to be boiled again. Different temperatures (of milk) at which milk can be preserved are as under:

At seven °C	it can remain good for		24 hours
At ten °C	"	"	20 hrs.
At 15°C	"	"	16 hrs.
At 20°C	"	"	10 hrs.
At 25°C	"	"	Six/seven hrs.
At 30°C	"	"	four hrs.

Chapter
19

TRANSPORT OF ANIMALS

At times dairy animals are required to be transported from one place to another. For a short distance, transport by road either in a four-wheeler tempo or a truck is convenient. This distance can be upto 300-400 kms. For longer distances, transport by trains is economic, and safe.

While transporting the cows by truck or tempo, observe following guidelines:-

(1) Clean the interior of the truck or tempo. Spray disinfectant one to two hours before loading the animals.

(2) Transport the animals during the cool hours of the day (seven p.m. to seven a.m. next day).

(3) Spread straw in the vehicle, as bedding for the cows. Pack some straw in gunnybags and tie these on the sides of the truck. This will act as cushions.

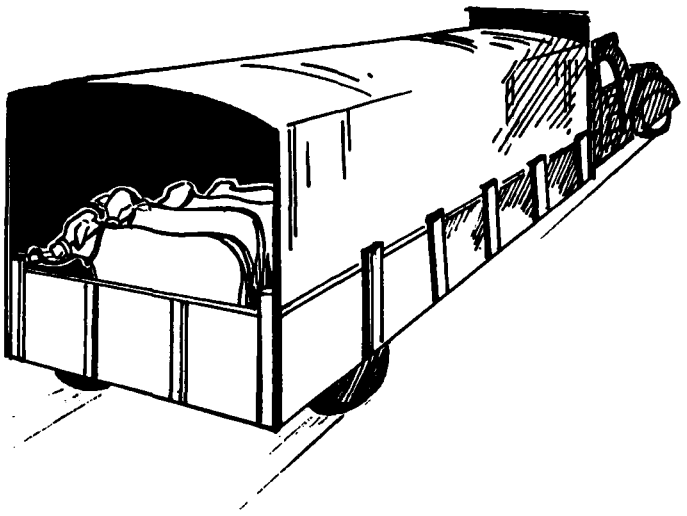
(4) Tie the cows parallel to each other, facing left (at right angles to the truck). Tie a rope between two cows.

(5) In a truck do not load more than five to seven large cows. In a tempo two to four may be loaded, depending upon its size.

Keep one farm-hand (labour) with the cows in the backside of the truck.

(6) Water the animals half an hour or an hour before loading. Give dry fodder to the cows in transport. Do not give them green fodder.

(7) The speed of the truck/tempo should not exceed 30 to 35 kms/hour.



Transportation of Animals

After every two hours, stop the vehicle for 15 to 20 minutes.

(8) The following should be carried:

(a) Buckets (minimum two) (b) Ropes (c) Torch (d) Knife/scissors (e) Tincture Iodine (f) Dry fodder (g) Relevant documents

(9) Cows need assistance during loading and unloading. One should be calm, quiet and gentle with the animals.

(10) After unloading the animals, do not give them water for half an hour. Give them only dry fodder.

(11) Normally after transportation, cows adapt themselves to the new environment in a day or two. However, if you find the animal to be dull and not eating, even later; contact your veterinarian.

(12) Take extra care of pregnant animals and those recently calved while transporting.

(13) Among the important documents which must accompany the truck carrying animals is the certificate as under on the letterhead of the purchasing party.

This is to certify that the animals (crossbred) carried in this vehicle (Truck No.) is the personal property of the.... (put the name of the owner or farm) and they are carried from.... (give name of the place) to.... (name of the place). They are not for sale.

A date and signature should be under the certificate of the purchasing party.

The truck should have animal transport licence.

During the interstate transport, along with the above certificate, a vaccination certificate from a veterinary doctor is required. It should state as under:-

This is to certify that I have vaccinated following animal/s (whose description is herein under) against.... (name of the disease).... on (vaccination date) by using.... (name of vaccine.... its batch number, date of manufacture and dose).

This should be signed by a veterinarian with a stamp of his designation. The description of the animal should include (for every animal), colour, sex, age, height (highest point at withers) and other marks (coloured patches on body, tail, its switch). See annexure for animal identification.

Chapter
20

ECONOMICS OF CROSSBRED COWS

In order to assess the technical and economic feasibility of a dairy farm, certain aspects must be kept in view irrespective of whether it is a small unit or a big unit. Otherwise, we cannot know whether we are facing a profit or a loss.

The assessment pointers are:-

(A) **Milk Yield**: It is experienced that unless a cow gives minimum 1,800 litres of milk per lactation, she will be uneconomical. If she gives more than 2,200 litres in one lactation, she can give profit.

(B) **Lactation Period**: A lactation period should be at least 240-280 days.

(C) **Inter-calving Period**: The inter-calving period should be between 360-400 days.

(D) **Service Period**: The service period should be between 60 to 90 days (maximum 110 days).

(E) **Feed Cost**: The most important component in expenditure is feed and fodder. It is well-known and an established fact that if greens are available, ad lib, the expenditure on feed will be minimised. Feeding of agricultural waste, non-traditional feeds will also help in minimizing the feed cost.

However, under any circumstances, the total cost on feed and fodder should not be more than 65 to 70% of the income through sale of milk.

(F) **Disease Control**: When animals are bred for high milk production, the production stress makes animals more vulnerable to diseases. Regular vaccination against

contagious diseases and deworming helps to maintain normal health of the animals.

Checking every cow with a simple test for mastitis (C.M.T.) once a fortnight definitely helps to control the disease 'Mastitis' of the animal. This will save loss of milk. (Farmer can do this test himself)

Under good management conditions, a farmer and his family can look after at least three cows. For bigger commercial units, hired labour is required for either eight to ten adult animals, or 20-25 calves (upto six months age) or 15 to 20 adult calves (six to 18 months age).

It is generally felt that an economic dairy farm could be a part of mixed farming complex. The foundation stock should be of good crossbred cows. Animals of 50 to 75% exotic blood level appear to be good for better adaptability and production.

While calculating profit and loss in milk production the basic dairy animal is more important. A cow with less than 1,800 litres of milk yield per lactation will not give any profit. A cow giving 2,200 to 2,400 litres yield with an inter-calving period of 360 to 400 days is thus needed.

Once the capital expenses are met on land, cow-shed, cows and equipment, one should be vigilant on recurring expenditure particularly on feed, fodder, labour, breeding and veterinary cost and miscellaneous expenses.

Good record-keeping helps in knowing the expenses on different items. This will help to keep check on extra, unwanted expenditure.

Rearing home-grown heifers is more economical than purchasing milking animals.

Marketing should assure sale of milk round the year. Market should also be available for sale of surplus livestock. It is advisable to insure the animals till the dairy owner understands the management of these animals.

Considering the above points, economics of a cow is worked out as below:

Assumptions:-

(1)	A cow giving eight litres of milk per day, i.e. 2,400 litre in one lactation (after feeding the calf)	
(2)	The price of the cow is	Rs. 5,000
(3)	The inter-calving period is for	400 days
(4)	The cost of concentrate is	Rs. 2 per kg
(5)	Cost of dry fodder at	Re. 0.60 per kg
(6)	Cost of green fodder at	Re. 0.30 per kg
(7)	Sale price of milk at	Rs. 4 per litre

(I) Expenditure:-

	Rs. Ps.
(1) Concentrates at 50% of total yield 1,200 kgs. + 100 kgs. additional to be fed in advance pregnancy i.e. in the last two months; thus 1,300 kgs. total at Rs.2 /kg.	2,600.00
(2) 400 days dry fodder at 5 kg per day 400 x 5 = 2,000 kgs.at 0.60 paise per kg.	1,200.00
(3) 400 days green fodder at 15 kgs. per day 400x15=6,000 kgs. at 0.30 paise per kg.	1,800.00
(4) Depreciation at 20% per year	1,000.00
(5) Interest at 12% per year	600.00
(6) Insurance at 5% per year	250.00
(7) Veterinary cost Vaccinations, Tick control, Dry cow treatment (Rs.10 + Rs.8 + Rs.25 respectively)	100.00
	7,550.00

(II) Income:-

(1) Milk 2,400 litres at Rs.4/litre	9,600.00
(2) Calf at the age of two months	200.00
(3) Dung at 10 kgs. per day 400x10=4000 kgs. when converted in compost manure at 60% will be available, which will fetch	300.00
	10,100.00

Income - Expenditure = Profit

10,100.00 - 7,550.00 = Rs.2,550.00 net profit in 400 days.

If the above prices and assumptions are constant except the sale price of the milk, the profit will vary as under

Sale price of milk	Profit obtainable
@ Rs.3.00/litre	150.00
@ Rs.3.25/litre	750.00
@ Rs.3.75/litre	1,950.00
@ Rs.4.00/litre	2,550.00

Chapter
21

CULLING OF THE COWS

In order to maintain economy and feasibility of the dairy unit, it is necessary to cull unprofitable animals every year. As we do weeding in agricultural operations in order to keep the field clean, we have to undertake culling of the unprofitable animals in the dairy herds.

This culling is to be done on the basis of problems in the herd as under: Culled animals are either sold out or sent to Panjrapoles.

(a) Any cow having service period of more than 150 days needs to be thoroughly checked/examined by a competent veterinarian. If such cow is declared as unfit, it should be culled.

(b) A cow requiring more than three inseminations should be checked by a veterinarian and suitable treatment should be undertaken. However, if such a cow does not settle down with one or two inseminations, even after the treatment or changed managerial practices, it should be culled.

(c) A cow having a chronic contagious disease like Tuberculosis, Brucellosis, Johnes; should be culled. Take the advice of your veterinarian from time to time.

(d) A cow giving 30% less milk than the average of the herd should be culled.

(e) If the lactation period of a cow is less than eight months, such a cow should be culled.

(f) A cow having chronic Mastitis, with two teats gone, should be culled.

(g) A cow having trouble of repeated prolapse of vagina; or if a problem case for retention of placenta or calving problem (Dystocia) should be culled.

(h) Cows which have temperamentally aggressive nature, or are very timid, or hard milkers, should be culled.

(i) Aged, non-lactating cows should be culled. (Cows over eight years age).

Before culling the cow consider the following:-

(1) whether it is possible for you to get a replacement.

(2) whether you are going to get any profit after removing this cow.

(3) whether the cow purchased as a replacement for this culled cow is profitable.

Chapter
22

MANAGEMENT OF COWS IN HOT CLIMATE

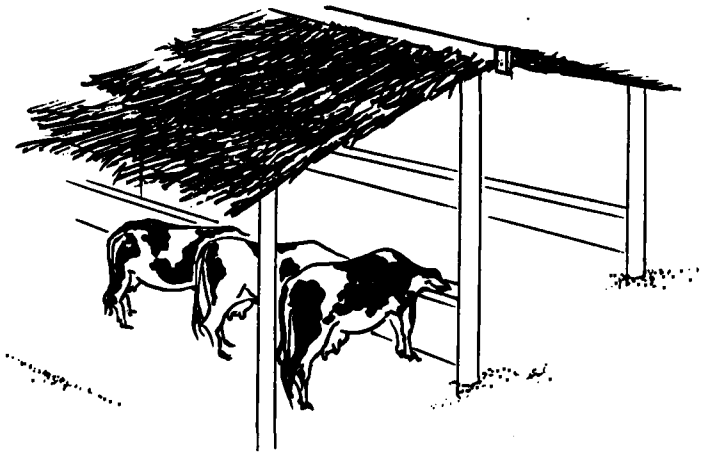
Ideal temperature for production by animals is supposed to be between 13°C to 18°C. Change in this temperature (either on higher or lower side) brings about discomfort and lower production.

One should not forget that, by nature body tries to keep its temperature within the normal physiological limits. This is one of the important conditions of the body for survival. In milch animals, more heat is generated in the body. When the atmospheric temperature increases, this heat stress is counteracted by increasing heat loss through evaporation, and by decreasing heat production through lowered metabolic rate; by body. It results in lower production.

In order to maintain the production level of the animal, we can, through appropriate systems of management, help the animal.

As the atmospheric temperature exceeds animal body temperature (37 to 38°C), the loss of heat by the body by conduction, convection and by evaporation stops. The only way to cool the body, by nature, is through increased respiration. The animal tries to breathe hurriedly ('panting'). These respirations may be as high as 200 per minute in large animals. Such panting is observed more in the animals having exotic blood level of 75% or more. The time for panting is usually seen to be from ten a.m. to five p.m.

The animal tries to reduce its metabolic heat. Its food intake is reduced. When the body cannot dissipate the entire heat, the body temperature rises. 1°C rise in body tempera-



Thatching of roof

ture represents storage of 410 kcal of heat to be disposed. The rumen contractions are lowered, there is a gut fill, thus the appetite is reduced.

Following management practices are suggested; in hot climate.

1) Animals should be tied under shady trees. Animals produce better under such conditions, than when having fans in sheds.

2) The roof of the sheds should be ten to twelve feet high.

3) Thatching of roof (straw, leaves etc.), sprinkling of water on the roof helps to lower the temperature of the shed.

4) Clipping of body coat helps in dissipation of heat.

5) Supply of cold drinking water (10 to 12°C) in abundant quantity helps to cool the body.

6) Giving cold water bath, at times ice cold water enema, helps to bring down the body temperature.

7) Adequate level of vitamin A in the body helps better heat tolerance. When sufficient green fodder is not

available, one can give vitamin 'A' in powder form @ one gram/day/animal for eight to ten days in a month in the summer.

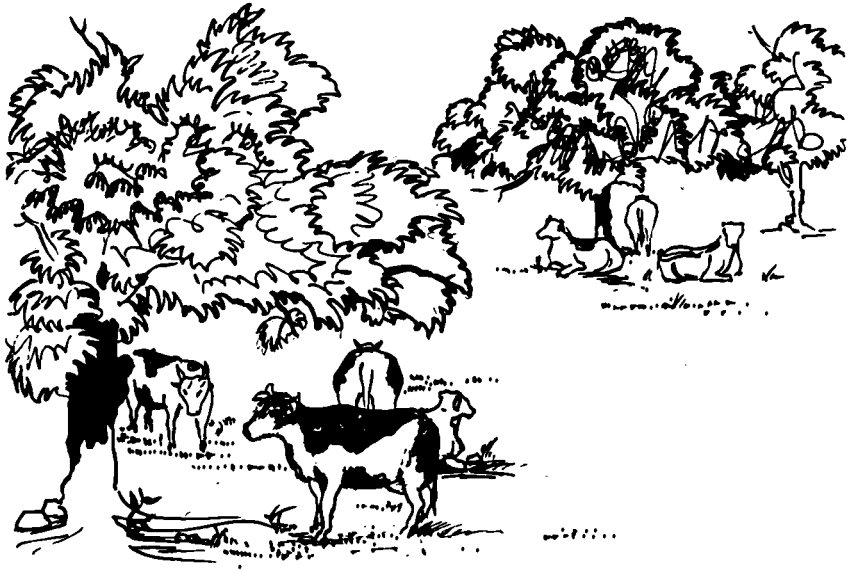
8) In hot climate, the need for potassium salt increases, so the animal may be given potassium chloride orally, as per the advice of the veterinarian.

9) Dry fodder should be given in the night (as it creates more metabolic heat).

10) Breed the animals from those sires (bulls) which have better heat tolerance.

11) Dark-coloured animals are more heat tolerant.

12) So long as the animal gives expected amount of milk, forget its raised body temperature or panting.



Chapter
23

RECORD-KEEPING

Record-keeping helps to assess the loss and profit position of the farm. It helps in knowing the quality of the dairy animals, besides evaluation of assets. This record-keeping should be a regular feature.

The record to be kept should have a simple, easily understandable format. Besides, it should give complete information.

Dairy records are grouped as under:-

I) Animal census records

II) Milk records

III) Breeding records

IV) Health records

V) Feed records.

The details of each group are:-

IA) Animal census records (only for large herds and not for individual farmer).

a) Whatever the number (age/breed) of animals may be on the farm; they must be identified by tattooing, tagging, photographs etc.

b) No animal on the farm should go without identification. (Tattoo, tag - with or without photograph).

c) The verification of the complete livestock should be done twice a year physically.

Cattle Roll Register:- This register keeps complete information of the animals on the farm.

Its proforma should be as under:

Sr. no.	Animal tattoo no. (and name if any)	Farm-born or purchased (put date & price if purchased)	Birth-date (if home born)	Disposal sold died trans-fered (to other farm)

On each page of this register put month and year:

This register should be updated every month. The calving register (calf born register), Death register, Sale registers when maintained separately should be used for verification and cross check.

IB) **Death Register**: The register keeps record of dead animals.

It should have the following columns:

Sr. No.	Month & date	Tattoo No. of animal	Age, M/F	Home -born Purch-ased	Probable cause of death	Disposal of carcass

IIA) **Milk Record**: It gives information about daily milk produced and also milk disposal.

The register maintained for this purpose should have following columns:

Daily Milk Register

Sr. No.	Tattoo No. of cow	Date A.I.	Date calved	Total milk (upto date)	Today's milk (kgs) Date M N E	Monthly Total kgs	Cumulative Total kgs

M-Morning; N-Noon; E-Evening (At least Ten days yield should be on one page).

IIB) **Register of Milk Disposal**:

Date	Total milk Lts./Kgs.	Fed to calves Lts./Kgs.	Sold Lts./Kgs.	Spoiled Lts./Kgs.	Spilt/error Lts./Kgs.

While measuring the milk, it is weighed on spring balance. However while selling and feeding to calves it is measured in litres.

While distributing the milk by measure, there could be an error. This is mainly because of spilling of milk. This error will depend upon number of times the measure is used, and its method of use. the total error should be within permissible limits (one to three percent)

III) **Breeding Records**:-

It gives information on status of breeding for each cow in the herd. One can have cow cards for individual cows. The columns are as under.

(A) **A.I. Register**:-

Tattoo No. of cow	Lactation number	Last date of calving	—A.I.— I Dt/ Sire	II Dt/ Sire	III Dt/ Sire	— P.D. Result — I	II	III

Calving particulars:-

Dt.	calf No.	Tattoo No.	

(B) **Calving Register**:-

Sr. No.	Animal tattoo No.	Date of calving	Order of Lactation	Gestation period (in days)	Details of calf Sex Wt. Sire No.	Calving difficulty Remarks

IV) **Health Record**:-

It gives complete information of the herd on the following:

A) Vaccinations
B) Testing (T.B., J.D., Brucella)
C) Mastitis (routine C.M.T. testing)
D) Haemogram/urine/stools exam/lab tests
E) Post-mortem reports.

A) 1. Vaccination Register

The register should have following columns:

Sr. No.	Tattoo No. of cow	Date of vaccination (& time & dose)	Disease against which vacci-nated	Source of vacc-ine	Batch of vacc-ine	Signature of vacc-inator

B) **2. Vaccine Register**

On big farms, the information of the vaccine is required to be kept as under:-

Sr. No.	Name of vaccine	Type of vaccine	Manuf-acturer & batch No of vaccine (with date of expiry)	Source from where obtained and date	How it was brought and stored	Date of use

B1) Testing - Information for testing of the animals, for Tuber-culosis - Johnes and Brucellosis should be maintained in two ways.

One sheet should give information of all the animals tested; as under:

Sr. No.	Tattoo No.	Date of test	Initial thickness of skin	Skin thickness after 48-72 hrs.	Other sypts.	Result Pos./Neg.

B2) On the other sheet total information should be given

Date of Test	T.B./J.D.	No.of animals tested	Positive/Negative	Doubtful

Above information can be kept for T.B. and J.D. (seperately or together)

B3) For Brucellosis:- A sheet should give information for all the animals tested on one day. It should have columns as under:

Sr.	Tattoo No.	Date of testing	——Plate Test—— coloured antigen	Rose Bengal antigen

On other sheet a total information may be given as under:-

Date of test	C.A./R.B.	No.of animals tested	No.of animals positive

Animals positive for plate test should be put for tube-test and the titre of each animal be written. (titre = extent of disease in percentage).

C1) Routine C.M.T. testing (Califomia Mastitis Test).

Once in 15 days all the animals in milk should be tested for sub-clinical mastitis.

A sheet should give information of the total No.of animals tested. It should have the columns as under:

Sr.No.	Tattoo No.	Date of calving	Date of test L.F. L.H. R.F. R.H.	Remarks

Under each teat, after testing results are given in +++ or ++++.

L.H. - Left hind teat

R.H. - Right hind teat

R.F. - Right fore teat

L.F. - Left fore teat

This should be taken for the animals in milk 15 days after calving till 210 days in milk. Otherwise it may give false positive result.

D&E) Health records:- These reports as and when obtained from the diagnostic laboratories should be filed separately (Blood/urine/stools report and post mortem report).

VA) **Feed Records**:-

Total quantity of concentrates purchased: its price; fodder purchased, minerals given should be accounted.

Farm produce/purchased with cost should be mentioned against each variety.

Disposal of concentrates per day should also be recorded.

VB) Book-keeping:- Showing expenditure on purchases and receipts - (due to sale of milk or livestock, scrap and sundry). Depreciation and appreciation should be indicated in this account book.

HISTORY SHEET

Name of the Cow_____ Si e_____ Name_____

Date of Birth_____

Breed and Grade_____

Dams Yield	Lact I	Lact II	Lact III	Lact IV

Breed _____ Grade_____

Dam _____

Lact I	Lact II	Lact III	Lact IV

A.I.1	A.I.2	A.I.3	Date of Calving	Birth Wt	Male/ Female

Lact No.	Milk Yield 100 DAYS	Milk Yield 200 DAYS	Milk Yield TOTAL

Chapter
24

EVALUATION: AT DAIRY AND VILLAGE LEVEL

In commercial dairy herds when appropriate records are maintained, it is advisable to evaluate individual animal once in a year.

Animals which do not come upto expectations — for breeding and production of milk — should be culled out. (sold or sent to Panjrapole).

For an area also where crossbreeding work is undertaken, an estimation of milk production can be worked out (it is given separately).

Following principles are suggested for evaluating the dairy herd. (Individual commercial herd)

(1) At any given time 80% of the cows should be in milk, 20% should be dry but pregnant. Out of 80 in milk, 70-80% should be pregnant.

(2) The average lactation period of all the cows should be 280-300 days.

(3) Dry period should be
50 days minimum
80 days maximum
80% cows could have a dry period of 55-60 days
20% cows may have a dry period of 70-80 days.

(4) After calving, cows should conceive within 80 to 90 days (maximum 120 days) — so that inter-calving period will be between 360 to 400 days.

80% cows should conceive in 80-90 days;

10% cows may conceive in 100-110 days;

Five percent cows may conceive in 120 days

Five percent cows may conceive in 120-140 days.

(5) Total 30-35% of the cows should be first calvers.

35-40% of the cows should be in their second to fourth lactation.

15-20% of the cows: from fifth - sixth lactation

Five percent of the cows should have more than six lactations.

(6) Average milk given by the first calvers should be 75% of the herd average. In the second lactation cow should give 85% of average.

For example:- If average yield per day/cow (in total herd) is 20 litres, then the first calver should give 15 litres/day.

(7) Cows having good consistency should be given preference over peak yielders.

(8) When cows are bred by Artificial Insemination:

70% cows should conceive in two inseminations;

20% cows may require three inseminations — per conception;

Five percent cows may need four inseminations per conception;

Five percent cows may need more than four inseminations.

(9) There should not be a single death due to contagious disease.

(10) Mortality and abortions should be within range as below (in crossbreds)

(a) 3-5% Abortions (but none from contagious type)

(b) 5-7% Mortality in calves upto four months age

2-3% Mortality in calves over four months age

1-3% Mortality in Adults.

(c) Heifers not coming up in appropriate growth rate: Three to five percent only.

(11) Male female ratio 50:50

(12) From No. 1,10, & 11 above, it can be said that in a herd of total 100 cows, ideally.

80 will remain pregnant (Cows may be in milk)

- 4 @ 5% abortions

76 will calve normally

- 6 at 7% mortality of calves

70 calves will survive

- 4 At 5% calves do not grow properly

66 Healthy calves available of which 33 will be males and 33 will be females.

Thus we can expect 30 to 33 heifers as a replacement stock available out of 100 breedable cows.

(13) Every year the average yield of the herd should increase by 10-15%

This can be achieved by:

(a) Using better quality bull semen.

(b) Improving management.

(14) In a herd of 100 milking cows

(a) when all 400 teats are functioning — Best udder health status

(b) when 390-395 teats are functioning — Good udder health

(c) when less than 390 teats are functioning, check for hygiene, milking practices and for mastitis.

(15) The total cost on feed (fodder and feed) should not exceed 65-70% of the income through the sale of milk.

(16) Every year cull the unprofitable animals. Culling should be on following grounds in order of merit (see Culling of animals)

(a) Breeding problems

(b) Disease problem: T.B., J.D., Brucella

(c) Hoof problems

(d) Mastitis

(e) Poor growth rate

(17) Carry out preventive vaccination programme, tick control programme and dry cow treatment regularly.

(18) Animals known as 'Hard Milkers' (very thin streams of milk comes out of teat when milked: such teat does not give free flow) should be either operated by a experienced doctor or such cows should be culled.

(19) So long as the cow gives milk from one/two/three/four teats which can take care of the cost of her feed, do not cull the cow when she is a regular breeder.

(20) Unless suitable replacement is available do not cull the cow which is average. Cows with two standard deviations below (than normal) average may be culled.

Calculate the feed conversion for individual animal.

(21) Every year undertake the valuation of the livestock on the farm. It is usually done at the beginning of the financial year. Individual animal is evaluated on the basis of its age-yield-lactation number etc. In some farms, they calculate feed cost per day of the year and multiply it by the number of days of age and add labour, electricity, taxes, water and administrative charges.

For practical purposes, find out the market price for each animal and deduct 20% from it, this is the cost. For fodder - feed etc. market price on this day minus 20% is taken as a value.

(22) When cattle crossbreeding work is undertaken in a group of villages (in an area of ten to 15 kms. radius, with total number of breedable cattle population around 2,500 to 3,000) by providing AI service at the farmer's door (frozen semen out of best bulls or 'Proven Sires), an estimation of milk production can be done. This estimation will depend upon mostly the response of the local people, and the man incharge of this work.

As per our experience, in a centre, the number of cows expected to be pregnant in ten years from the commencement of the programme will be as under:

Number of cows expected to conceive each year

	Years					Years				
	I	II	III	IV	V	VI	VII	VIII	IX	X
Poor response	30	50	75	100	150	150	175	200	200	250
Good response	75	100	130	160	200	250	300	360	425	480
Better response	150	180	210	240	270	320	370	450	500	550
Best response	300	330	360	400	450	525	600	650	650	650

Considering the response to be good, we can get a total of 2,480 conceptions. Assuming at five percent abortions at seven percent calf mortality and five percent calves with poor growth rate, we can get 2,080 calves born. Out of them 50% will be females. Thus we can get 1,040 cows born. Assuming production of milk to be 2,000 litres/lact. and considering average four lactations from a cow, we can estimate 83,20,000 litres of milk produced. If average sale price of milk is considered to be Rs. 3.50/litre and a profit at 20%, the total profit earned will be Rs. 58,24,000; in a period of ten years by the above reasonable estimate. However, this needs motivation of villagers and provision of infrastructural facilities for marketing, besides regular training (education) to the farmers.

For undertaking such an activity in a group of villages infrastructure should be as under:

(1) Identify 15 to 20 villages in a radius of 10-15 kms. (approachable round the year) covering 2,000 to 3,000 breedable cattle population (local cows and cross-breds)

(2) Provide mobile service for AI at farmers' door; with frozen semen out of proven sire. (Motor cycle & Technician)

(3) Establish a dairy cooperative society which can give these facilities. Arrange animal health cover (Preventive vaccination cover) through this society.

(4) Following inputs are needed.
   (A) A good technician — well trained.
   (B) Motorcycle — 900 Rs./month/running expenses
   (C) LN2 containers — one 50 litres capacity, one 20 litres capacity, one 3 litres capacity each.
   (D) Liquid nitrogen — 35 litres/month at Rs. 15/litre
   (E) One Assistant

Considering yearly recurrent expenses of such unit (including salary, Liq. Nitrogen, vehicle expenses, semen etc.) to be around Rs. 70,000 per year the total cost for ten years will be Rs. 7,00,000. Thus the cost benefit ratio comes to 1:8 approximately (Profit 58,24,000 divided by expenditure 7,00,000).

Remember, successful operation of the work depends upon number of breedable cows available (more the cows better the work), the AI technician, communication (roads) and market facilities for the milk. Also the people should be dairy-minded.

Doctor visits farmers' house on motorcycle and does AI at his door

Chapter
25

SOME MISCONCEPTIONS AND SCIENTIFIC TRUTHS

Many farmers have certain misconceptions in their minds about crossbred animals even today. These are out of ignorance. A few of them are as under:

Q.1 Do these animals survive in our country?

Ans. Yes, they do. These animals require adequate shade and shelter. A shady tree, or an ordinary roof can be useful rather than tying them in the open sun. In a fairly large part of our country, crossbreds have not only survived but have also produced good quantity of milk.

Q.2 Do these animals fall sick often? They pant and are said to be delicate.

Ans. (i) No, these animals are not delicate. As these animals produce more milk, their body is put to certain stress. Under this condition, their body cannot fight against diseases.

Our local-cow produces very little milk, but has the strength to fight diseases. Crossbred cows also have this strength, however they need to be protected against contagious diseases by regular vaccinations. Once it is done, they are as strong as our local animals.

(ii) Yes, these animals have low heat tolerance as compared to our animals, because they have European (exotic) blood. Once these animals get adapted to our climatic conditions, panting is less. Taking work from the crossbred bullocks in the cooler hours of the day, clipping their body coat, giving cold water for

drinking and giving them shade helps them to adapt well. If the cow gives expected amount of milk in the bucket, there is no need to worry about her panting.

Q.3 Are the male animals useful? They do not have a hump.

Ans. Crossbred males, because of fast growth rate, mature early and become useful for all types of agricultural operations. They become useful as early as one and half years of age, when reared properly.

These animals have more strength for pulling as compared to indigenous animals. A slight modification in the yoke can make them useful for ploughing, other agricultural operations, for harnessing to the bullock-cart etc.

Q. 4 It is said that crossbreds require greens. We can not supply greens always. how can they thrive?

Ans. It is not necessary that they must be given greens. Scientists advise greens because: (a) Greens is their natural source of fodder (b) It contains proteins which are cheaper. (c) It also contains vitamin 'A'. (Carotene — precursor of vit. 'A').

In case you do not get greens, increase the quantity of concentrates (per five to six kgs of greens give one kg of concentrate). This will be sufficient for the needs of the body. For requirement of vitamin 'A' give it in a powder form. (e.g. Vitablend (Glaxo) @ half to one gram/day).

Supply of greens for eight months in a year will store sufficient vitamin 'A' in the body.

Q.5 The milk of the crossbred cow is not thick. Does it differ from that of an Indian cow?

Ans. Milk is a complete food, with digestibility of its proteins to 98%. Milk is a good source of minerals (calcium - phosphorus) besides proteins and fat. Indian cow gives. less milk, so that milk appears thick. Fat percentage is inversly proportional to the quantity of milk. As crossbred cow gives more milk, fat in the milk gets diluted.

A Holstein Freisian crossbred gives more quantity of milk with less fat percentage (three to four per cent). But Jersey crossbred give comparatively less amount of milk with more fat percentage (4 to 5.5-6%). Danish Jersey cows give milk with seven to eight percent fat. Breeding from a Danish Jersey for getting a crossbred will give more fat percentage in the milk.

When a crossbred cow gives 2,200 litres of milk with four percent fat, it gives 88 kgs of butter in one lactation. Indian cow giving five percent fat and 1,200 litres of milk in one lactation (a dairy breed) gives only 60 kgs of butter.

For other ingredients, there is no difference in the milk of crossbred cow or indigenous cow.

Q.6 By crossbreeding, are we not eliminating our good indigenous animals?

Ans. Our first need is milk. To get more milk, we have introduced European germplasm. This type of breeding even today does not cover even one percent of cattle population in India. So one need not be afraid: Indian scientists have preserved good Indian germplasm (of good breeds) in the form of frozen semen.

Q.7 To what exotic blood level of a crossbred cow is suitable and profitable/

Ans. By and large, crossbreds having 50% to 75% exotic blood level have adapted well at the farmer's door. At many places farmers have kept cows with 87.5% and above exotic blood level without any problem. But in general, it can be advised that an exotic blood level between 50% to 75% (preferably upto 62.5%) is suitable for a common farmer.

If a farmer has more experience, and has facilities suitable to keep higher exotic blood level animals, he can do so. (Good shade, adequate feed, fodder and water plus veterinary facilities).

Chapter
26

LIQUID NITROGEN: CONTAINER AVAILABILITY

We get the following models of liquid Nitrogen (LN2) containers, useful for storage and transport of the frozen semen.

I) Indo-Burma-Petrol Company.(I.B.P.)

A) Mini-wonder:

i) One litre capacity.

ii) Accommodates one canister.

iii) Thirty mini straws can be accommodated, in one canister.

Refilling Schedule: About half a litre every two days.

B) Three-litre type:

i) Three litre capacity.

ii) Six canisters

iii) Twelve goblets

iv) 960 (nine hundred sixty) doses can be accommodated.

Refilling: Half a litre every alternate day.

C) Jumbo-type:

i) Fifty litre capacity

ii) Twelve canisters

iii) Forty-eight goblets

iv) 14,400 (Fourteen thousand four hundred) doses can be accomodated.

Refilling: Five litres/month.

It is necessary to know the evaporation rate, from the manufacturer and then arrange refilling schedule accordingly.

Some of the imported models of containers now in use in India are as under:

			Capacity:
I)	M.V.E. Company	Model AL 3	960 doses of semen Three litre LN2
	Minesotta Valley Engineering	Model XRA 16	1920 doses, 16 litre LN2 capacity.
		Lab 50	For storage of liquid nitrogen, fifty litre capacity.
II)	Union Carbide	XR 16	1920 doses of semen, 16 litre capacity.

How is leakage in the container detected?

a) The spot which leaks is moist.

b) Ice is formed around the neck of the container and on the lid.

While taking out the straws use a torch, and with the help of long forceps (14" stainless steel, or six inches forceps for small container) take out the straws.

For stock checking, pour the liquid nitrogen in a thermocole box, and then count the straws under the level of liquid nitrogen with the help of torch or light.

Caution: Observe the principles of preservation of semen doses. They must be always under the level of liquid nitrogen.

Chapter
27

SUCCESS OF CROSSBREEDING PROGRAMME

1. It is not the breed alone, but better management which is the key to the success in dairy business.
2. In the management balanced feeding, shade and shelter and preventive control of diseases is more important.
3. A good daily observation of the animals will educate the farmer more than reading books.
4. Who will be a successful dairy farmer?
   (a) He should know milking (by hand)
   (b) He should know oestrous cycle and oestrous symptoms of a cow.
   (c) He should know basic principles of feeding a cow.
   (d) He should know care of a pregnant cow and care of cow at and after calving.
   (e) He should know calf-rearing.
   (f) He should be in a position to understand a sick cow, a cow not taking feed fodder.
   (g) He should have normal perception of smell, colour and feel.
   (h) He should love the cow.

   You cannot get such a person everywhere; you have to make him.
5. Cattle crossbreeding, if one wants to make it successful, in a group of villages, observe the following ten steps:-

(a) Identify the area and persons who know dairy cow-keeping by tradition and those who love cows.

(b) Take these people on a trip to those areas where crossbreeding has become successful. Let the dairy farmers have a free dialogue with each other.

(c) Educate these dairy farmers on a crossbred cow/ its management.

(d) Provide Artificial Insemination service at the farmer's door.

(e) Have a Dairy Cooperative Society established - for collection and disposal of milk.

(f) Arrange on a cooperative basis a regular preventive vaccination programme.

(g) Every year, have an orientation/training programme for farmers on dairy animal management.

(h) Supply good quality frozen semen - obtained out of proven sires. The frozen semen technology must be scientifically followed.

(i) Undertake fodder development programmes simultaneously.

(j) Educate and encourage the farmer for record-keeping and evaluating the animals.

If these steps are followed, the programme will be successful. It will not only get established, but will multiply geometrically.

It is observed that with normal response of the people, the first crossbred comes into milk 40-45 months after the onset of the programme — thus

upto first 50 months	It is 'observation and acceptance phase'.
50 to 100 months	Programme doubles. The milk yield increases substantially in the area where the programme is undertaken.

The area where we cannot provide the above facilities or people are not interested, the programme may not be successful.

(k) Remember that there exists a great deal of technological gap between potential of the technology to increase milk production and its actual adoption by the dairy farmers. Factors such as socio-economic status, psychology, education, herd strength, communication status of the farmers contribute significantly.

Limited feed resource availability is one of the important constraints for certain areas. The availability of feed and fodder differs very widely between periods and locations and also between the herds.

This results into variable success in exploiting the animal potential.

Milk Cans

Chapter
28

USEFUL TABLES, FORMULAE AND EQUATIONS

Following formulae/equations will be useful in evaluating the dairy.

(1) A good cow is expected to be in milk for 305 days (300 days in milk + five days' colostrum) and 60 days dry. However, different cows have milk days in different numbers. There are certain numerical factors suggested, for estimating the milk, in different milk days. They are as under:-

Milk days	Factors to be multiplied by, convert to 305 days yield
90	2.82
125	2.77
155	2.16
185	1.51
215	1.32
245	1.18
275	1.08
305	1.00 (Ideal)

(2) When a cow is in milk for 305 days and 60 days dry, the percentage of days in milk in a year is as under: (Calculated from dry days)

Dry days	Percentage of days in milk
60	83.6 Ideal
55	84.9%
50	86.3%
45	87.7%
40	89%

(3) Reproductive efficiency of a dairy cow

$$R.E.= \frac{12 \times (\text{number of calves born})}{(\text{Age of a cow in months—age at first breeding months})+3} \times 100$$

Example: A five year old cow who has dropped four calves, bred first at 15th month, gives 100% efficiency

$$= \frac{12 \times 4}{(60 - 15) + 3} \times 100$$

$$= \frac{12 \times 4}{48} \times 100$$

$$= 100\%$$

(Normally it should not be less than 80%)

(4) Cows give milk with varying fat percentage. Standard milk is considered to be at four percent fat level. The fat corrected milk for four percent fat is as under:

F.C.M. = 0.4 x Yearly milk produced + 15 x Yearly fat produced (Fat corrected milk).

Example: A cow gave 3,000 litres of milk in a year with five percent fat in the milk. Thus, cow gave 150 kgs. of total fat.

Now F.C.M. = 0.4 x 3,000 + 15 x 150
at 4% = 3,450 litres (at 4% fat)

(5) Coefficient of efficiency of milk production

$$C.E.= \frac{52.6 \text{ Fat corrected milk}}{\text{M.P. Fat corrected milk+8.847xBody weight in pounds}}$$

Example: A cow produced 3,450 litres of fat corrected milk having 400 kgs. body weight (880 lbs).

$$C.E.= \frac{52.6 \times 3{,}450}{3{,}450+8.847 \times 880}$$

$$= \frac{52.6 \times 3{,}450}{11.235.36}$$

$$= 16.15$$

i) Thus cow weighing 545 kg. producing 6,818 kg.
ii) " " 415 kg. " 3,025 kg
iii) " " 464 kg. " 3,390 kg
iv) " " 545 kg. " 3,025 kg.

will have C.E. i - 20.58
ii - 14.33
iii - 14.35
iv - 11.67

(6) Conception rate in percentage (%)

$$CR = \frac{100 \times \text{Number of animals pregnant after first AI}}{\text{Number of first AI done}}$$

Under village conditions 40-45% conception rate is good — for over all conception. For first AI it should be 60 to 65%

Thus here 60 to 65 animals will be pregnant (confirmed) after first A.I. and total number of first AI will be hundred (Some cows will conceive at the second AI, some at third and then overall conception rate will be 40-45%)

(7) AI per conception in a unit

$$\frac{\text{Total number of AI done}}{\text{Number of total pregnant animals found}}$$

Example: Suppose you examine 50 animals for pregnancy diagnosis for which you have done 70 AIs

(35 animals were given one AI

Ten animals were given two AIs

Five animals were given three AIs

Out of 50 animals examined if we get 40 animals pregnant thus 70/40 = Services per conception.

Thus 1.75 inseminations are required per conception (Practicable and ideal will be 1.5 to 2.2 inseminations per conception or services per conception.

(8) Milk production efficiency can also be calculated as under (in relation to body weight)

$$\frac{\text{Total milk produced}}{\text{Body weight}}$$

(9) At some places, income from the cow is calculated on the calendar year basis. However, a cow may have part of her lactation in one calendar year and other part in other calendar year. The calculations in such cases are done as under:

Example: A cow calved on 1st June 1989 and was dry on 01.03.1990 and produced total 5,000 kgs of milk, of which 3,000 kgs milk produced in the period from 01.06.89 to 31.12.89 and 2,000 kgs was produced in the period from 01.01.1990 to 01.03.1990. Then for the period of calendar year ending 31.12.1989 the unit is calculated

$$\frac{3{,}000}{5{,}000} = 0.6 \text{ lactation units.}$$

(Lactation Unit = Amount of milk produced in one lactation)

(10) Freezing point of milk is -0.53°C to -0.56°C

Each percent added to water lowers the freezing point by 0.0055°C

(11) Total solids in milk

$$= \frac{\text{Lactometer reading} + 1.2 \times \text{fat\%}}{4}$$

(12) Solids not fat

$$= \frac{\text{Lactometer reading}}{4} \times \frac{\text{Fat \%}}{5}$$

(13) A cow produces 40% of its total milk in first 100 days, 50% of milk in first 120 days of lactation, and remaining milk is produced in 180 days.

(14) Hand milking requires 120-130 labour hours/cow/year

Machine milking requires 70-80 labour hours/cow/year.

(15) Hand milking pressure is 16-32 inches/Hg

Machine milking pressure is 10-24 inches/Hg.

(16) Normal temperature of an adult cow;

99 to 101.5°F (in summer at noon, it may go upto 103.2°F).

(17) Respirations 20-25/min.

(18) Heartbeats 80-90/min.

(19) Normal Gestation period 280 days.

(20) Maximum recorded gestation period 310 days. (exceptional)

(21) Daily dung output (adult lactating) 15-25 kg.

(22) Daily urine output (adult-lactating) 20-30 litres.

(23) Capacity of digestive tract (adult cow) 150-200 litres.
Rumen 80%
Reticulum 5%
Omasum 6-8%
Abomasum 7-8%.

(24)

Milk records	In the world	In India			
		HF		Jersey	
		cross	pure	cross	pure
a) Highest milk given in a day.	109.3 kg (HF cow from CUBA in June 82)	54.750 litres	62.5 litres	42 litres	48 litres
b) maximum milk given in a lactation.	25,247 kg (HF cow in 1975)	——————Not known———			

(25) For prevention of moss formation in a water trough — do as under.

Dissolve 15 grams of copper sulphate in 45 litres of water (33.3% solution). Put this mixture @ 120 ml per 100 gallon water. (Once in fortnight) (Length in feet x breadth x height of water trough x 6 = gives you capacity of trough in gallons).

Chapter
29

LIST OF SUNDRIES REQUIRED FOR TEN COWS

1.	Brooms (palm)	two/month.
2.	Bent shovel	one/year
3.	Spare wooden handle	one/year
4.	Iron basket (12 to 15 litres capacity)	four/year
5.	Hindalium buckets: Ten litres cap.	Two/per two years
6.	Brass bucket: 12 to 15 litre cap.	one/five years.
7.	Iron-sheet 'barni' with lids, ten litre cap.	Three/years.
8.	Measures 1/4 litre 1/2 lit.re (Aluminium)	Two/years Two years.
9.	Coir gloves 15 gloves at a time	Thrice/an year
10.	Spring balance, 35 kgs capacity. 'SALTER' dial type.	One
11.	Iron chains (Two kg wt/each for Large animals). (One kg wt/each for Small animals).	Ten/five years.
12.	Cotton rope two kg	One bundle/year
13.	Strainer/Nylon mesh.	

14. Vim or detergent powder.
Caustic Soda.
Liquid soap.

List of medicines to be kept on the farm.
(For animals more than three in number)

Medicines

1) Tincture Iodine
2) Olium Turpentine
3) Any antiseptic ointment like
   a) Loraxane (I.C.I.)
   b) Terramycin (Pfizer).
4) Potassium permanganate crystals.

Equipment

1) One clinical thermometer
2) Soap-cake
3) Cotton, clean white cloth. (old, washed and dried)

Uses

1) Tinture Iodine: (a) For external application on wounds (b) For application to umbilical chord.
2) Ol. Turpentine: in case of Tympany take 30-40 ml, mix it with half to one litre of sweet oil and drench it to the animal.
3) Antiseptic ointment: For external application on wounds after cleaning.
4) Pot. Permanganate: Put a pinch in a bucket of water, use this water for washing the udder.
5) Clinical Thermometer: For recording body temperature.

Chapter
30

GLOSSARY

The list below gives glossary of the technical terms used in Dairy cattle management.

AI: Artificial insemination: Placing the semen into the genital tract of the female by a long pipette. Semen may be liquid or frozen.

Abortion: Expulsion of the foetus before the completion of the full term of pregnancy.

After births: Placenta. Membranes which cover the foetus.

Animal husbandry: A branch of veterinary science which deals with feeding, breeding and management of livestock.

Anoestrous: A condition when female is not in oestrous (heat) and cannot be mated.

Antibody: Substance produced in the body in response to antigen. It provides immunity against disease.

Antigen: A foreign substance (mainly protein) which stimulates formation of antibody.

Balanced: A term applied to feed (diet) of animal. Having all known required ingredients in appropriate proportion.

Branding: An identification mark on animal body. It may be on the skin, horn or hoof. Branding on skin may be made by hot or cold brand or by chemicals.

Butter fat: Fat in milk.

C.P.: Crude protein.

Calving Interval: Interval between two calvings. 12 to 14 months interval is considered good.

Colostrum: First milk produced after calving. It contains antibodies besides a rich supply of proteins and vitamin A.

Concentrate: A feed low in fibre (around 20%) and high (60% or more) of T.D.N. (Total Digestible Nutrients).

Culling: Removing from the herd.

Dehorning: Removal of horns. This is done when animals are young (15-30 days age). The buds are removed by hot iron or chemicals.

Dry cow: A cow which has stopped giving milk.

Dry matter: That part of feed which is not water.

Dry period: Period between the end of one lactation and beginning of the second.

Drying off: making the cow dry before she calves again.

Dystocia: Difficult calving.

Embryo: After 13th day till 45th day of calf in womb, when formation of most organs body parts has taken place.

Foetus: Unborn young. From 46th day of conception till 280th day.

Freemartin: A sterile female calf born twin to a male.

Gestation: A period during which the unborn calf is carried in the uterus till calving.

Hay: Forage preserved in dry form without any appreciable loss in its nutritive value.

Heifer: A matured young female, one that has not produced offspring so far.

Inheritance: Acquisition of characters by transmission from parents.

Lactation period: Period between calvings when cow produces milk.

Mastitis: A disease of mammary gland.

Milk fever: A disease usually seen in high yielding animals, due to deficiency of calcium.

Oestrous: Sexual excitement period of a female when she is ready for breeding.

Premature: Expulsion of foetus before full terms, but late enough to permit independent survival.

Puberty: The age at which the reproductive organs of the animal become functional.

Reproductive cycle: A sexual cycle, which is normally of 21 days in cows.

Still-birth: Birth of a dead foetus; usually well-advanced in development.

Service period: Period between date of calving till date of conception.

T.D.N.: Total digestible nutrients.

Vaccine: Biological agent or antigen, made for getting immunity when injected.

Weaning: To separate the calf from mother and allow it to feed other than sucking.

Zoonosis: Diseases communicable from animal to animal, and/or animal to man.

Chapter
31

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Annexure

I

BREEDS OF COWS IN INDIA

The Indian cattle 'Zebu' — differs from European cattle thus: The Zebu, *Bos indicus*, have a prominent hump, long face, upright horns, drooping ears and a dewlap. They have comparatively lower basal metabolic rate and better capacity for heat dissipation.

Mr. Oliver (in 1938) was the first to survey the important breeds of cattle in India.

Breeds of cattle in India

There are twentysix identified breeds of cattle. They are categorised as under.

I) Milch Breeds — Four
   a) Sindhi
   b) Sahiwal
   c) Gir
   d) Tharparkar

II) Dual Purpose — Eight
   a) Haryana
   b) Nimari
   c) Dangi
   d) Mewati (kosi)
   e) Rathi
   f) Ongole
   g) Kankrej
   h) Deoni

III) Draught Purpose — Fourteen
   a) Nagori
   b) Bachaur
   c) Kankatha
   d) Malvi
   h) Khillari
   i) Bargur
   j) Kangyam
   k) Panwar


JAMMU & KASHMIR
SINDHI
SAHIWAL
HARYANA
THARPARKAR
NAGORI
MEWATI
RATHI
GIR
HIMACHAL PRADESH
PUNJAB
HARYANA
RAJASTHAN
GUJARAT
NIMARI
PANWAR
UTTAR PRADESH
MADHYA PRADESH
BIHAR
ARUNACHAL PRADESH
ARUNACHAL
ASSAM
MANIPUR
MIZORAM
W BENGAL
KANKREJ
DANGI
MAHARASHTRA
ORISSA
BACHAUR
KANKATHA
MALVI
DEONI
KHILLARI
ANDHRA PRADESH
KARNATAKA
DEONI
ONGOLE
KERALA
TAMIL NADU
BARGUR/
KANGYAM

Map of India

e) Khairagarh
f) Hallikar
g) Amritmahal
l) Siri
m) Gaolao
n) Krishna valley.

These breeds were evolved by natural selection - on the basis of adaptation to the agro-ecological conditions. The criteria used for selection in some of these breeds were more or less based on phenotypic characters, like colour, type of horns etc.

However, under village conditions no definite policy for breeding appears to have been adopted nor any principles observed. The cows were served with any bull available locally. Majority of the cows were covered by the scrub bulls when they were going out for grazing. Thus the status of such cows was identified as 'nondescript'.

Above breeds of cattle come from following areas.

1) Sindhi - Haryana - Punjab, West U.P., East Rajasthan
2) Sahiwal - Haryana - Punjab
3) Gir - Saurashtra - Gujrat
4) Tharparkar - Rajasthan, Marwar
5) Haryana - Haryana
6) Nimari - Madhya Pradesh
7) Dangi - Nasik, Dang (Gujrat), Ahmednagar
8) Mewati - Rajasthan (Eastern part)
9) Rathi - Rajasthan
10) Ongole - Andhra Pradesh
11) Kankrej - Gujrat, Kutch
12) Deoni - Andhra, Karnataka, Maharashtra
13) Nagori - Rajasthan (Jodhpur)
14) Bachaur - Bihar (Sitamarhi dist)
15) Kankatha - Uttar Pradesh, M.P.
16) Malvi - Madhya Pradesh, Rajasthan, U.P.
17) Khairagarh - Uttar Pradesh
18) Hallikar - Karnataka (Mysore)
19) Amritmahal - Karnataka (Mysore)
20) Khillari - Maharashtra (South)
21) Bargur - Tamil Nadu (Coimbtur area)

22) Kangayam - Tamil Nadu (Coimbatore)
23) Panwar - U.P.
24) Siri - Sikkim
25) Gaolao - Madhya Pradesh, Maharashtra
26) Krishna valley - Andhra, Maharashtra, Karnataka.

In their home tract, typical animals of these breeds are seen. At some of the Government farms, agricultural colleges and agricultural universities, animals from typical local breeds are maintained.

Annexure
II

NUTRITIVE VALUES OF SOME FEEDS & FODDER

Sr. No.	Material	Dry matter	DCP %	TDN
	I. Roughages			
1.	Paddy straw	90%	-	40%
2.	Wheat straw	90%	-	40%
3.	Sorghum straw	90%	-	40%
4.	Bajra straw	90%	-	40%
5.	Sugarcane bagasse	90%	-	40%
6.	Hay Local	90%	1.5	50%
	II. Greens			
1.	Maize	25%	5	65%
2.	Lucern (Midbloom)	20%	16	60%
3.	Berseem (Midbloom)	20%	14	60%
4.	Hybrid Napier	20%	5	55%
5.	Sorghum Green	30%	4	55%
6.	Bajra Green	25%	4	55%
7.	Sugarcane Whole	25%	3	60%
	III. Concentrates			
1.	Cottonseed cake	90%	20	75%
2.	G.N.C. (expeller)	90%	40	75%
3.	G.N.C. (de-oiled)	90%	45	75%
4.	Sunflower cake	90%	28	75%
5.	Linseed cake	90%	30	75%
6.	Rice Bran	90%	9	65%
7.	Rice Bran (De-oiled)	90%	10	55%
8.	Wheat Bran	90%	8	60%
9.	Gram Chuni	90%	8	65%
10.	Tur Chuni	90%	7	65%

	IV.	Others			
1.		Anjan Green Leaves	40%	7	68%
2.		Mango Green Leaves	40%	4	40%
3.		Oat (Avena sativa)	82%	5.6	55%
4.		Neem leaves (Azadirachta indica)	40%	8	20%
5.		Banana skin (Ripe)	15%	2.7	62%
6.		Banana skin (Green)	15%	1.7	60%
7.		Carrot	14%	9.8	85%
8.		Barley (Hordeum nulgare) Green: 12 weeks	22%	8.2	75%
9.		Desmanthus (Green)	40%	11	57%
10.		Pennisetum pedicellatum	20%	4.2	52%

1 kg TDN= 4.4 MCal of DE (Digestible energy)
1 kg TDN= 3.6 MCal of ME (Metabolizable energy)

DCP.: Digestible crude protein.
TDN.: Total digestible nutrients.

Mineral content

	Calcium	Phosphorus
Sterilised bone-meal	22-29%	8-13.2%
Rock phosphate (defluorinated)	31.7%	13.7%
Dicalcium phosphate	22.7%	18%
Limestone	36%	0.02%
Monosodium phosphate	0%	24%

Annexure

III

I) Nutrient requirement of growing cattle: (550 gms/day)

Body wt (kgs)	DM (kg)	DCP (gms)	TDN (kg)	Calcium (gms)	Phosph. (gms)
100	2.78	328	1.80	12	9
120	3.23	373	2.07	15	11
140	3.67	419	2.34	17	12
150	3.90	442	2.47	20	13
160	4.12	465	2.61	20	13
200	5.02	556	3.14	20	13
240	5.97	647	3.68	25	17

II) Nutrient requirement for maintenance of cattle

250	4-5	140	2.20	25	17
300	5-6	168	2.65	25	17
350	6-7	195	3.10	25	17
400	7-8	223	3.55	28	20
450	8-9	250	4.00	31	23
500	9-10	278	4.45	31	23
550	10-11	310	4.90	31	23
600	11-12	336	5.35	31	23

III) **Nutrient requirement per kg milk production**

Fat (%)	DCP (gms)	TDN (gms)
3	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

DM: Dry matter.
DCP.: Digestible crude protein.
TDN.: Total digestible nutrients.

Annexure

IV

Table showing probable date of Calving (Gestation period 280 days)

Date of AI (or cow served)	Probable Date of calving	Date of AI (or cow served)	Probable Date of calving
Jan 1	Oct 8	Jul 8	Apr 12
Jan 7	Oct 14	Jul 15	Apr 19
Jan 14	Oct 21	Jul 22	Apr 26
Jan 21	Oct 28	Jul 29	May 3
Jan 28	Nov 4	Aug 5	May 10
Feb 4	Nov 11	Aug 12	May 17
Feb 11	Nov 18	Aug 19	May 24
Feb 18	Nov 25	Aug 26	May 31
Feb 25	Dec 1	Sep 2	Jun 7
Mar 4	Dec 8	Sep 9	Jun 14
Mar 11	Dec 15	Sep 16	Jun 21
Mar 18	Dec 22	Sep 23	Jun 28
Mar 25	Dec 29	Sep 30	Jul 5
Apr 1	Jan 5	Oct 7	Jul 12
Apr 8	Jan 12	Oct 14	Jul 19
Apr 15	Jan 19	Oct 21	Jul 26
Apr 22	Jan 26	Oct 28	Aug 2
Apr 29	Feb 2	Nov 4	Aug 9
May 6	Feb 9	Nov 11	Aug 16
May 13	Feb 16	Nov 18	Aug 23
May 20	Feb 23	Nov 25	Aug 30
May 27	Mar 1	Dec 2	Sep 6
Jun 3	Mar 8	Dec 9	Sep 13
Jun 10	Mar 15	Dec 16	Sep 20
Jun 17	Mar 22	Dec 23	Sep 27
Jun 24	Mar 29	Dec 30	Oct 3
Jul 1	Apr 5		

Annexure
V

Conception after calving (so as to achieve an intercalving period of 12 months). Get your cow conceived during this period.

Cow calved on	Conception desirable between
Jan 1	Mar 1 — Mar 31
Jan 10	Mar 11 — Apr 10
Jan 20	Mar 21 — Apr 20
Jan 30	Mar 31 — Apr 30
Feb 1	Apr 2 — May 3
Feb 10	Apr 12 — May 13
Feb 20	Apr 22 — May 23
Feb 28	Apr 30 — May 31
Mar 1	May 1 — May 31
Mar 10	May 10 — Jun 9
Mar 20	May 20 — Jun 19
Mar 30	May 30 — Jun 29
Apr 1	Jun 1 — Jun 30
Apr 10	Jun 10 — Jul 9
Apr 20	Jun 20 — Jul 19
Apr 30	Jun 30 — Jul 29
May 1	Jul 1 — Jul 31
May 10	Jul 10 — Aug 9
May 20	Jul 20 — Aug 9
May 30	Jul 30 — Aug 29
Jun 1	Jul 30 — Aug 29
Jun 10	Aug 1 — Aug 31
Jun 10	Aug 10 — Sep 9
Jun 20	Aug 20 — Sep 19
Jun 30	Aug 30 — Sep 29

Cow calved on	Conception desirable between
Jul 1	Aug 30 — Sep 30
Jul 10	Sep 8 — Oct 7
Jul 20	Sep 18 — Oct 17
Jul 30	Sep 28 — Oct 27
Aug 1	Oct 1 — Oct 31
Aug 10	Oct 10 — Nov 10
Aug 20	Oct 20 — Nov 20
Aug 30	Oct 30 — Nov 30
Sep 1	Nov 1 — Nov 30
Sep 10	Nov 10 — Dec 10
Sep 20	Nov 20 — Dec 20
Sep 30	Nov 30 — Dec 30
Oct 1	Dec 1 — Dec 31
Oct 10	Dec 10 — Jan 9
Oct 20	Dec 20 — Jan 19
Oct 30	Dec 30 — Jan 29
Nov 1	Jan 1 — Jan 31
Nov 10	Jan 10 — Feb 8
Nov 20	Jan 20 — Feb 18
Nov 30	Jan 30 — Feb 28
Dec 1	Jan 31 — Mar 3
Dec 10	Feb 9 — Mar 10
Dec 20	Feb 19 — Mar 20
Dec 30	Mar 1 — Mar 31

Annexure
VI

Table showing hundred days from the date of calving (First hundred days milk yield is approximately 40% of the total)

Date of Calving	Hundredth day
Jan 1	Apr 10
Jan 5	Apr 14
Jan 10	Apr 19
Jan 15	Apr 24
Jan 20	Apr 29
Jan 25	May 4
Jan 30	May 9
Feb 4	May 14
Feb 9	May 19
Feb 14	May 24
Feb 19	May 29
Feb 24	Jun 3
Feb 27	Jun 6
Feb 28	Jun 7
Mar 1	Jun 8
Mar 5	Jun 12
Mar 10	Jun 17
Mar 15	Jun 22
Mar 20	Jun 27
Mar 25	Jul 2
Mar 30	Jul 7
Apr 4	Jul 12
Apr 9	Jul 17
Apr 14	Jul 22
Apr 19	Jul 27
Apr 24	Aug 1
Apr 29	Aug 6

Date of Calving	Hundredth day
May 3	Aug 10
May 8	Aug 15
May 13	Aug 20
May 18	Aug 25
May 23	Aug 30
May 28	Sep 4
Jun 2	Sep 9
Jun 7	Sep 14
Jun 12	Sep 19
Jun 17	Sep 24
Jun 22	Sep 29
Jun 27	Oct 4
Jul 2	Oct 9
Jul 7	Oct 14
Jul 12	Oct 19
Jul 17	Oct 24
Jul 22	Oct 29
Jul 27	Nov 3
Aug 2	Nov 9
Aug 7	Nov 14
Aug 12	Nov 19
Aug 17	Nov 24
Aug 22	Nov 29
Aug 27	Dec 4
Sep 1	Dec 9
Sep 6	Dec 14
Sep 11	Dec 19
Sep 16	Dec 24
Sep 21	Dec 29
Sep 26	Jan 3
Oct 1	Jan 8
Oct 6	Jan 14
Oct 11	Jan 19
Oct 16	Jan 23
Oct 21	Jan 28
Oct 26	Feb 2
Nov 1	Feb 8
Nov 6	Feb 13
Nov 11	Feb 18

Date of Calving	Hundredth day
Nov 16	Feb 23
Nov 21	Feb 28
Nov 26	Mar 5
Dec 1	Mar 10
Dec 6	Mar 15
Dec 11	Mar 20
Dec 16	Mar 25
Dec 20	Mar 29
Dec 25	Apr 3
Dec 26	Apr 4
Dec 27	Apr 5
Dec 28	Apr 6
Dec 29	Apr 7
Dec 30	Apr 8
Dec 31	Apr 9

Annexure

VII

Table showing 305 days after calving.
(305 days lactation is a standard lactation)

Jan 1	—	Nov 1	May 6	—	Mar 6	Sep 22	—	Jul 23
Jan 5	—	Nov 5	May 11	—	Mar 11	Sep 29	—	Jul 30
Jan 10	—	Nov 10	May 16	—	Mar 16	Oct 4	—	Aug 4
Jan 15	—	Nov 15	May 21	—	Mar 21	Oct 9	—	Aug 9
Jan 20	—	Nov 20	May 26	—	Mar 26	Oct 14	—	Aug 14
Jan 25	—	Nov 25	May 31	—	Mar 31	Oct 19	—	Aug 19
Jan 30	—	Nov 30	Jun 5	—	Apr 5	Oct 24	—	Aug 24
Feb 4	—	Dec 5	Jun 10	—	Apr 10	Oct 29	—	Aug 29
Feb 9	—	Dec 10	Jun 15	—	Apr 15	Nov 3	—	Sep 3
Feb 14	—	Dec 15	Jun 20	—	Apr 20	Nov 8	—	Sep 8
Feb 19	—	Dec 20	Jun 25	—	Apr 25	Nov 13	—	Sep 13
Feb 24	—	Dec 25	Jun 30	—	Apr 30	Nov 18	—	Sep 18
Feb 27	—	Dec 28	Jul 4	—	May 4	Nov 23	—	Sep 23
Feb 28	—	Dec 29	Jul 9	—	May 9	Nov 28	—	Sep 28
Mar 1	—	Dec 30	Jul 14	—	May 14	Dec 3	—	Oct 3
Mar 6	—	Jan 4	Jul 19	—	May 19	Dec 8	—	Oct 8
Mar 11	—	Jan 9	Jul 24	—	May 24	Dec 13	—	Oct 13
Mar 16	—	Jan 14	Jul 29	—	May 29	Dec 18	—	Oct 18
Mar 21	—	Jan 19	Aug 3	—	Jun 3	Dec 23	—	Oct 23
Mar 26	—	Jan 24	Aug 8	—	Jun 8	Dec 28	—	Oct 28
Mar 31	—	Jan 29	Aug 13	—	Jun 13	Dec 29	—	Oct 29
Apr 1	—	Jan 30	Aug 18	—	Jun 18	Dec 30	—	Oct 30
Apr 6	—	Feb 4	Aug 23	—	Jun 23	Dec 31	—	Oct 31
Apr 11	—	Feb 9	Aug 28	—	Jun 28			
Apr 16	—	Feb 14	Sep 2	—	Jul 3			
Apr 21	—	Feb 19	Sep 7	—	Jul 8			
Apr 26	—	Feb 24	Sep 12	—	Jul 13			
May 1	—	Mar 1	Sep 17	—	Jul 18			

Annexure

VIII

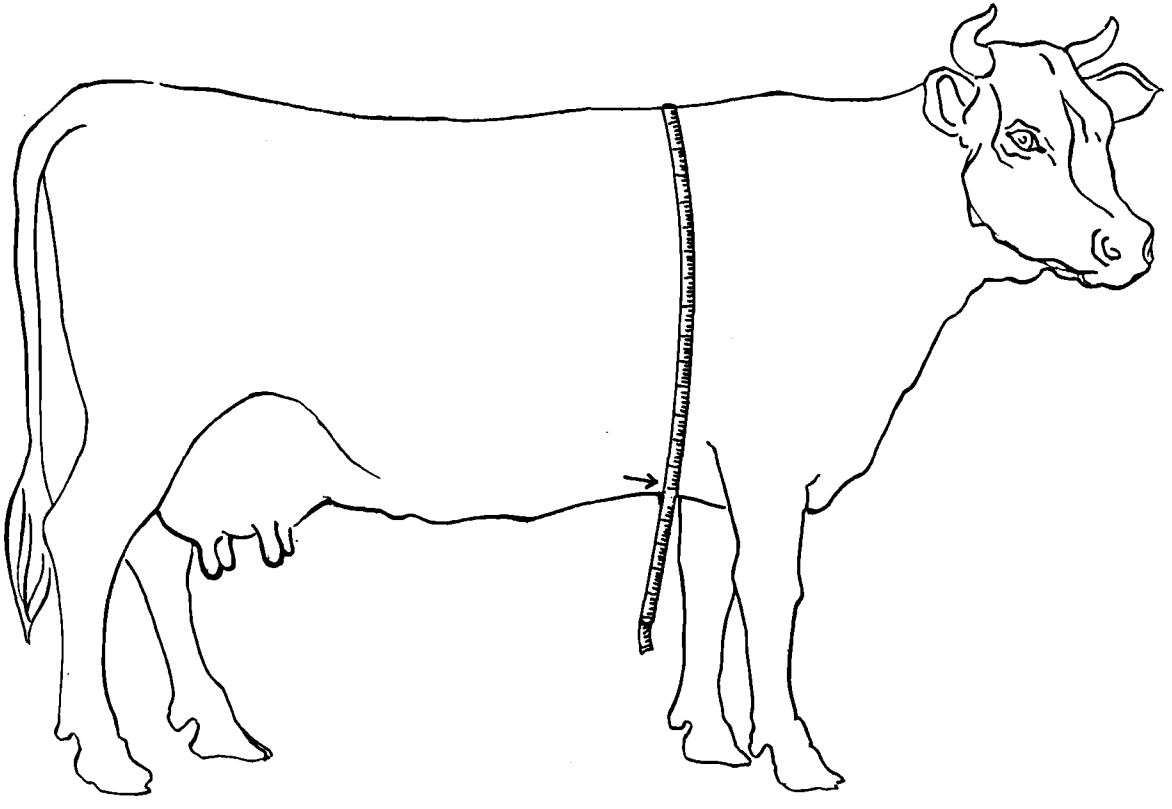
Animal Body-Weight Table
(Animal's Girth is to be meaured behind the forelegs —by a Measuring Tape: Hold the Tape close to the chest).

Girth		HF Cross	Jersey Cross
Inches	cms	kgs	kgs
23	58	21	19
24	60	23	21
25	62	26	24
26	65	29	27
27	68	32	30
28	70	35	33
29	73	39	36
30	75	43	40
31	78	47	44
32	80	51	48
33	83	56	52
34	85	61	57
35	88	66	62
36	90	71	67
37	93	76	72
38	95	82	78
39	98	88	84
40	100	95	90
41	102	102	97
42	105	109	104
43	107	116	111
44	110	123	118
45	112	131	126
46	115	139	134

Girth		HF Cross	Jersey Cross
Inches	cms	kgs	kgs
47	117	148	142
48	120	156	151
49	122	165	160
50	125	175	169
51	127	185	179
52	130	195	189
53	132	205	200
54	135	216	211
55	137	227	222
56	140	239	234
57	142	251	246
58	145	263	258
59	147	276	272
60	150	289	284

Method of taking measurement of Girth. Picture on page 168.

Take the tape around the chest slightly tighter and observe the reading in cms. See the table for ascertaining the body weight approximately.



Measurement of the girth of Cow

Annexure

IX

VACCINATION PROGRAMME

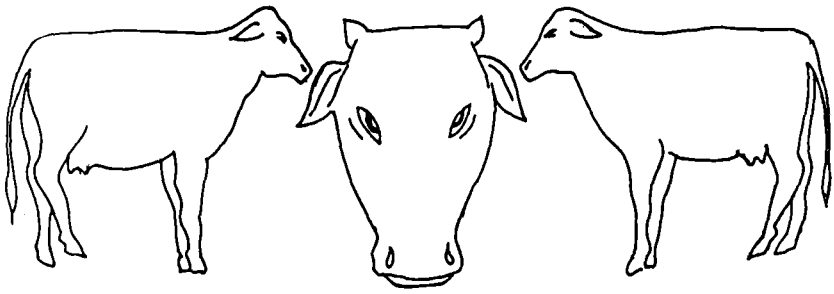
Vaccines (storage, dose, manufacturers)

Sr No.	Name of the Vaccine	Storage Temp.	Dose	Vaccination schedule	Remarks
1.	Foot & mouth Disease(FMD)	4° to 6°C	Ranges from 3 ml to 10 ml (Adult and calf same dose)	Thrice in a year	FMDV is produced by BAIF Laboratory, Hoechst, NDDB (It can be started any time of the year)
2.	Rinderpest disease (RP) (T.C.R.P.)	0° to 4°C	1 ml (Deep freezer or Ice chamber of refrigerator)	Once in an year	It is produced by BAIF laboratory, IVRI, various State Govt. also (Preferably to be given in Nov. or December)
3.	Haemorrhagic Septicaemia (HS)	At room temp. (in cool and dark place)	2 ml to 5 ml	Once in an year	Both vaccines are produced by IVRI, BAIF Laboratory, various State Governments (Preferably to be given one month before the onset of monsoon)
4.	Black Quarter disease(BQ)	" "	" "	Once in an year	BAIF laboratory produces combined (mix) vaccine of HS & BQ (dose - 4 ml)
5.	Anthrax	" "	1 ml	Once in an year	It is produced by various State Governments(It is to be carried out in Endemic area only)

Notes: 1. Nowadays, no specific season could be predicted for outbreak of any disease. 2. In the face of any outbreak of disease, revaccinate your animals, irrespective of previous vaccination dates. 3. Rinderpest vaccine must be utilised within one to one and half hour, after reconstitution. In crossbred animals only "Tissue-Culture Rinderpest" vaccine (TCRP) is advocated. It is preferable to vaccinate crossbreds thrice a year against FMD.

Annexure
X

IDENTIFICATION DETAILS OF INDIVIDUAL ANIMAL

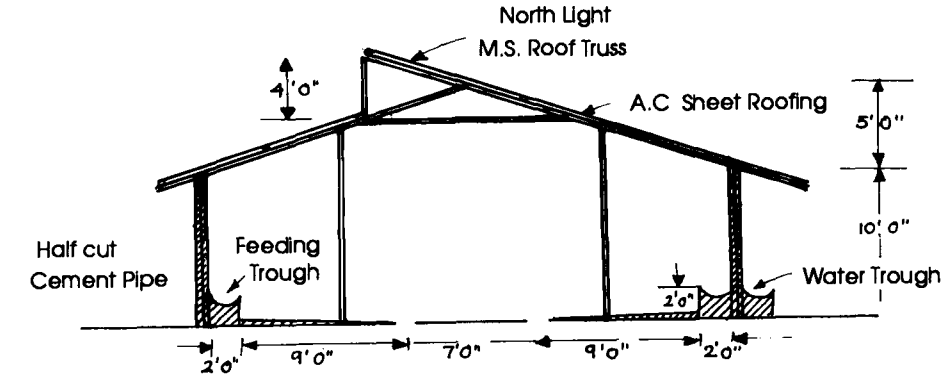


Outline of coloured patches on the actual body of the animal are drawn in the figures

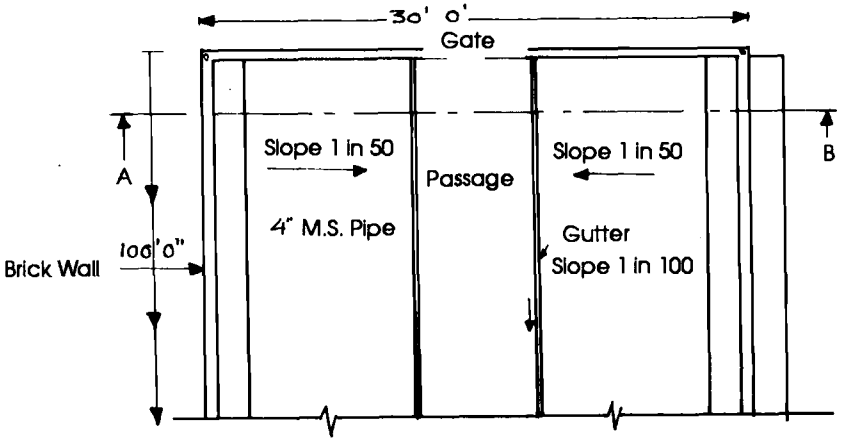
1. Breed/grade :
2. Colour :
3. Sex :
4. Age :
5. Height :
6. Other identification marks :

Home born/Purchased :
Price as on :

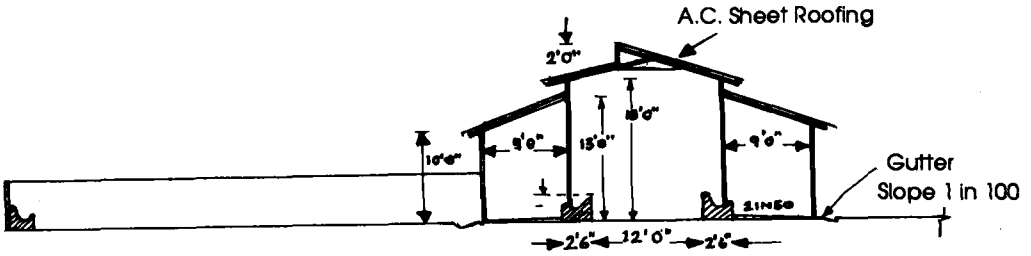
(N.B.: Identification by putting ear tags is also practised. Tattoing-Tagging gives additional information).



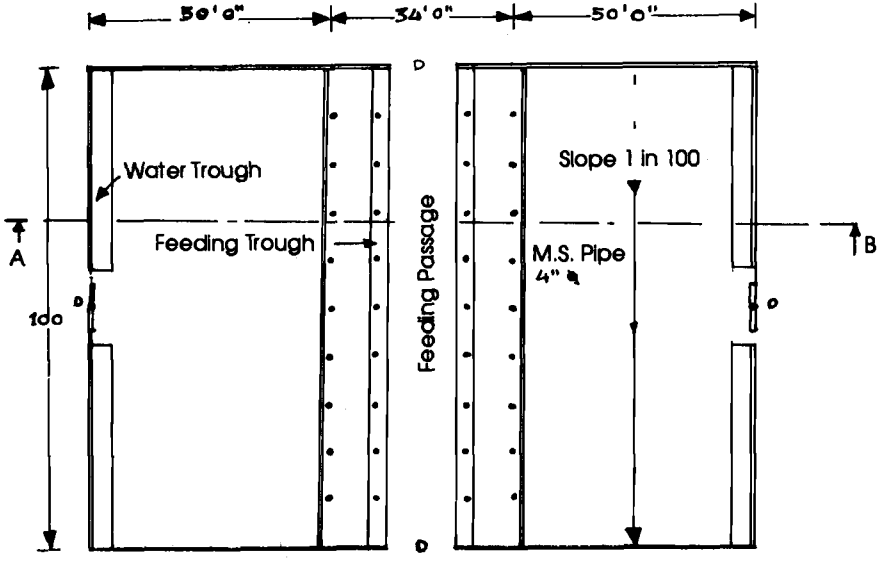
Section A-B



Plan



Enlarged Section A-B



Plan

Estimate of cattle shed (Drawing on page no. 171-172)

For five cattle 30'0"x15'0"

1. Brick walls in mud mortar 225 cft

Bricks (Nos.)	2000	1,000.00
Mason	2	100.00
M-labours	1	20.00
F-labours	2	50.00
		1,160.00

2. Feeding trough 157.5 cft.

Bricks (Nos.)	1370	685.00
Cement bags	9	540.00
Sand (cft.)	63.39	190.00
Mason	3	150.00
M-labour	1	20.00
F-labour	3	60.00
		1,585.00

3. Flooring 67.5 cft.

Bricks (Nos.)	590 Nos.	295.00
Cement bags	4	240.00
Sand (cft.)	28	84.00
Mason	3	150.00
M-labour	1	20.00
F-labour	3	60.00
		849.00

4. Pointing 1632 sq. ft.

Cement bags	8	480.00
Sand	19.52	58.56
Mason	6	300.00
M-labour	1	20.00
F-labour	3	60.00
		918.00

Roofing

Angle truss	400.00
Fitter	40.00
Help	20.00
	460.00
Vertical poles for support 45' 0"	250.00
Fitter-1	40.00
Helper-1	20.00
	310.00
Angle purlins 120' 0"	657.00
Fitter-1	40.00
Helper-1	20.00
	717.00
Roofing with A.C. sheet 665 sq. ft.	4,408.00

Low Cost Method

Roofing using thatched roof of split bamboos.

Angled truss	460.00
Pillar supports	190.00
Roof of bamboos	2,250.00
	2,900.00

Comparision

Walls in mud	1,160/-	1,160.00
Feeding trough	1,585/-	1,585.00
Flooring in brick	849/-	849.00
Pointing in cement	918/-	918.00
Roofing using AC sheets	5,895/-	— —
Thatched roof	— —	2,900.00
	1,0407/-	7,412.00
	23.12 Rs./sq.ft.	16.47 Rs./sq.ft.

Annexure

XII

Number of crossbreds born, assets created in a period of ten years from one nondescript (indigenous) cow.

The crossbreeding programme has been accepted by many farmers, as a means of remunerative self-employment, in rural areas.

If a farmer has only one breedable, indigenous cow, in a period of ten years how much assets could be created, and how much milk (besides manure and urine) is produced can be worked out in a fairly accurate manner.

(I) **Assumptions:**

(1) The farmer is dairy-minded.

(2) Facilities for breeding of his cow with frozen semen from good bulls are available at his door.

(3) There is reasonably good fertility in the animals.

(4) Male calves are sold at Rs.200 at two or three months age.

(5) Milk is sold at the rate of Rs.3.50/litre.

(6) The indigenous cow will calve first at the age of 40 months (or earlier) **and** will give birth to a female calf. (Thereafter alternatively male-female).

(7) The intercalving period of this cow is 18 months.

(8) The crossbred cow will calve at the age of 30 months, its intercalving period will be 15 months.

(9) Male/female ratio will be 50:50.

(10) The milk given by an indigenous cow will be Lact.I:500 litres, Lact.II:550 litres, Lact.III and onwards:600 Litres/lact.

(11) The crossbred cow will give yield of 2,000 litres in Lact.I, 2,200 litres in Lact.II and 2,400 litres/Lact. thereafter.

(12) Exotic blood level will be 50-75%

(13) Regular preventive health cover is given.

(14) No mortality and/or sale of females.

Thus the total milk produced and calves born per year will be as under:

Year	Milk production	Males	Females
1	50 litres	Nil	one
2	450 "	Nil	Nil
3	385 "	One	Nil
4	1,625 "	One	One
5	2,020 "	Nil	One
6	1,980 "	Two	Nil
7	3,600 "	One	One
8	6,560 "	Nil	Three
9	5,180 "	Four	Nil
10	6,860 "	One	Two
Total	28,710 litres	Ten	Nine

(I) The assets created at the end of ten years will be as under:

	Age Yr. Mth.	Approx.value (Rs.)
C.B.one cow :	9 - 1 month	2,000.00
C.B.one cow :	6 - 1 month	4,000.00
C.B.one cow :	5 - 3 months	4,500.00
C.B.One cow :	3 - 1 month	5,500.00 (in milk and pregn.)
C.B.two cows :	2 - 9 months	9,000.00 (at Rs.4,500/each)
C.B.Heifer one:	2 - 3 months	4,000.00 (Pregnant 6 months)
C.B.Heifer two:	0 - 3 months	1,200.00 (At Rs.400/each)
Total value of assets		30,200.00

(II) Dung and urine (10 years) Rs. 10,000.00 (minimum)

(III) Profit from milk at 20%

(milk sold @ Rs. 3.50) Rs. 20,117.00

Net profit including assets Rs. 60,317.00

This comes to Rs. 6,031/year i.e. Rs. 500/month.

When two cows are kept, this will become Rs. 1,000/month.

Annexure
XIII

EXOTIC BLOOD LEVELS OF CROSSBRED COWS

Ebl - Exotic blood level

First generation calf	100% Indian cow X 100% Exotic bull 50% Indian blood+50% exotic blood 50% exotic blood level
Second generation calf	50% Ebl cow X 100% exotic bull 75% exotic blood level 25% indigenous blood.
Third generation calf	75 Ebl cow X 100% exotic bull 87.5% exotic blood 12.5% indigenous blood
Fourth generation calf	87.5 Ebl cow X 100% Exotic bull 93.75% exotic blood level 6.25% indigenous blood
Fifth generation calf	93.75 Ebl cow X 100% exotic bull 96.87/exotic blood level 3.13% indigenous blood.
Sixth generation calf	96.87 Ebl cow X 100% exotic bull 98.93% exotic blood level 1.07% indigenous blood
Seventh generation	98.93 Ebl cow X 100% exotic bull 99.46% exotic blood level 0.54% indigenous blood

Level - For obtaining 62.5% exotic blood cross 50% Ebl cow X 75% Ebl Bull
62.5% exotic blood level cow
37.5% indigenous blood

Annexure
XIV

ASCERTAINING THE COW'S AGE FROM TEETH

When authentic record of the birth date of the animal is not available, the age of the animal can be known from its teeth. It will give approximate age of the animal.

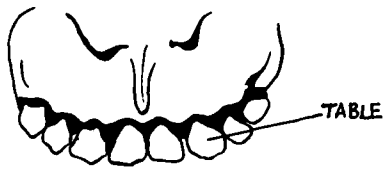
A cow does not have front teeth (incisors) in the upper jaw; instead there is a hard rough pad, known as dental pad.

It has front teeth (incisors) in the lower jaw. In a fully grown animal, there are eight teeth.

There are total 24 molars (cheek teeth) in the upper and lower jaws; (six molars on each side of the upper and lower jaw). Thus there are a total of 32 teeth in the mouth of cow.

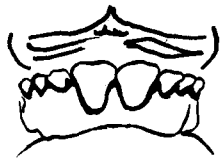
The front teeth of the lower jaw (incisors) come out at different age as under:

At birth —	two teeth (known as milk teeth; they are temporary).
15 - 20 days —	four teeth (milk teeth/temporary)
One month —	eight teeth (milk teeth/temporary)
2 - 2.5 years age —	two incisors (central) become permanent
3 - 3.5 years —	four incisors (Medial) become permanent
4 - 5 years age —	six incisors (lateral) become permanent.
5 - 6 years age —	All eight incisors become permanent.



5 months old Animal

i Edges of the incisors are sharp
ii Table of the teeth is very smooth and narrow
iii All are very close to each other
iv Colour of the teeth is milky white



2 to 2.5 years old Animal

i Table of the teeth becomes rough and broad
ii Other temporary teeth are loose
iii Colour slowly becomes yellowish

6 years old Animal

i Table of the teeth are rough, broad and slient inside
ii Very close to each other
iii Colour becomes dark yellow with a blackish tint/tinge

The change from temporary (milk) teeth to permanent teeth depends upon many factors such as feed/fodder and management.

Beyond six years of age, as the age advances, the gums recede and the tooth is exposed. Thus from the extent of receding of gums, wear of the crown of the tooth, further age can be ascertained (See figures).

Ascertaining the age of the animal from the teeth requires experience, and knowledge.

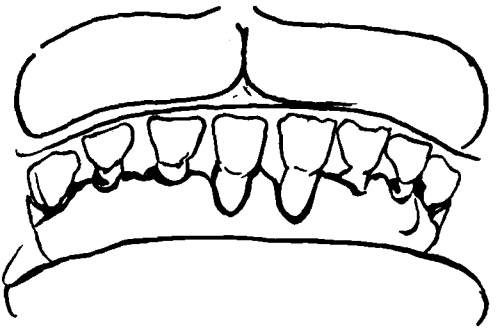
Some animals have their teeth a little loose in the socket. It could be a normal and natural feature.

Age of the animal can also be known from the complete rings on the horns. This method of ascertaining the age does not appear to be more reliable (Number of rings + two gives the age of animal).

It is suggested to observe the teeth age and the rings on the horn and these should be weighed and compared.

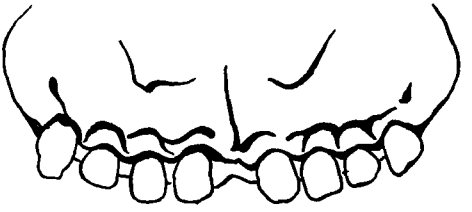
However, nothing is as reliable as keeping authentic records of birth.

Muzzle impressions (ink painted) can also be used to identify the cattle.



15 to 16 years old Animal

i Wear and tear is more vertical
ii Gaps between two teeth widen
iii Roots of the teeth are loose
iv Colour of the teeth blackens



18 years old Animal

i Size of the teeth becomes small
ii Table of the teeth becomes more rough
iii Teeth could fall out any time
iv Colour of the teeth is more blackish and dark yellow

DETAILED INDEX

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