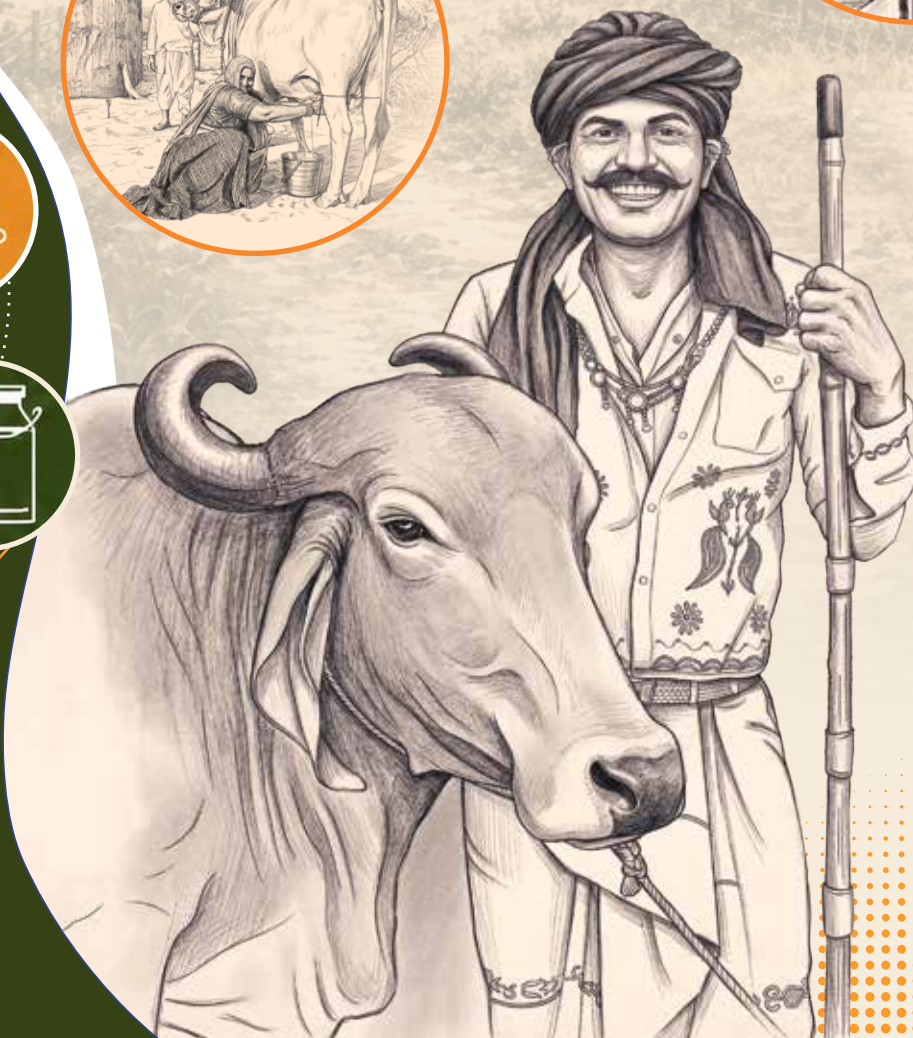




**NATIONAL
DAIRY
DEVELOPMENT
BOARD**

Handbook of **Good Dairy Husbandry Practices**



BREEDS OF INDIGENOUS DAIRY CATTLE

BULLS



Gir

Native tract: Junagadh, Rajkot, Bhavnagar and Amreli districts in Gujarat



Hariana

Native tract: Rohtak, Hissar, Sonapat, Gurgaon, Jind and Jhajjar districts in Haryana



Sahiwal

Native tract: Ferozpur and Amritsar district of Punjab & Shri Ganganagar district of Rajasthan



Rathi

Native tract: Bikaner & Shri Ganganagar districts of Rajasthan



Red Sindhi

Native tract: In Pakistan, also found in Punjab, Haryana & Rajasthan & Uttarakhand



Tharparkar

Native tract: Jaisalmer, Barmer and Jodhpur districts in Rajasthan



Kankrej

Native tract: Kutch, Mehsana & Banaskantha districts of Gujarat

COWS



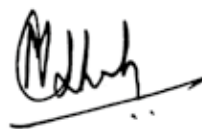
FOREWORD

India continues to be largest milk producer in the world since 1997 and dairying has been one of the main livelihood sources for our millions of dairy farmers most of whom are small and marginal with limited resources at their disposal. It is therefore of utmost importance that the dairy farmers have the knowledge of scientific animal husbandry practices to make dairying more profitable and sustainable. Scientific animal husbandry practices include various tenets of animal health, breeding and feeding.

Focused efforts in the field animal health, breeding and nutrition would however be pivotal to bring about sustainability in dairying. In our endeavor to bring about sustainable livestock transformation, we at the National Dairy Development Board are continuously striving to explore new technologies and activities which include- advanced reproductive technologies, scientific nutrition, cost effective and efficacious disease control coupled with manure management, solar, bee keeping, organic produce etc.

This handbook on scientific dairy practices has been designed keeping the requirements of the dairy farmers in mind. The handbook attempts to provide basic information on breeding, healthcare, management, nutrition, fodder production etc., based on existing and new technologies, along with illustrations. The information provided here has been compiled from multiple sources to help dairy farmers for better understanding.

We sincerely hope that the handbook would be beneficial to the dairy farmer.



Dr. Meenesh Shah
Chairman
National Dairy Development Board

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KEY INDICATORS FOR A SUSTAINABLE DAIRY FARM

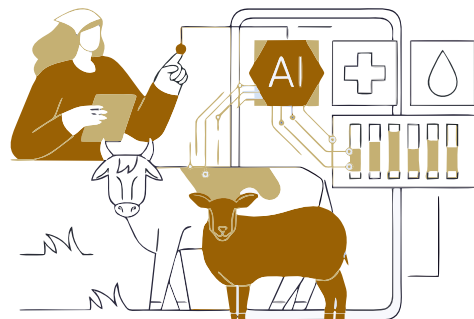
PRODUCTION TRAITS

- ✂ Birth weight
- ✂ Average daily body weight gain (ADG)
- ✂ Heifer hood Body weight
- ✂ Pregnancy weight gain
- ✂ Lactation yield
- ✂ Lactation length
- ✂ Fat %
- ✂ Dry period (DP)
- ✂ Wet Average
- ✂ Herd Average



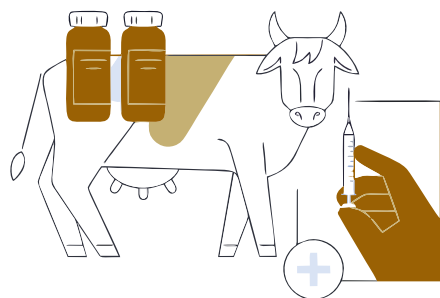
REPRODUCTION TRAITS

- ✂ Age at puberty
- ✂ Age at first calving (AFC)
- ✂ Calving interval (CI)
- ✂ Service period (SP)
- ✂ Conception rate (CR)
- ✂ Abnormality in Pregnancy
- ✂ Artificial insemination (AI) with high genetic merit bull (HGM) semen/sexed semen



HEALTH MANAGEMENT

- ✂ Calf mortality
- ✂ Incidence of mastitis
- ✂ Incidence of metabolic diseases
- ✂ Body condition score (BCS)
- ✂ Removal of diseased animal from the herd



PART I

ANIMAL HEALTH AND BREEDING

Animal health plays an important role in harnessing the expected production potential of dairy animals. A diseased animal cannot perform to the expected level. Timely intervention is therefore pivotal in reducing the economic losses due to diseases. Improvement of breeds is also the need of the hour and the farmer needs to be made aware of various aspects of breeding to be an active participant of breed improvement programmes. With this aim, the Part I of this booklet is divided into XIII sections which are as under:

- Section I General observation of an animal
- Section II Buying and inducting a new animal
- Section III Care of new born calf
- Section IV Diseases preventable by vaccination
- Section V Other important diseases
- Section VI Tick & fly borne diseases
- Section VII Tick, fly & worm control
- Section VIII Diseases that occur after calving
- Section IX Diseases that occur due to faulty feeding
- Section X Mastitis and diseases of teats
- Section XI Common poisoning conditions
- Section XII Common zoonotic diseases
- Section XIII Breeding and related activities

SECTION I

GENERAL OBSERVATION OF AN ANIMAL

General observation of certain parameters will guide you in assessing the health status of your animal which will in turn help you in seeking timely advice from a veterinarian.

Timely intervention can prevent or drastically reduce the losses due to diseases or other conditions. This section has therefore the following chapters:

- A. Seven questions for a healthy animal
- B. Observing basic health parameters
- C. Body condition score (BCS)



A. SEVEN QUESTIONS FOR A HEALTHY ANIMAL

1. Does the animal react normally to its environment and in the herd or is it acting strangely? (**Behaviour**)
2. Does it carry its head, ears, body and tail as usual? Does it walk normally? (**Attitude**)
3. Is the animal in good condition and is it well muscled, neither too thin or too fat? (**Condition**)
4. Does it eat, drink and ruminate properly?
5. Does it urinate and defaecate normally?
6. If a cow is in milk, is there a sudden drop in milk production?
7. Any other abnormal signs?

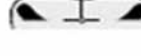
Consult a veterinarian in case any change is noticed

B. OBSERVING BASIC HEALTH PARAMETERS

- **Breathing frequency** - (Breathing in + breathing out) is 10-30 times per minute in normal adults and 30-50 times per minute in calves. Observed best from the animal's right flank, seen from behind.
- **Rumination** - Not less than 40 times per minute and 7-10 hours per day.
- **Rumen movement** - Two to three per minute, can be felt by pressing lightly on the upper part of the left flank.
- **Appearance** - A healthy animal has a shining, smooth and even coat as well as shiny horns and hoofs. Eyes should also be normal without discharge or tears and muzzle moist.
- **Fever** - Usually accompanied by rapid breathing, shivering and occasionally diarrhoea. Ears, horns and legs are usually cold to touch while body is too warm.

If any change is observed in the above parameters or fever seen, consult a veterinarian.

Body condition scoring

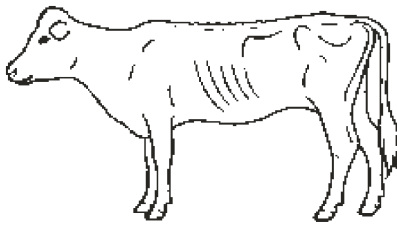
Scoring	Vertebrae at middle of the back	Rear view of the hook bone (cross-section)	Side view of the line between hook and pin bones	Cavity between tail head and pin bone (rear and side view)	Interpretation
Score 1 - Severe under-conditioning					Not in good health. Will not milk well or reproduce.
Score 2 - Frame obvious					Health may be OK. But milk production low and poor reproduction.
Score 3 - Frame and covering well					High producing, but fat may not be enough for peak production.
Score 4 - Frame not very visible					May have more metabolic problems at calving.
Score 5 - Severe over-conditioning					Extremely fat and will have metabolic and breeding problems.

Dry cows and calving cows should have a body condition score of 3.5 (See chapter on body scoring)

Observe your animals closely to help diagnose diseases early

C. BODY CONDITION SCORE (BCS)

- Body scoring is very important in assessing the health status of an animal.
- A low score may indicate diseases or improper feeding while a high score may indicate a high probability of breeding and metabolic problems.



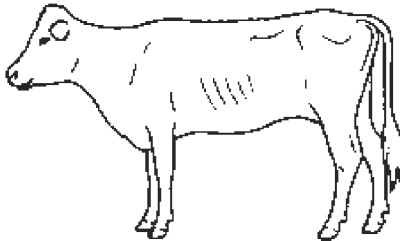
Body score 1

BCS-1

- Extremely thin. No fat in brisket or tail docks.
- All skeletal structures are visible.
- Dull hair
- May be diseased and survival during stress is doubtful



Cattle with body score 1



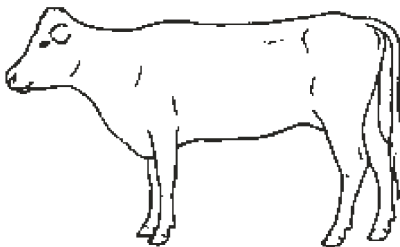
Body score 2

BCS-2

- Thin. Vertebrae, hips and pin bone prominent.
- Some tissue cover around tail dock, hip bones and the flank.
- Muscle tissue evident but not abundant, health may be OK.



Cattle with body score 2



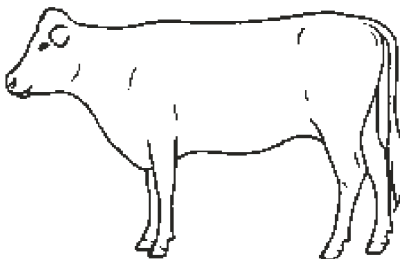
Body score 3

BCS-3

- Ribcage only slightly visible.
- Fat deposit behind shoulder obvious, ideal condition for calving.
- Fat deposit in brisket area.
- Hook and pin bone visible, but not prominent.



Cattle with body score 3



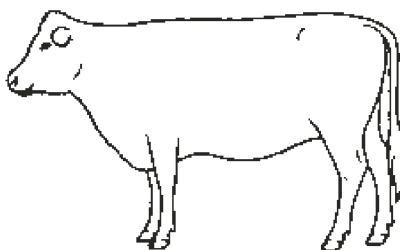
Body score 4

BCS-4

- Skeletal structure difficult to identify.
- Obvious fat deposits behind shoulder and tail head.
- Flat appearance to the top line.
- Folds of fat starting to develop over ribs and thighs.



Cattle with body score 4 may have metabolic problems at calving.



Body score 5

BCS-5

- Animal is obese, flat appearance dominates.
- Brisket is heavy and bone structure not noticeable.
- Tail head and hip bones completely buried in folds of fat.
- Back is flat and completely covered by fat.
- Mobility impaired by large fat deposits.



Cattle with body score 5 and above have high probability of metabolic and breeding problems.

Body condition score is a helpful yardstick to monitor health

SECTION II

BUYING & INDUCTING A NEW ANIMAL

Newly purchased animals are one of the major sources of infection and may introduce new diseases into your herd. Once you decide on what type of animals you want to rear based on your resources, purchasing healthy animals and implementing strict protocols for introduction into your herd is one of the most important components to prevent diseases occurring in your herd due to introduction of a newly purchased animal. Determining the age of the newly purchased animal will also be a helpful tool. This section consists of the following sections:

- A. Purchasing a new animal
- B. Inducting a newly purchased animal into the herd
- C. Determining the age of an animal

A. PURCHASING A NEW ANIMAL

Breed

A decision on what breed one wants to keep depends on the resources available with the farmer and the suitability of the breed to the locale. A decision on the breed should be taken only after detailed discussions with your local veterinarian/Krishi Vigyan Kendras (KVKs)/Kisan Call Centres.

Source

- Known disease free farms (either govt or private) where regular testing for diseases like TB, JD and brucellosis are done and positive animals removed would be ideal sources to procure your animals.
- It is better to buy animals from the owners' premises rather than from cattle markets/shanties since chances of the animal being exposed to diseases is high at these locations.

General signs to observe for in healthy animals during purchase

- Eyes: bright, clear and not runny (no discharge), crusty or bloodshot.
- Nose: cool, moist muzzle, with frequent licking; breathing should be regular and not laboured; beware of discharge, coughing, wheezing or irregular breathing.
- Coat: Glossy, clean and un-matted, free of ticks/lice, other parasites or eruptions.
- Weight: Average weight for the breed; beware of emaciated or thin animals.
- Attitude: Curious, alert and contented; beware of cattle that stand apart from the herd, that seem disinterested or that show signs of a bad temper.
- Mobility: Walking should be easy and free of limps; beware of slow or uneven gaits or hunched positions when sitting; the animal should be able to rise from seated positions with ease.
- Udder: Healthy; size isn't necessarily an indicator of a good udder. It should sit forward with prominent milk veins, not sag and not be too meaty. Observe the cow when she walks, the udder should not show too much sideways movement.
- Body score: This is an important indicator of the health of the animal. An animal in good health will have a body score between 3-4. (See chapter on body scoring)
- History: It is important to have a record of the detailed history of the animal on number of calvings, recorded milk yield during previous lactation, any specific disease occurrence like mastitis, prolapse of uterus, ROP, dystocia, hypocalcaemia etc.
- Age : Though not directly related to health, the farmer should also ensure the age of the animal by referring to its dentition. (See chapter on aging and dentition)

Transportation of animals

All steps should be taken to avoid stress while transportation. Adequate water, space, feed, water and rest should be provided at regular intervals while transporting, since stress predisposes to various diseases. The flooring should be provided with some bedding material like paddy straw.



Observe proper procedures while purchasing new animals

B. INDUCTING A NEWLY PURCHASED ANIMAL INTO THE HERD

Quarantine (Isolating the animal)

- The newly purchased animal should be kept in isolation without contact with the other animals atleast for 3 weeks. One should attend to the newly purchased animal only after attending the herd.
- Avoid attending to your herd after contact with the newly purchased animal without a proper wash and cloth change.
- Carry out routine deworming, fluke treatment (based on endemicity) and vaccination during the period of quarantine.
- For lactating animals, milk the newly purchased animal separately and, only after milking all the other animals in the herd.
- Always adopt an “all-in all-out” system, clean and disinfect the quarantine area before inducing another animal(s).

Testing during quarantine

The following tests should be performed while in quarantine.

1. For in-milk animals, test for sub-clinical mastitis (SCM)– If found positive, they should be treated and retested till negative results are obtained. In case these animals do not become negative for SCM on subsequent tests, they are most probably chronically infected.
2. Test for brucella
3. Test for bovine TB (bTB)
4. Test for Johne’s Disease (JD)

The following regional laboratories may be contacted for further information:

Note: An animal testing negative does not necessarily mean it is free from disease

For Northern region

1. Joint Director,
Centre for Animal Disease Research
and Diagnosis (CADRAD), Indian
Veterinary Research Institute (IVRI),
Izatnagar– 243122, Uttar Pradesh
2. Joint Director and In-charge
Northern Regional Disease Diagnostic
Laboratory, Jalandhar -144001, Punjab

For Southern region

Joint Director
Institute of Animal Health and Veterinary
Biologicals, Hebbal, Bangalore - 560024,
Karnataka

For Eastern region

1. Joint Director
Eastern Regional Disease Diagnostic
Laboratory, Kolkata-700 037,
West Bengal
2. Deputy Director
North Eastern Regional Disease Diagnostic
Laboratory, Khanapura, Guwahati-781 022,
Assam

For Western region

Joint Director
Western Regional Disease Diagnostic
Laboratory, Aundh, Pune-411 007
Maharashtra

Note : The local veterinarian should be contacted for taking samples for the test or testing the animals (bTB/JD) and for any other advise. Many State animal husbandry departments also do the tests in their laboratories.

Proper quarantine will protect your herd from diseases

C. DETERMINING AGE OF AN ANIMAL

Determining age of the animal is important while purchasing a new animal since the information provided by the seller may not always be reliable.

I. DETERMINING AGE BY DENTITION

At birth to one month, two or more temporary incisor teeth are present. By first month all 8 temporary incisors appear.



Dentition at 30 months

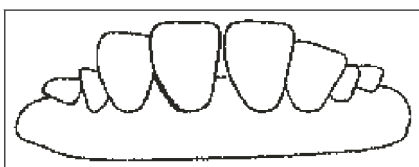
The central pair of temporary incisors are replaced by permanent ones which attains full growth by 2 years (thin arrows).

The third permanent incisor erupts at around 30 months of age (thick arrow)



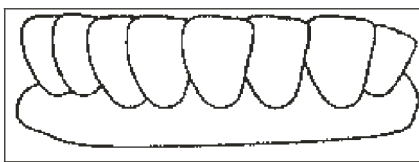
Dentition after 30 months

The fourth permanent incisors erupt after 30 months.



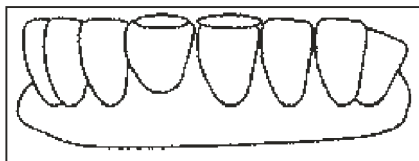
Dentition at 3 years

The second pair of incisors is fully developed at 3 years.



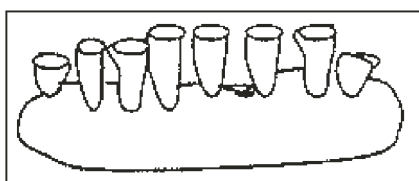
Dentition by 4-5 years years

By the 4-5 years the animal has a full set of permanent incisors. (In buffaloes by 5-6 years)



Dentition by 6th year

By the sixth year, the central incisor shows wear and leveled top.



Dentition by 10th year

The wearing progresses steadily after the sixth year and by the tenth year, all the incisors show significant wear and space in between them.



Dentition of a 3 year old cattle with 2 pairs of fully developed incisors



Dentition of cattle aged around 4-5 years with 4 pairs of permanent incisors.

II. DETERMINING AGE BY HORN RINGS

This is not a good guide and may give only a very rough idea. The first horn ring appears at 10-12 months. One ring is added approximately in a year. But at the fifth year, the first three rings may not be visible and after 8 years, none may be visible.

Determine the age of animal before purchase

SECTION III

CARE OF NEW BORN CALF

A calf is tomorrow's cow. From the health point of view, the life of a bovine is divided into two parts; the first 24 hours, and the rest. The first 24 hours of life of a calf is so important that it has a strong bearing on the rest of its life. A calf not provided adequate care in the first 24 hours may succumb to diseases or will always remain weak and an underperformer, even though it has good genetic potential and is provided a good environment. Another important reason for losing a calf is diarrhoea, the management of which is equally important till such time the cause is treated and cured. Keeping this in view, the following chapters are covered under this section:

- A. Care of new born calf
- B. Calf diarrhoea and its management

A. CARE OF NEW BORN CALF

The golden hour: The first hour after calving is the most critical period in the entire life of a new born calf.

Important points to remember:

- Clean nostrils and mouth which helps the calf breathe better and help prevent future breathing problems.
- Allow the mother to lick the calf clean which promotes circulation within the calf's body and prepares the calf to stand up and walk.
- Cut the navel cord at a distance of around 2 inches from the base with a clean instrument.
- Dip the navel (a simple smearing will not serve the purpose) in 3.5% or higher tincture of iodine solution ensuring a minimum contact time of at least 30 seconds.
- Tie the exposed end of the cord with a clean thread to close the opening.
- Repeat navel dipping after 12 hours. A poorly maintained navel is the gateway to serious infections.
- A new born calf should be given 2 litres of colostrum within the first 2 hours of birth and 1-2 litres (based on size) within 12 hours of birth.
- Many calves do not nurse adequate amounts of colostrum from their dams within the first few hours of life, and thus they may not receive adequate immunity.
- Feeding colostrum after 24 hours of birth may not help the calf to ward off infections.
- A calf must receive adequate colostrum to protect it from diseases for the first three months of its life. Colostrum is the calf's "passport to life".
- Hand-feeding new-born calves is therefore recommended so that the farmer is sure about the amount of colostrum an individual calf receives.
- De-worming should be done within 10-14 days of age subsequently on a monthly basis up to the 6th month.
- When the animal is 3 months old, contact the veterinarian for vaccination.
- Provide calf starter from 2-8 weeks for better growth and early maturity.

Example of a simple calf starter (approx. percentages)

Maize- 52 %; Oats - 20 %; Soya bean meal - 20 %; Molasses - 5 %;
Salt - 0.5 %; Minerals (Macro & Micro) - 1.5%; Vitamins - 1%



Licking stimulates the calf to stand up



Dipping the navel in 7% Tr.iiodine is very important in preventing navel infections



A new born calf should receive colostrum as early as possible



Hand-feeding to ensure adequate colostrum intake by calves

Timely care of new-born calf will ensure its survival

B. CALF DIARRHOEA

- Diarrhoea in calves can occur due to various reasons.
- Calves with diarrhoea lose considerable amounts of water and electrolytes.
- Diarrhoea and rapid loss of fluid and ions can cause sudden death in calf.

MANAGEMENT OF CALF DIARRHOEA

- Replace the lost water and electrolytes at the earliest - Feed 2-4 litres of electrolyte solution every day.
- The electrolyte solution provided should be over and above the normal feeding.
- Consult a veterinarian at the earliest to determine the cause of diarrhoea and to provide appropriate treatment.

Home electrolyte solution formula

(For 1 litre of warm water)

Glucose * - 5 teaspoons

Soda bi carb - 1 teaspoon

Table salt - 1 teaspoon

1 teaspoon=5 g (approx.)

** Calves do not digest table sugar (sucrose) effectively and addition may worsen diarrhoea leading to more fluid and electrolyte loss. Glucose is hence preferred.*

ASSESSING LEVELS OF DEHYDRATION

Dehydration level (%)	Symptoms
Up to 5%	No symptoms, animal is normal.
5 – 6%	Diarrhoea, no clinical signs, strong suckling reflex.
6 - 8%	Mild depression, skin tenting* 2-6 seconds, still suckling, sunken eyes, weak.
8-10%	Depressed, laying down, eyes very sunken, dry gums, skin tenting more than 6 seconds.
10-14%	Cannot stand, cool extremities, skin remains tented, comatose.
Over 14%	Leads to death

* The skin above the eye and around the chest and neck should rapidly snap back and return to normal when released. If the skin remains raised it is considered 'tented'. The time taken to return to normalcy indicates the level of dehydration.

Calves showing symptoms of above 8% dehydration require immediate intravenous fluid therapy, contact a veterinarian immediately.

PREVENTION OF CALF DIARRHOEA

- Ensure that adequate quantities of colostrum has been fed to the calf within 6 hours of birth to avoid failure of transfer of immunity.
- Ensure that the calf is maintained in a hygienic and dry environment.
- Ensure udder cleanliness before allowing the calf to suckle.

Early management of diarrhoea will save your calf

SECTION IV

DISEASES PREVENTABLE BY VACCINATION

Our country is endemic to many diseases that cause severe economic losses due to drastic reduction in the production capacity. Some of the diseases are even highly fatal. Fortunately, vaccines are available for most of these diseases in our country and can be easily controlled if timely vaccination is carried out in a mass scale, covering a large proportion of the susceptible population (at least 80%). This section describes the following diseases that can be easily prevented by resorting to timely and regular vaccination:

- A. Foot and Mouth Disease (FMD)
- B. Haemorrhagic Septicaemia (HS)
- C. Black Quarter (BQ)
- D. Brucellosis
- E. Infectious Bovine Rhinotracheitis (IBR)
- F. Rabies
- G. Anthrax
- H. Theileriosis
- I. Vaccination schedules for cattle and buffalo
- J. Important points to be noted during vaccination
- K. Common reasons for vaccination failure



A. FOOT AND MOUTH DISEASE (FMD)

- A highly contagious viral disease
- Spreads through contact, contaminated water, feed and air.
- Disease is rarely fatal for adults, however the milk production, fertility in females and draft power of males are severely impaired for life after recovery from disease.
- Usually fatal in calves.
- Also affects sheep, goat (usually sub-clinically and are maintenance hosts) and pigs, which are amplification hosts (multiplies the virus around 3000 fold).

SYMPTOMS



Foot lesion



Tongue lesion



Dental pad lesion



Udder lesion

- Drastic drop in milk production and working capacity (draft animals).
- Fever and serous nasal discharge and excessive salivation.
- Vesicles may be seen on tongue, dental pad, lips, gums etc.
- Vesicle in inter-digital cleft may lead to lameness.
- Lesions on teat may lead to mastitis.
- Loss in condition may persist even after recovery.

PREVENTION

- Get your animals aged 4 months and above vaccinated once in 6 months.
- Infected animals should be immediately separated since all excretions and secretions from infected animals contain the virus.
- All feed and fodder in contact with the infected animal should be destroyed.
- All equipment used should be cleaned and disinfected with 4% sodium carbonate solution or as suggested by a veterinarian.
- Healthy animals should not be handled by persons in contact with infected animals.
- The infected premises should be disinfected with 4% sodium carbonate solution or with the disinfectant suggested by a veterinarian.
- Vaccinating sheep, goat and pigs would control the disease to a better extend.
- Informing authorities promptly would enable them initiate control measures at the earliest which will help in limiting the spread of the disease.

MANAGEMENT OF FMD

- Treatment is only symptomatic, the disease will run its course.
- Emollients may be applied on lesions to soothe pain.
- Contact veterinarian for suitable advice.

Vaccinate your animals regularly against FMD to avoid economic losses

B. HAEMORRHAGIC SEPTICAEMIA (HS)

- This is an acute bacterial disease of cattle and buffaloes which usually occurs during monsoon.
- Mortality rate may be as high as 80 %.
- Germs of this disease survive longer in humid and waterlogged conditions.

SYMPTOMS

- High temperature, sudden decrease in milk yield.
- Salivation and serous nasal discharge.
- Severe oedema of the throat region.
- Difficulty in breathing, animal produces a grunting sound.
- Animal usually dies within 1-2 days of showing symptoms.
- Buffaloes are generally more susceptible than cattle.
- Animals with clinical signs, particularly buffalo, rarely recover.
- In endemic areas, most deaths seen in older calves and young adults.



Severe throat and brisket oedema

PREVENTION

- Segregate the sick animal from healthy ones and avoid contamination of feed, fodder and water.
- Avoid crowding especially during wet seasons.
- Vaccinate all animals which are 6 months and above of age annually before the onset of monsoon in endemic areas.

TREATMENT

- Treatment is usually ineffective unless treated very early , that is during the stage when fever sets in.
- Few animals survive once clinical signs develop.
- Case fatality approaches 100% if treatment is not followed at the initial stage of infection.



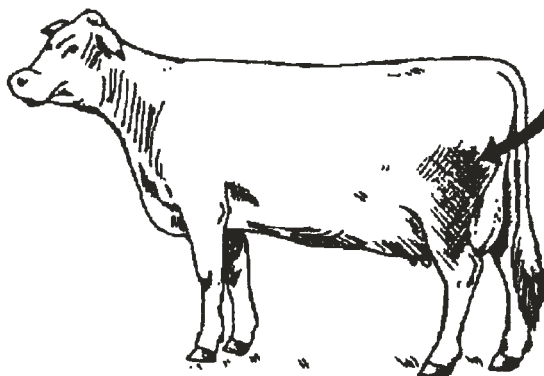
Get your animals vaccinated annually against HS before rains

C. BLACK QUARTER (BQ)

- An acute disease of cattle characterized by emphysematous swelling usually in heavy muscles.
- Buffaloes usually suffer from a milder form.
- Contaminated pasture appears to be major source of infection.
- Healthy animals in the age group 6 months to 2 years are generally affected.

SYMPTOMS

- Sudden high fever (107°F-108°F) and the animal stops eating and ruminating.
- Characteristic hot and painful swelling develops on loin and buttocks causing lameness. Swelling sometimes affects shoulders, chest and neck also. When pressed, a crackling sound is heard because of the gas accumulation in the swellings.
- Animal dies within 24-48 hrs of appearance of symptoms. At this juncture, swellings become cold and painless.



Swelling on legs

PREVENTION

- Vaccinate all animals which are 6 months and above of age annually before the onset of monsoon in endemic areas.
- Burning the upper layer of soil with straw to eliminate spores may be of help in endemic areas.
- Sprinkle lime over carcass at the time of burial.

TREATMENT

- Treatment may be effective in initial stages of infection. However in most cases treatment is not worth the while.

Get your animals vaccinated annually against BQ in endemic areas

D. BRUCELLOSIS (CONTAGIOUS ABORTION)

- An important bacterial disease of cattle and buffalo.
- Leads to loss in milk production, loss of calf, birth of weak or diseased calf, repeat breeding and even mastitis.
- Humans may also get the disease from consumption of raw milk of infected animal or contact with uterine discharges.
- The disease is very much prevalent in India, both in humans and animals.

SYMPTOMS



Joint swelling



Abortion



Retention of placenta

- Abortion occurs typically after 5th month of pregnancy.
- In an infected animal, chances of abortion reduces with number of calvings.
- No abortions may be observed after 4th calving, but dam and calf remain infected.
- Placental retention may lead to infection and even death of the animal.

PREVENTION

- Vaccinate female calves (not male calves) between 4-8 months of age.
- Only one vaccination is required in its lifetime to protect it from brucellosis.
- Any abortion from 5th month onwards should be suspected for brucellosis.
- Ideally such animals should be culled. If culling is not possible, isolate the animal immediately for a minimum of 20 days after calving/abortion.
- The aborted foetus, placenta, contaminated bedding, feed etc, should be buried (at least 4 feet deep) after a liberal sprinkling of lime. These materials contain very high bacterial loads and if disposed improperly cause the spread of disease by contaminating food sources (pasture, feed, water etc).
- Disinfect the shed after isolating the aborted animal.
- When the animal is in isolation, disinfect the lochial discharges (which also contain high bacterial loads) daily with 1-2% NaOH or 5% sodium hypochlorite (bleach) solution till the discharges cease (usually by 10 –15 days).
- Do not handle infected material with bare hands since the disease is zoonotic.

TREATMENT

- There is no effective treatment once the animal is infected since the bacteria remains in the body of the animal. Consult a veterinarian in case of suspicion.
- Disease in humans is curable provided proper treatment regimen is followed.



Vaccinate 4-8 month old female calves once - protect them for life.

E. INFECTIOUS BOVINE RHINOTRACHEITIS (IBR)

- An important viral disease affecting domestic and wild cattle and buffaloes.
- There are three forms : respiratory, genital and encephalitic, the first two are more common. There is a high prevalence of this disease in India.
- Causes abortions, ROP, moderate reduction in milk production and even death in calves. Infection can be transmitted through semen.

SYMPTOMS



Salivation

- Coughing, profuse bilateral serous discharge from nostrils and pyrexia.
- Rhinitis, conjunctivitis (one or both eyes) with profuse ocular discharge.
- In genital form, swollen vulva with papules which later become ulcers.
- Abortion is common at 6-8 months of pregnancy.



Genital form - Pustules on vulva

- Uncomplicated cases of respiratory and genital forms usually resolves in 5-10 days. Infected animals may carry the virus throughout its lifetime.
- The brain may be effected in calves below 6 months causing high mortality.



Respiratory form - Red nose



Respiratory form - Necrosis of mucous membrane

PREVENTION AND CONTROL

- Purchase new animals only after testing them.
- Induct only negative animals to your farm.
- Vaccination is a method of prevention.
- Consult a veterinarian immediately if the above symptoms are seen to prevent the disease from spreading.



Vaccination

IBR is an emerging disease that needs to be controlled

F. RABIES

- A highly fatal viral disease mainly transmitted by bite of a rabid dog.
- Humans can get the disease through bites of rabid dogs.
- Wild carnivores and bats also present a considerable risk where the disease is prevalent. The disease is endemic in India.

COMMON SYMPTOMS

- Hyperexcitability.
- Drooling of saliva
- Peculiar hoarse sound (bellowing)
- Aggression or paralysis
- The animal dies within 24-48 hours after appearance of first sign, which may be mostly seen within 3 weeks or as late as 5-6 months of the dog bite. Once symptoms are seen, death is inevitable.



Bellowing and salivation

PREVENTION

- Wash the wound immediately in running water for 5-10 minutes.
- Gently clean the wound with bath soap.
- Consult a veterinarian immediately.
- Carry out post-bite vaccination in suspected cases. (see chapter on vaccination)
- Protect your pet dogs and cats against the disease through annual vaccination.



Paralytic form of rabies

G. ANTHRAX

- A highly fatal bacterial disease affecting all farm animals.
- Disease is characterized by high fever, respiratory distress, bleeding from orifices and sudden death.
- Infection is due to ingestion of contaminated feed and fodder with spores of the bacteria, which can survive for up to 30 years in the soil.
- Treatment is usually ineffective unless done at very early stages.
- Humans get infection by eating infected raw meat, contact with infected animals or by inhalation of spores.



Sudden death

PREVENTION

- Regular annual vaccination of animals in endemic areas will prevent the disease from occurring.
- Vaccination may be carried out at least a month prior to expected disease occurrence in endemic areas.



Bleeding

- Never open a carcass of an animal suspected to have died from Anthrax.
- Contact a veterinarian immediately if the above symptoms are seen and seek advice on control measures to be adopted.

H. THEILERIOSIS (A PROTOZOAN DISEASE)

- Young exotic and crossbred cattle are highly susceptible. Indian breeds of cattle (Zebu) are comparatively resistant.
- Buffaloes are also infected but symptoms are mild.
- Fever, swollen peripheral lymph nodes, pallour of mucous membranes, anaemia, nasal discharge, jaundice, salivation, rapid and shallow breathing, watery eyes etc are common symptoms.
- Cattle lose condition rapidly.
- Some animals show nervous signs characterized by stepping gait, head pressing, recumbency, unconsciousness and death.



Swollen lymph node in a theileria infected calf.

PREVENTION AND TREATMENT

- Regular tick control is the most effective way to keep these infections in check (see chapter on tick control).
- Seek veterinary treatment if above symptoms of any of the above diseases are seen, since treatment is most effective in the initial stages. Delays may result in death.
- For control of theileriosis, give primary vaccination at the age of 3 months and above; revaccinate annually.

I. VACCINATION SCHEDULES FOR CATTLE AND BUFFALO

S.no	Name of Disease	Age at first dose	Booster dose	Subsequent dose(s)
1	Foot and Mouth Disease (FMD)	4 months and above	1 month after first dose	Six monthly
2	Haemorrhagic Septicaemia (HS)	6 months and above	-	Annually in endemic areas.
3	Black Quarter (BQ)	6 months and above	-	Annually in endemic areas.
4	Brucellosis	4-8 months of age (Only female calves)	-	Once in a lifetime
5	Theileriosis	3 months of age and above	-	Annually
6	Anthrax	4 months and above	-	Annually in endemic areas.
7	IBR	3 months and above	1 month after first dose	Six monthly (vaccine presently not produced in India)
8	Rabies (Post bite therapy only)	Immediately after suspected bite.	4th day	7,14, 28 and 90 (optional) days after first dose.
9.	Lumpy Skin Diseases (LSD)	4 months and above	-	Annually

* Follow the dosages and administration instruction as per the manufacture's guidelines.

J. IMPORTANT POINTS TO BE NOTED DURING VACCINATION

- Animals should be in good health at the time of vaccination.
- The cold chain of the vaccines wherever prescribed should be maintained till the time of administration to the animal.
- The manufacturers' instruction on the route and dosage should be strictly followed.
- A minimum vaccination coverage of 80% of population is required for proper control of the disease.
- It is beneficial to deworm the animals 2-3 weeks before vaccination is carried out for better immune response.
- Vaccination should be carried out at least a month prior to the likely occurrence of the disease.
- Vaccination of animals in advanced pregnancy may be avoided even though in most cases nothing untoward may happen.

K. COMMON REASONS FOR VACCINATION FAILURE

- Lack of maintenance of cold chain from the time of manufacture till vaccination.
- Poor immune response in weak and improperly fed animals.
- Lack of herd immunity due to only a few animals being vaccinated.



Vaccination is the easiest and cheapest way to prevent diseases

- Poor quality of vaccine - Quality will deteriorate if repeatedly thawed and cooled.
- Low efficiency or ineffective vaccine – May occur in case of strain variation (eg. FMD).

L. LUMPY SKIN DISEASE

- It is a viral disease caused by a pox virus.
- It is an emerging disease in India.
- Biting insects and ticks may transmit the disease.
- Direct contact does not play a major role in the transmission of the virus.

SYMPTOMS

- Fever and marked reduction in milk production.
- Enlarged superficial lymph nodes.
- Rhinitis, conjunctivitis and excessive salivation.
- Cutaneous nodules of 2–5 cm diameter seen all over the body within 48 hours of onset of fever.
- Nodules are circumscribed, firm, round and raised, and involve the skin, subcutaneous tissue and sometimes even the underlying muscles.
- Large nodules may become necrotic and eventually fibrotic and persist for several months.
- Small nodules may resolve spontaneously without consequences.
- Myiasis of the nodules may occur.
- Vesicles, erosions and ulcers may develop in the mucous membranes of the mouth and alimentary tract and in the trachea and lungs.
- Pregnant cows may abort and may not come into heat for several months.
- Bulls may become permanently or temporarily infertile.



Enlargement of superficial lymph node



Nodules on body and muzzle

PREVENTION AND TREATMENT

- Ensure proper arthropod control.
- Provide primary vaccine at age of 4 month and above; repeat annually.
- Consult a veterinarian immediately if symptoms are observed.

SECTION V

OTHER IMPORTANT DISEASES

There are certain other diseases which cause severe economic losses but cannot be prevented by vaccination since there are no vaccines available . A few of these diseases are self limiting and proper care and treatment during infection may aid in recovery.

Besides these, there are some diseases which are incurable and the only option is to isolate and remove infected animals from the herd to prevent infection spreading to other animals. The clinical symptoms are seen only late in the disease and animals can spread the infection before exhibiting any symptoms. This section therefore deals with the following important conditions:

- A. Johne's Disease (JD)
- B. Bovine Tuberculosis (bTB)
- C. Mycotoxicosis
- D. Ephemeral Fever (Three day sickness)
- E. Foot rot
- F. Dermatophytosis
- G. Dermatophilosis
- H. Clostridial Infections



A. JOHNE'S DISEASE

- An important bacterial disease of ruminants causing long-lasting diarrhoea with heavy economic losses.
- Loss of weight despite good appetite.
- Bottle jaw may also appear.
- Once clinical signs appear the animal will not recover and will continue to deteriorate.

PREVENTION AND CONTROL



Loss of weight

- Johne's disease is not curable.
- Positive animals should be culled from farm as it may infect other healthy animals.
- Purchase new animals only after testing them.
- Induct only negative animals to your farm.
- Carry out regular testing of your animals.
- Consult a veterinarian to test your animals for Johne's disease.

B. BOVINE TUBERCULOSIS (BTB)

- It is also an important bacterial disease of cattle and buffalo.
- The disease develops over a number of years and results in weakness, coughing and weight loss.
- Also leads to anorexia, emaciation, difficulty in breathing, enlargement of lymph nodes and diarrhoea.
- The disease is also transmissible to humans.

PREVENTION AND CONTROL

- Bovine Tuberculosis is also not curable.
- Positive animals should be culled from farm as it may infect other healthy animals.
- Purchase new animals only after testing them.
- Induct only negative animals to your farm.
- Carry out regular testing of your animals.
- Consult a veterinarian to test your animals for bTB.

Purchase only negative animals to avoid TB and JD.

C. MYCOTOXICOSIS

- Disease is caused by toxins produced by mold (fungus) that grows on feed (eg. ground nut cake, maize etc) and stored fodder (paddy straw etc) that is damp. Mainly result in Aflatoxicosis and Degnala disease in bovines.
- The toxins can occur in concentrations high enough to cause major losses in health and performance of the animal.
- The economic impact of reduced productivity is many times the impact caused by fatalities, milk production may drop by more than 15%.



Mold growth on cattle feed stuffs



Mold growth on paddy straw

COMMON SYMPTOMS

- Gradual loss of appetite and body condition, intermittent diarrhoea may be seen.
- Alopecia, sloughing of extremities like tail and ear.
- Gangrenous lesions on foot.
- High producers may show symptoms first.
- Reduction in feed consumption, reduced fertility, abortions, weight loss, increased occurrence of ketosis, Retention of Placenta (ROP), metritis, mastitis and other diseases due to lowered immunity.



Gangrenous foot lesions and tail necrosis due to aflatoxins.

PREVENTION

- Avoid feeding dry fodder that is or has been damp and is obviously moldy and also avoid feeding feed ingredients with fungus.
- Provide adequate mineral mixture supplements and green fodder.
- Consult a veterinarian immediately on observing any of the above symptoms.

Avoid feeding moldy straw and feed-prevent mycotoxicosis.



D. EPHEMERAL FEVER (THREE DAY SICKNESS)

- Ephemeral fever is viral disease of cattle and buffalo.
- It is an insect-transmitted disease.
- Persists usually for 3 days.
- Morbidity may be very high but mortality is very low (1-2%).

SYMPTOMS

- Biphasic to polyphasic fever with shivering, tears from eyes and decreased appetite.
- Nasal discharge, drooling, labored breathing, depression, stiffness, lameness and sudden decrease in milk yield.

PREVENTION AND TREATMENT

- Spontaneous recovery usually occurs within a few days.
- Proper fly control would help to reduce the disease (See chapter on fly management).
- Complete rest is the most effective treatment. Recovered animals should not be stressed or worked for some days since relapse may occur.
- Consult a veterinarian for symptomatic treatment.



Nasal discharge, drooling

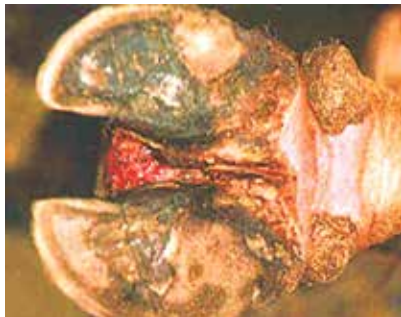


Unable to rise

E. FOOT ROT

- Foot rot is a bacterial infection which is of great economic importance for dairying.
- The incidence varies according to weather, season of year, grazing periods, housing system, type of flooring etc.
- Stony ground, sharp gravel and pasturing on coarse stubble also predispose to the condition.

SYMPTOMS



Foot rot with lesion

- Fever and anorexia.
- Reduced milk yield.
- Swelling of inter-digital space.
- Foul smell from lesion.
- Severe lameness - Animal holds leg in air to relieve pressure.



Severe foot rot

- Hind feet are affected most often and cattle tend to stand and walk on their toes.

PREVENTION AND TREATMENT

- Remove sources of injury and keep feet dry and clean.
- Animals that are actively shedding infectious organisms should be isolated until signs of lameness have disappeared.
- Steps should be taken to ensure that areas around drinking troughs, gateways, and tracks are adequately drained.
- Preventive use of a footbath with an astringent and antiseptic solution.
- Systemic therapy is more important than topical treatment.
- Prompt diagnosis and initiation of parenteral antimicrobial therapy are essential to achieve a satisfactory response.
- If improvement is not evident within three to four days, it may mean the infection has invaded the deeper tissues.
- Contact a veterinarian immediately on observing the above symptoms.



Regular foot bath is useful in preventing foot rot

Proper foot care is very important



F. DERMATOPHYTOSIS

- Fungal disease of keratin tissue (skin and hair).
- Caused by a group of fungi called dermatophytes.
- Direct contact is the most common method of transmission.
- May be transmitted to humans.
- Though lesions are unsightly, economic losses are minimal.
- Lesions may cause some degree of discomfort or may lead to secondary bacterial infection.

SYMPTOMS

- Circular and slightly raised grey-white areas on skin called crusts.
- Size of lesions are very variable and can become very extensive.



Crust formation in dermatophytosis

PREVENTION AND TREATMENT

- Usually recovers without treatment; however this can take many months.
- Clean and disinfect premises regularly.
- Reduce the density and direct contact between animals.
- Increase exposure to sunlight.
- Medicine to be applied topically after removing the crusts by scraping or brushing since medicine cannot penetrate the crust.
- Crust should be collected and burned to avoid contamination of premises.
- Consult a veterinarian for proper treatment.

G. DERMATOPHILOSIS

- The disease affecting the skin is caused by *Dermatophilus congolensis*, a type of bacteria.
- Direct contact or biting insects may transmit the disease.
- Prolonged wetting by rain, high humidity and temperature and, presence of ectoparasites are predisposing factors.
- The organism can remain in a dormant form in the skin until the conditions are appropriate.
- Can be transmitted to humans.

SYMPTOMS

- Lesions are characterized by dermatitis and scab formation.
- Lesions can be observed in 3 stages (i) hairs matted together as paint-brush (ii) crust or scab formation as the initial lesions coalesce (iii) wart- like lesions due to accumulation of cutaneous keratinized material.
- Most affected animals recover spontaneously within 3 weeks of initial infection.
- Onset of dry weather hastens healing.
- There is severe productivity loss in animals with extensive lesions.
- Deaths may occur, especially in calves.



Scab formation in dermatophilosis

PREVENTION AND TREATMENT

- Avoid damp conditions.
- Proper ectoparasite control.
- Hand-washing with an antibacterial soap after handling infected animals to avoid infection in humans.
- Consult a veterinarian for proper treatment.



H. CLOSTRIDIAL INFECTIONS

The diseases caused by *Clostridium* bacteria, are significant in farm animal production due to their ability to produce potent exotoxins, causing major economic losses for farmers. These bacteria can spread through infected animals, carriers, and contaminated animal products like bones, hides, and meat. However, they typically only cause disease under specific conditions that enable their multiplication and tissue invasion. Clostridial infections are severe, with sudden onset and explosive outbreaks.

a. Tetanus

- Tetanus is a non-contagious disease caused by exotoxins produced by *Clostridium tetani*, commonly found in soil and the intestines of humans and animals.
- Infection occurs when spores enter through wounds or lesions, often linked to surgical procedures or improper wound care. Favourable conditions, such as devitalized tissue, allow the spores to germinate and release toxins, which causes the clinical symptoms of tetanus.
- Symptoms include muscle stiffness, jaw trismus (lockjaw), neck rigidity, dysphagia, hyperextension of limbs, opisthotonos, and eventually death due to respiratory failure within 3–4 days of symptom onset.
- The treatment may be effective in initial stage but the disease can be prevented with vaccination.



Spastic paralysis

b. Botulism

- Botulism is a lethal food poisoning in cattle caused by eating material that contains *Clostridium botulinum* toxins. This anaerobic bacillus is classified into seven types (A to G). Types A, B, E and F cause human botulism.
- Infection typically occurs when cattle consume spoiled silage, decaying carcasses, or contaminated water containing botulinum toxins.
- Animals with high nutritional requirements, such as pregnant or lactating females, raised on soils and pastures poor in minerals, especially phosphorus.
- Without adequate mineral supplementation, animals develop the habit of eating bones or corpses seeking to supply its mineral deficiencies. However, at the same time, they ingest pre-formed neurotoxin during the decomposition of carcasses, which led to large epidemics of the disease.
- The clinical signs viz., weakness, muscle incoordination, depression, and paralysis, followed by death. Treatment for this condition is generally unsuccessful, so prevention is the key to control.
- To control this condition, it is essential to remove the contaminated animal or plant products in and around animal environment. Presently, no vaccine is available in India.



Flaccid paralysis

SECTION VI

TICK AND FLY BORNE DISEASES

Tick infestation is a major problem for dairy farmers. Many farmers find it difficult to control the problem. Ticks and biting flies cause a great amount of discomfort to the animal and also drain the animal of considerable amounts of blood, which in itself leads to a significant decrease in productivity. More importantly, they are also responsible for transmitting some diseases that destroy the blood cells. Infected animals, if not treated in time will succumb to the infection or remain chronically ill. It is therefore important to understand the symptoms of such diseases so that timely advice and treatment is sought from a veterinarian. The following chapters are covered under this section:

- A. Anaplasmosis
- B. Babesiosis
- C. Trypanosomiasis
- D. Theileriosis (Refer chapter H of section IV)



TICK- BORNE INFECTIONS

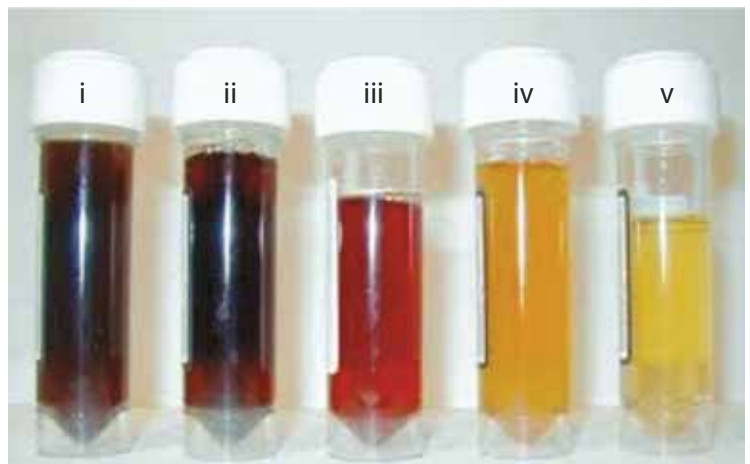
Anaplasmosis, Babesiosis and Theileriosis (already covered under chapter H of Section IV) are the three main tick-borne infections affecting blood.

A. ANAPLASMOSIS

- Anaplasmosis is caused by a small type of bacteria called rickettsia.
- Anaplasmosis can also be spread by blood contaminated needles or AI gloves.
- Calves are more resistant to anaplasmosis than older cattle.
- Carriers exist in endemic areas which act as reservoirs of infection.
- Chronically infected cattle may relapse in adulthood.
- Fever, fall in milk production, progressive anaemia, jaundice, abortion are the common symptoms.
- In later stages, inappetence, incoordinated movements, breathlessness when exerted, and a rapid pounding pulse are usually seen and animals may succumb.
- The disease is curable if treated promptly in early stages.

B. BABESIOSIS

- Babesiosis is caused by a type of microbe called protozoa.
- Fever, inappetence, increased respiratory rate, sharp decrease in milk production, muscle tremors, anaemia, jaundice, abortion, constipation or diarrhoea are the common symptoms.
- Curable if treated promptly.
- In later stages, loss of weight with haemoglobinuria is seen. Nervous symptoms may also be seen.
- It is better to repeat treatment if colour of urine does return to normal by 24 hours after treatment.
- Babesiosis is not to be confused with “Red Water Disease” which is an acute highly fatal bacterial disease seen especially in areas with liver fluke infestation.



Urine before treatment (i) and progressive improvement (ii to iv) to normal (v) after prompt treatment.

Treat tick-borne infections promptly – save your animal

C. TRYPANOSOMIASIS (SURRA)

- An important disease of cattle and buffalo caused by protozoa.
- Transmitted mechanically by biting flies.
- Cattle and buffalo also are reservoir hosts to horses and camels.
- Blood from infected animal, occasionally meat and milk are the sources of infection.
- There is severe loss of productivity due to anaemia. Animals under stress are more susceptible to the disease.

BITING FLIES THAT CAN TRANSMIT SURRA



Tabanus



Stomoxys



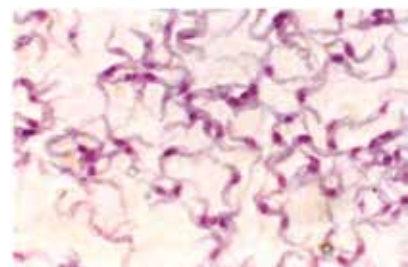
Haematobia

SYMPTOMS



Weak and anaemic animal

- Progressive anaemia, weight loss and weakness.
- Abortions, infertility and stillbirth may occur in buffaloes.
- Cattle may have a chronic course with high mortality and may last up to 2 years.



Tryps in blood

- Death may occur in 2 weeks to 2 months.
- Oedematous swellings of the lower parts of the body (legs, briskets and abdomen) may be seen.
- Lymph nodes also may be swollen.
- Nervous signs like head tilt, circling, blindness, hyper-excitability, paddling movements may also be seen.

PREVENTION

- Control fly population (see chapter on fly control).
- Sufficient ventilation and sunlight should be available in the shed.
- Insecticide applications may be done in the shed and surrounding areas under advice of a veterinarian.

TREATMENT

- Call the veterinarian immediately on seeing the symptoms for treatment.
- Timely and early treatment ensures a high cure rate.

Control biting flies – control Surra

SECTION VII

TICK, FLY AND WORM CONTROL

Both external (tick and flies) and internal parasites (worms) cause a marked reduction in the production potential of the animal. As already discussed in the previous section, ticks and flies also are responsible for transmitting certain diseases. Worms inside the body drain the animal of valuable nutrients. Infestations with worms lead to poor growth rate, diarrhoea, delayed maturity, weakness, increased susceptibility to infection, low response to vaccination and in severe cases, may lead to death. A little attention in controlling the external and internal parasites would go a long way in harnessing the production potential of the animal. This section therefore deals with the following chapters:

- A. Tick and fly control
- B. Management of worm infestation

A. TICK AND FLY CONTROL

- Ticks transmit diseases like anaplasmosis, theileriosis and babesiosis (see chapter on tick-borne diseases).
- Biting flies transmit diseases like Surra and E fever (see respective chapters).
- Heavy infestations may lead to anaemia and significant loss in productivity.
- Tick and biting flies cause severe discomfort to the animal.
- May cause allergic reactions at the biting sites.
- They lay a large number of eggs resulting in further increase in population.



Various types of ticks



A tick with eggs



Skin allergy due to tick bite



Skin allergy due to fly bite

I. TICK CONTROL

- Any newly purchased animal should be completely de-ticked before allowing to mix with other animals.
- Carry out periodic application of acaricide on the animal.
- Each adult tick lays around 3000 eggs and the larvae can survive from 2-7 months, based on the climate, without feeding.
- All cracks and crevices in the cattle shed therefore should be sprayed with a higher concentration of the acaricide along with application on the body to avoid re-infestation. Flaming also can be done using a flame gun if available, with a little bit of caution.
- The acaricide group should be changed often to avoid resistance from developing.
- The acaricide should be applied in proper concentration.
- Seek advice from a veterinarian on the appropriate acaricide and its dosage.

II. FLY CONTROL

- Proper manure and urine disposal on a regular basis. Disposal should be done at a reasonable distance from the cattle shed.
- Any stagnation of drainage should be avoided.
- Smoking the shed with raw leaves (neem leaf preferred) especially during evenings would help reduce the nuisance.
- Fly repellants may be used in proper concentration.

Natural repellants like neem oil etc, may be applied regularly to repel both biting flies and ticks. This does not have any harmful effects of chemicals and chances of resistance developing are also remote. Application should be always done against the direction of the hair and should cover the entire body, especially underbelly and legs.

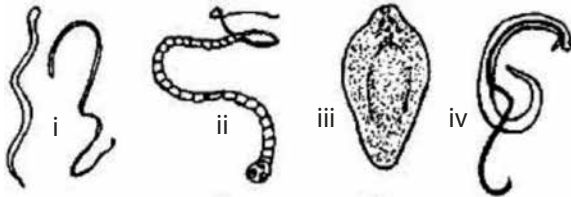


B. MANAGEMENT OF WORM INFESTATION

- Worms are parasites that usually live inside the digestive tract of the host, feeding on tissue fluids or blood of the animal. Worms may also be found in lungs, nasal passage, eye etc.
- Eggs are passed through the faeces which contaminate pasture, feed or water sources. Some cause disease in humans also.
- There are basically four types of worms : (i) Round worms and (ii) Tapeworms-found in the digestive tract; (iii) Flukes- found in the rumen and liver and (iv) Schistosomes – found inside blood vessels. (See figure below)
- Different treatment regimens are required based on the type of the worm.

SYMPTOMS OF WORM INFESTATION

- Diarrhoea, delayed age at maturity, reduction in growth rate and milk production, lower reproductive, draft and feed conversion efficiencies, lower disease resistance, anaemia etc.
- In amphistome (rumen and liver fluke) infestation, severe foetid diarrhoea and sub-mandibular oedema (bottle-jaw) may be seen.
- Jaundice may be seen in liver fluke infestation.
- In tapeworm infestation, pot-belly and moving small white segments in faeces maybe seen. It may also cause intestinal obstruction due to its length.
- Hookworm (type of round worm that sucks blood) and schistosome infestation may cause severe anaemia and bloody diarrhoea.
- Thick nasal discharge, snoring and shortness of breath may be seen in nasal schistosome infestation. Cough is seen in lunaworm (type of round worm in lung) infestation.



Different types of worms



Weak animal



Bottle-jaw

PREVENTION AND TREATMENT

- First dewormer dose to calves to be given between 7-10 days of age and repeated monthly till 6 months of age.
- Administer dewormer to all animals above 6 months of age twice a year, once at the beginning and another at the end of the rainy season. Ensure administration on the back of the tongue rather than into the mouth to avoid rumen bypass.
- Adopt deworming on a mass scale to reduce the egg load of worms in the soil.
- Pregnant animals should also be dewormed twice, 1st dose near its calving time and the 2nd dose around 6-7 weeks after calving.
- If the animal is not responding to treatment, get the dung of the animal examined by a veterinarian to determine the type of worm and provide appropriate drug as advised.
- In areas with snail population (water-logged etc), flukes and schistosomes may be suspected, since snails are involved in completion of its lifecycle.
- To avoid drug resistance, do not administer the same drug repeatedly .
- For any worm treatment to be effective, the drug must be provided in adequate dosage, consult a qualified person for proper advise.

Deworm your animals regularly – Increase the productivity

SECTION VIII

DISEASES THAT OCCUR AFTER CALVING

There is a huge increase in the requirement of nutrients and minerals in the body immediately after calving. Unless the body of the animal is conditioned properly through proper management and feeding during pregnancy, there is a high probability of such animals developing disease conditions due to such nutritional deficiencies which are collectively called “Metabolic Diseases” which leads to drastic decrease in milk production or even leads to death if timely treatment is not given. It would be important to identify the symptoms of such diseases so that prompt veterinary aid can be sought. The chapter describes the following disease conditions:

- A. Hypocalcaemia (Milk Fever)
- B. Hypomagnesaemia
- C. Ketosis
- D. Post-parturient Haemoglobinuria
- E. Prolapse of Uterus
- F. Retention of Placenta
- G. Udder Oedema
- H. Fatty Liver Syndrome (Lipidosis)



A. HYPOCALCAEMIA (MILK FEVER)

- Occurs due to low calcium level in blood, there is actually no fever. May also cause dystocia, ROP and uterine prolapse.
- Occurs usually within 72 hours of calving. Initial stage is excitability with fine tremors over flank and loins, ear twitching and head bobbing.
- Complete milking during the first 48 hours of calving may precipitate milk fever in some cases.
- The animal is unable to stand up and in later stages become recumbent, first with its neck turned to one side and then laterally. Eye reflex is also lost.
- In last stage the animal becomes unconscious with sub-normal temperature.
- Hypocalcaemia also exists in sub-clinical form with greater risk of the animals developing fever, metritis & ketosis. More losses are thought to occur from this form.

VARIOUS STAGES IN MILK FEVER



Unable to get up



Head turned to one side



Lateral recumbency

PREVENTION AND TREATMENT OF MILK FEVER

- Do not feed calcium supplements in excess during late pregnancy.
- Chances of milk fever in prone animals is reduced greatly if given 3-4 doses of oral calcium 12-24 hours before calving to 48 hours post calving, with each dose providing 40-50 g of calcium.
- Anionic salts like ammonium chloride and magnesium sulphate or ammonium sulphate (50-100 g each/day) may be fed during last 3 weeks before calving.
- Contact veterinarian immediately if symptoms are seen, animals respond to therapy instantly. If left untreated, the animal will succumb.
- Some animals may relapse within 24-48 hours and require further treatment.
- An animal should ideally have a urine pH between 6.5-7 near the time of calving. Higher pH indicates increased risk of milk fever.

B. HYPOMAGNESAEMIA

- Occurs due to low magnesium levels in blood, adult lactating animals are most susceptible. May occur in calves also.
- Normal animal suddenly throws up its head, bellow, gallop and fall exhibiting severe paddling convulsions which are repeated in short intervals.
- In milder cases animal walks stiffly, is hypersensitive to touch and sound, urinates frequently and may progress to convulsive stage after 2-3 days.
- Often occurs along with hypocalcaemia. Untreated animals will die.
- Soils fertilized with potash and nitrogen are high risk areas.

PREVENTION AND TREATMENT OF HYPOMAGNESAEMIA

- Provide Magnesium oxide @ around 50 g per day to animals at risk.
- Contact veterinarian immediately if symptoms are seen, animals respond to therapy instantly. May relapse after 1-2 days which require further treatment.

Timely treatment will save your animal

C. KETOSIS

- Occurs in lactating animals usually during the first 2 months of lactation.
- Initially there is slight decrease in feed intake, drop in milk production, lethargy and firm mucous covered dung.
- As disease progresses, there is marked weight loss, pica (animal seeks coarse materials), humped-back posture. Some even show frenzy and aggression.
- Compulsive licking of mangers, bodies, head and nose pressing, chewing bellowing may occur.
- Walking may be abnormal with staggering, circling and falling.
- If untreated, milk production decreases to an insignificant amount.
- Once a cow develops the condition, it is likely to recur in succeeding lactations.

PREVENTION AND TREATMENT OF KETOSIS

- Proper feeding during late lactation and dry period.
- Body score at calving should be 3.5 on a 5 point scale.(see chapter on body scoring)
- Sudden change of feed /overfeeding should be avoided.
- Conditions like ROP, metritis, mastitis, environmental stress etc should be managed properly.
- Contact a veterinarian when above symptoms are seen.



Weight loss in ketosis

D. POST PARTURIENT HAEMOGLOBINURIA

- Recent parturition, heavy milk production, phosphorous & copper deficiency, excess consumption of turnips, rape (Brassica species), sugar beet pulp etc, are considered as predisposing factors.
- Symptoms are haemoglobinuria, marked drop in milk production, fever, diarrhoea, severe anaemia, weakness and pallor and sloughing of the extremities.
- Diseases like babesiosis and theileriosis have to be ruled out.
- Contact a veterinarian when above symptoms are seen.



Haemoglobinuria

Timely treatment will save your animal



E. PROLAPSE OF UTERUS

- More common in buffaloes than in cattle.
- May have genetic predisposition and may occur pre or post partum.
- Place the prolapsed mass gently over a clean surface and protect it from soiling /flies/birds etc.
- Do not attempt to remove anything or push the uterus back, this may cause severe bleeding.
- Gently wash with saline solution if excessively soiled.
- Call a veterinarian for further treatment at the earliest.
- Prone animals may be kept with the hind quarter at a slight elevation.
- Check the vulval area for any stitch marks before purchasing an animal.



Prolapse of uterus after calving

F. RETENTION OF PLACENTA (ROP)

- Normally foetal membranes are expelled within 3 to 8 hours after delivery.
- It is termed as ROP if foetal membranes are not expelled even after 12 hours of parturition.
- Chances of ROP are increased in cases of abortion, dystocia, milk fever, twin birth, induction of calving, infection and nutritional disturbances.
- Never pull the placenta on your own.
- Consult a veterinarian to avoid complications like metritis, septicaemia etc which may lead to even death of the animal.
- Dispose the removed placenta by deep burial. Avoid handling it with bare hands.



Retained placenta

G. UDDER OEDEMA

- Accumulation of excess fluid in udder and sometimes in the belly around calving time.
- Mainly due to increased blood flow to udder against decrease flow from udder and increased permeability of blood vessels in the udder.
- More prevalent in high producing animals, especially heifers.
- Udder is not painful or hot and should not to be confused with clinical mastitis.
- Predisposing factors may be genetic, nutritional, obesity, lack of exercise.
- May become chronic and persist throughout lactation.
- Veterinarian may be consulted if the oedema interferes with milking the animal.



Cow with udder oedema

Proper management will lead to resolution

H. FATTY LIVER SYNDROME (LIPIDOSIS)

- Fatty liver can develop within 24 hours of an animal going off feed.
- This is typically happens around calving time. Fat mobilisation occurs as a result of negative energy balance which is exacerbated when off feed.
- The broken down fat is then converted back to fat in the liver thus the liver is filled with fat even when the cow is losing condition.
- Once fat is deposited in the liver, its concentration in the liver does not fall until the cow gets into positive energy balance, which can be over ten weeks after calving, particularly if the fatty liver is severe.
- Fat cows (Body Condition Score greater than 3.5) are much more prone to fatty liver. (Please see chapter on Body Condition Scoring)
- It is an important economic disease especially in high yielders because cows that develop fatty liver are affected by multiple metabolic and infectious diseases.

SYMPTOMS

- Lower milk yields
- Depressed appetite
- Incidences of milk fever, ketosis, mastitis, retained fetal membranes etc
- Reduced fertility
- This condition can be detected by blood tests.
- Mortality can be high.

PREVENTION

- There is no proven treatment for fatty liver.
- Ensuring that cows are calving at the correct body condition would prevent the breakdown of fat and fatty liver.
- An ideal body condition score to calve would be between 3 to 3.5 Cows should be dried off at this score and weight maintained through the dry period.
- Changing diets during this period should be avoided.
- Consult a veterinarian immediately if the above symptoms are seen.
- Glucose supplements can be given to overfat animals as preventive measure.
- Minimising stress is important for prevention of fatty liver. Sudden changes in environment should be avoided.



Fat cows are more prone to lipidosi

Overfeeding pregnant cattle may be risky



SECTION IX

DISEASES THAT OCCUR DUE TO FAULTY FEEDING

The digestive system of cattle is highly complex with the stomach having four chambers. The digestive process is based on the action of various types of microbes which break down the feed and provide nutrients to the animal. Any sudden change in feeding pattern or an improper feeding regimen is bound to disturb the balance of the various types of microbes, leading to an over population of certain unfavourable microbes that may cause various problems like laminitis or even death in severe cases (acute acidosis). Such conditions may also arise from interference in the process of natural gas expulsion produced as a bye-product of microbial digestion. It is important to understand the common conditions so that timely advice or treatment can be sought from a veterinarian. The following conditions are described under this section:

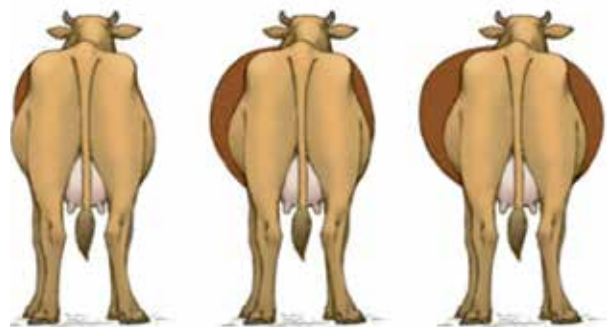
- A. Bloat
- B. Rumen Acidosis
- C. Sub-acute Ruminant Acidosis (SARA)
- D. Laminitis

A. BLOAT

- Bloat is a form of indigestion marked by excessive accumulation of gas in the rumen.
- Bloat can occur when the animal grazes on lush young pasture, particularly if the pasture is wet. Some plants, e.g. clover, lucerne and alfalfa are especially dangerous in causing bloat but any fast growing plants can cause it.
- Choking due to foreign objects (esophageal obstruction) will also cause bloat by preventing gas release and causing accumulation of gas in the rumen.
- Sometimes feeding of leftover food such as dry bread can cause bloat.

SYMPTOMS OF BLOAT

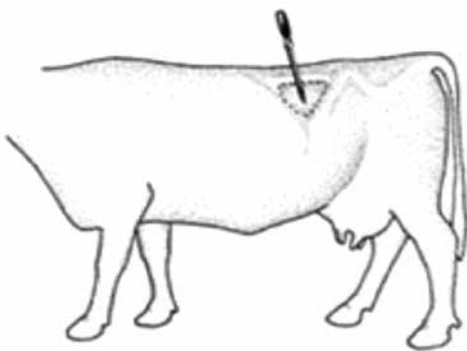
- The left flank balloons out.
- The animal kicks its belly or stands with its back legs wide apart.
- It has difficulty in breathing.
- In severe cases, death occurs due to asphyxiation.



Bloating can be mild to fatal

PREVENTION AND TREATMENT

- Avoid moving animals to wet pasture in the morning.
- Do not allow very hungry animals to graze a pasture. Offer dry, cut grass first before turning out to graze.
- Home remedies may be used in mild cases.
- In severe cases, puncturing the left flank with a sharp knife to release the gas is necessary, it will be necessary for you to act quickly as any hesitation could lead to the death of the animal.



Point for puncturing in the left flank

Home remedies for adult animals

- Drench coconut/vegetable /peanut oil: 300-500ml once a day for 2-3 days till recovery. Or;
- Above plus 30-40 ml turpentine oil. Or;
- Drench 1 tablespoon of detergent in half litre of water once. Or;
- Feed 4-6 banana leaves (mild bloat)

Timely treatment of bloat will save your animal

B. RUMEN ACIDOSIS

- Acidosis may be clinical or sub-clinical.
- Feeding large quantities of rapidly digestible carbohydrate in a short period of time causes clinical acidosis.
- In severe clinical cases, animals may be recumbent within 24-48 hours, which may resemble cases of milk fever. Animal may not urinate or pass dung.
- Sub-clinical acidosis is seen as a result of feeding increased concentrates compared to forage.



Diarrhoea in acidosis

- In sub-clinical acidosis there is reduced feed intake, weight loss, unexplained diarrhoea and exhaustion. This may also lead to laminitis and lameness.
- In severe clinical cases, prognosis may not be good. Some animals though appear to improve, may become seriously ill 3-4 days later.

PREVENTION AND TREATMENT OF ACIDOSIS

- Proper feeding practices should be adopted after consulting a veterinarian.
- Animal should be provided a roughage diet in the mornings before feeding concentrates so that adequate quantities of saliva is produced.
- Never provide the animal with large quantities of rapidly digestible carbohydrates.
- A veterinarian must be consulted immediately in case of clinical acidosis.

C. SUB-ACUTE RUMINAL ACIDOSIS (SARA)

- Occurs due to excessive acid production(usually not lactate unlike acidosis) due to abrupt switch from high fibre diets to higher concentrate diets.
- Major cause of reduced production efficiency.
- Mainly due to improperly balanced or mixed rations, low fibre content or particle size.

SYMPTOMS

- (i) Reduced feed intake (ii) reduced rumination (iii) mild diarrhoea (iv) foamy faeces (v) appearance of undigested >6mm particles in faeces (vi) depressed milk fat.
- Secondary effects : (i) Laminitis (ii) weight loss (iii) poor body condition despite adequate energy intake.
- Prevention : Correcting feeding practices

D. LAMINITIS

- Commonly seen in mature dairy cows during peak lactation, often a herd issue.
- Higher concentrate/protein, low forage, mastitis, metritis , acidosis etc predispose.
- Occurs in sub-clinical, acute and chronic form.
- Rough irregular flooring , lack of enough lying space also predispose to the disease.



Sole ulcer in sub-clinical laminitis



Cross leg in acute laminitis



Hoof deformity in chronic laminitis



Dropped sole in chronic laminitis.

PREVENTION OF LAMINITIS

- Provide soft flooring.
- Provide balanced feed which includes sufficient forage.
- Practice foot bath using routine antiseptic for 2-4 days continuously every fortnight.
- Arrange for regular hoof trimming at least once in 6 months.
- Adequate lying space should be provided to avoid excessive standing.
- Check hoofs regularly for any injury and signs of laminitis.



Arched back in severe lameness



Untrimmed hoof



Untrimmed and trimmed hoof



Trimmed hoof

Hoof care is essential especially in high yielders

SECTION X

MASTITIS AND DISEASES OF TEATS

Mastitis is a scourge that result in heavy losses to the dairy farmer by causing a reduction in milk production, drastic decrease or cessation of production, causing permanent damage to the udder or, even death of the animal in severe cases.

Pure exotic breeds like HF, Jersey etc have the highest susceptibility to mastitis followed by crossbreds. The lower susceptibility of local breeds is basically due to its lower milk production and a better immunity levels. Buffaloes are the least susceptible to mastitis.

With more farmers taking to crossbreeding for higher production, the prevalence of mastitis is also on the rise. Preventing the occurrence of mastitis would therefore play a pivotal role in making milk business profitable. A proper understanding of the mastitis will go a long way in reducing the incidence at the farmers' homestead.

Diseases of the teat may not lead to production losses directly, but indirectly there could be a decrease in yield due to difficulty in milking and pain caused by the lesions. This may also predispose the animal to mastitis. The following chapters are described here:

- | | |
|--------------------------|------------------------|
| A. Clinical Mastitis | E. Teat Warts |
| B. Chronic Mastitis | F. Ulcerative Mammitis |
| C. Sub-Clinical Mastitis | G. Pseudocowpox |
| D. Mastitis in Heifers | |

A. ACUTE MASTITIS

It is the severe inflammation of udder where physical changes are clearly visible in udder and milk. High yielding animals are more prone. Mainly caused by bacteria (more than 100 types). Also caused by fungi, virus & rarely by algae.

MAJOR PRE-DISPOSING FACTORS



Unclean animal/shed



Faulty milking practices

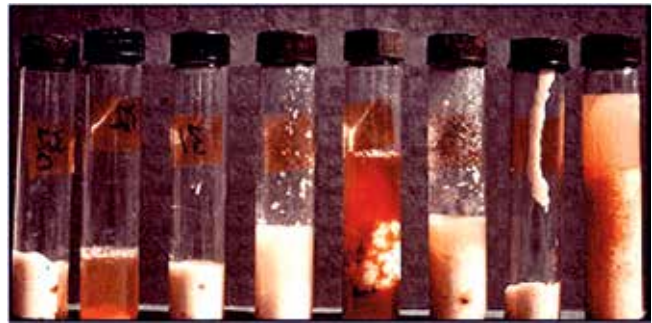


Teat/ udder Injury

MAJOR SYMPTOMS



Inflamed udder in clinical mastitis



Physical changes of milk in clinical mastitis

PREVENTION

- Manage the pre-disposing factors of mastitis properly.
- Before milking, clean the udder well with clean water and wipe dry with clean towel. Should use separate cloth towel for each animal. Disposable paper towel is also an option. Repeated use of unclean towel may itself predispose to mastitis.
- Milking should be quick, complete and hygienic.
- Milk animals with chronic mastitis in the end. (see chapter on this)
- Carry out teat dipping or spray immediately after milking.
- Prevent the animal from sitting for at least 30-45 minutes after milking.
- Periodically check and treat for sub-clinical mastitis (see chapter on this).
- Keep the floor of the cattle shed without holes and as dry as possible.
- Continue teat dipping/spray 2 weeks after drying off and start the practice two weeks before calving.
- Carry out proper fly control.
- After milking, allow calf to suckling.

TREATMENT

- Contact a veterinarian immediately. Early treatment (within 2-3 hours) improves the chances of cure, delayed treatment may cause loss of udder or even death of animal.
- Milk of animal suffering from mastitis should be discarded at least for 4 days after the treatment is over or as directed by the veterinarian.

Detect and treat cases early. Avoid loss of udder or animal.



B. CHRONIC MASTITIS

- A persistent infection of udder.
- Exists most of the time in the subclinical form.
- Occasionally can develop into the clinical form before returning to the subclinical.
- This results in hard lumps in the udder.

MAJOR PRE-DISPOSING FACTORS

- Neglected sub-clinical mastitis
- Improper treatment protocol of acute mastitis
- Unhygienic shed



Unhygienic shed



Improper treatment of mastitis

MAJOR SYMPTOMS

The affected udder may atrophy or may lead to fibrosis leading to decreased or total loss of production in the affected quarter.

Chances of recovery of chronically affected quarters are very low once atrophy/fibrosis has occurred.



Atrophy of quarters due to chronic mastitis



Fibrosis and hardening of quarter due to chronic mastitis

PREVENTION

- Separate the affected cow from rest of the herd since they remain a source of infection for healthy animals. Milk chronically affected cows in the end.
- Screen regularly for sub clinical mastitis and treat positive animals.
- Shed hygiene is of prime importance.

TREATMENT

- Antimicrobial treatment is usually not effective.
- It is better to dispose off such chronically affected animals.

Avoid occurrence of chronic mastitis through timely action

C. SUB-CLINICAL MASTITIS (SCM)

- Most prevalent form of mastitis - causes about 70% of the losses due to mastitis.
- Causes heavy losses due to its prolonged effect throughout lactation.
- The other forms of mastitis (clinical or chronic) develop from this stage.

SYMPTOMS

- No specific symptom seen except a slight decrease in milk production.
- Cannot be normally detected since there is no physical changes in udder or milk.

DETECTION OF SCM



California Mastitis Test



Strip cup test



YELLOW NORMAL	YELLOWISH GREEN SUSPECTED	GREEN SUB CLINICAL	BLUE CLINICAL
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- CMT - Equal quantities of milk and CMT reagent are mixed by rotating, SCM milk will form a gel. CMT reaction may disappear within 20 seconds, readings must therefore be taken fast. Also check each quarter separately.
- CMT may give false positive reaction in very early (less than 10 days) lactation or when animal is almost dry.
- Strip cup test - Small flakes are present in SCM milk when viewed against a black surface, size of flakes increase with the degree of SCM.
- Paper test - Green colour is indicative of SCM.
- Field mastitis test - Can be carried out like CMT using concentrated detergent solution instead of CMT reagent.



Treatment of SCM will greatly reduce losses

PREVENTION OF SCM

- All the points mentioned for prevention of 'clinical mastitis' are relevant here too.
- Test for the occurrence of SCM in your animals at least once a week.
- Each quarter should be separately tested.
- Newly purchased animals should be tested first for SCM and treated if found positive before mixing them with the herd.
- SCM positive animal (s) should always be milked at the end.
- After milking allow calf to suckling.
- If animals are tethered in open, change places frequently.
- Ideally, no lubricant should be used during milking. If used, it should be heated daily before use.

TREATMENT

- Consult a veterinarian for proper treatment.
- The chances of curing SCM is much higher than a clinical or chronic case.
- Timely treatment of SCM will also reduce the chances of clinical and chronic cases of mastitis.

D. MASTITIS IN HEIFERS

- Traditionally heifers have been thought of as a group free of mastitis which is not true.
- Routine visual and manual examination of the developing udder, mammary fluid and teat skin to identify swollen quarters and abnormal secretions (clots and flakes) help to detect heifer mastitis.
- Heifers with teat scabs and abrasions also are likely to be infected and should be treated with advice from a veterinarian.

PREVENTION AND CONTROL

- Calves should receive early, adequate colostrum intake and be removed from the dam as soon as possible.
- If calves are grouped, they should be kept separate for at least one hour after feeding.
- Watch for suckling of heifers: Remove any calf from a group that sucks on other calves.
- Use fly control measures to minimize skin and teat fly strikes.
- Pay attention to environmental conditions. Avoid wet, bacteria-laden areas for resting areas indoors and outdoors.
- Maintain adequate nutrition without over-conditioning heifers.
- Mineral mixture should be fed in adequate quantities for boosting the udder immune system.
- The critical time to prevent new infections is the last seven days before calving.

DISEASES OF TEAT

- Various conditions affect the teat causing difficulty in milking and some may even be transmitted to the milker's hands.

E. TEAT WARTS

- Teat warts are caused by virus and heifers are more prone to infection.
- Teat warts may appear as fleshy lumps or they may be of the feathery type.



Feathery teat warts

- Teat warts are generally more of an unsightly appearance issue rather than a serious physical problem. But may hamper milking.



Fleshy teat warts

TREATMENT

- Treatment is not usually required, as most warts eventually regress spontaneously.
- Surgical removal is possible but may lead to recurrence.
- Removal should only be done on mature growths, since removing warts too soon can stimulate the growth and spread the virus.
- Large pedunculated warts can be removed slowly by tying a ligature around the base. The wart will dry up and fall off within a month.
- Consult a veterinarian for further advice on treatment.

PREVENTION

- Disinfection of stalls etc, can reduce transmission.
- The virus is thought to be transmitted by flies, so fly control is also important.

F. ULCERATIVE MAMMILLITIS

- Ulcerative mammillitis is a relatively uncommon condition but it can spread rapidly in herds which are affected for the first time and cause significant pain and discomfort.
- It tends to occur most commonly in first lactation cows.
- It is also caused by a virus.
- Lesions of mamillitis can spread over the entire udder and perineum.
- Mouths of nursing calves might be affected. The clinical signs vary from small irregular fluid-filled blisters to larger areas of ulcers and scabs.



Ulcerative mammillitis

TREATMENT

- No specific treatment is available.
- Infected cows should be separated from others.
- Iodine dips may help disinfect teats to prevent the spread of the disease.
- An emollient udder cream can speed healing of skin.

PREVENTION

- Difficult to eliminate once disease occurs in the farm.
- Proper quarantine of newly purchased animals, good hygiene on farm and controlling biting flies can significantly reduce the disease.



G. PSEUDO COWPOX (MILKERS' NODULE)

- The most common infectious cause of teat disease in cattle.
- Caused by a virus and not to be confused with cowpox, which is rare.
- Since immunity is short-lived, cows can get infected fairly soon (often less than six months) after recovering from the disease.

SYMPTOMS

- Initial infection causes a small area of swelling and reddening on the teat.
- Over the next two days, the affected area elevates into an orange papule, which then scabs over.
- Seven to ten days after first signs the scabs start dropping off. This often leaves a horse-shoe or ring shaped area, which is very characteristic of pseudocowpox.
- Affected areas may grow together leading to scabs covering the entire length of the teat.
- Damaged teats are usually healed around a month after first signs.
- Lesions of pseudocowpox is usually found on the teat. However up to 10% of affected cows may have lesions on the udder skin.
- It can spread from cattle to man by contact. Skin infection in man is known as milker's nodules, and is a painful localised infection.



Pseudocowpox



Scabs covering the teat in pseudocowpox

TREATMENT

- Removal of scabs followed by application of a suitable disinfectant.
- Emollient teat dips and sprays have a beneficial effect of reducing bacteria and viruses on teat skin.
- Consult a veterinary doctor if above symptoms are seen.

PREVENTION

- Proper quarantine of newly purchased cows before introducing into the herd.
- Proper teat dipping using iodophor is one of the most effective means of control.
- Maintain proper hygiene in the shed.

SECTION XI

COMMON POISONING CONDITIONS

There are a large number of plant and chemical agents that cause poisoning in animals. Some of them are fatal in nature if left untreated. A general awareness on the symptoms of common poisoning conditions would help the farmer in seeking timely treatment. The following conditions are described in this section:

- A. Gossypol Poisoning
- B. Cyanide Poisoning
- C. Organophosphorous Poisoning



A. GOSSYPOL POISONING

- Occurs due to consumption of cottonseed or cottonseed products that contain excess free gossypol and can affect high-producing dairy cows with high feed intake.
- Also affect other mature ruminants fed excess gossypol for long periods of time.

SYMPTOMS

- Irregular cycling in cows and buffaloes, reduced libido in males.
- Weight loss, weakness, anorexia, and susceptibility to stress.
- Adult dairy cattle may show weakness, depression, anorexia, edema of the brisket, and dyspnoea, and also have gastroenteritis, hemoglobinuria, and reproductive problems.

CONTROL

- Remove cottonseed products from the diet immediately. Severely affected animals may still die even 2 weeks after stopping feeding of cottonseed products.
- Poor weight gains in affected livestock and increased susceptibility to stress may persist for several weeks after cottonseed products are removed from the diet.
- A high-quality diet supplemented with lysine, methionine and fat-soluble vitamins should be included in supportive therapy.
- Consult a veterinarian for further advise.

B. CYANIDE POISONING

- The most frequent cause of cyanide poisoning is ingestion of certain plants. These include arrow grass, velvet grass, young plants of Sorghum species, tapioca leaves etc.

SYMPTOMS

- Signs occur within 15-20 minutes to a few hours after animals consume toxic forage.
- Excitement may be displayed initially, followed by rapid & difficult respiration, excess salivation. Mucous membranes are bright red but may become cyanotic later.
- Animals stumble/struggle and collapse within an hour.

PREVENTION & CONTROL

- Avoid feeding grasses that cause poisoning until they are 15-18 inches tall.
- Forage sorghums should be several feet tall before being used as fodder.
- Animals should be turned out to new pasture later in the day only.
- Grazing should be monitored closely during periods of environmental stress.
- Immediate veterinary help must be sought if cyanide poisoning is suspected.
- Treatment is very effective if given on time.

Recognize symptoms and provide immediate treatment to save the animal

C. ORGANOPHOSPHOROUS (OP) POISONING

- Pesticides are used on both plants and animals to control crop pests that and to control ticks on cattle.
- A majority of pesticides are organophosphorous (OP) compounds which are active poisons.

COMMON SYMPTOMS OF OP POISONING IN CATTLE & BUFFALO

- Severe depression
- Hypersalivation
- Frequent urination
- Diarrhoea, colic, and dyspnoea
- Involuntary muscle contraction and relaxation which may be visible under the skin
- Nervousness, ataxia, apprehension, and seizures
- Pupillary constriction

PREVENTION AND CONTROL

- Animal should be fed adequate water before applying liquid/spray on the animal body to kill ticks.
- The fodder sprayed with insecticides should be properly washed with water before feeding it to the animal.
- Apply the pesticide as directed on the label at the recommended dose and time.
- Do not treat sick, emaciated or convalescent animals, or animals under severe stress with pesticides for removing external parasites.
- Generally, animals less than 3 months of age should not be treated for external parasites with pesticides.
- Keep animals away from pesticide containers (new or used) or pesticide-contaminated feed.
- Check the label for restrictions regarding application in conjunction with other pesticides or animal health products.
- Contact a veterinarian immediately on observing the symptoms for timely treatment which could save the animal.



Treat OP poisoning at the earliest to increase the chances of survival

SECTION XII

COMMON ZOONOTIC DISEASES

Zoonoses are diseases and infections that are naturally transmitted between vertebrate animals and humans.

Zoonoses constitute 61% of all known infectious diseases. It may also be noted that out of the 175 diseases considered to be emerging, 75% are zoonotic.

Poor hygiene, poverty, malnutrition, lack of education, close contact with animals are predisposing factors causing zoonotic diseases.

There are some 45 zoonotic diseases purported to be transmitted from cattle. Dairy farmers who are in close contact with their animals are always at risk of acquiring infections from animals, especially since most of these diseases are prevalent in animals in our country. It is important that the farmer is aware of these diseases which could help him seek appropriate advice or treatment from a doctor. This section briefly describes the following zoonotic diseases that can be transmitted by cattle:

- A. Human Brucellosis
- B. Human Tuberculosis
- C. Leptospirosis
- D. Salmonellosis
- E. Gastro-intestinal Zoonotic Diseases
- F. Tick borne Zoonotic Diseases

A. HUMAN BRUCELLOSIS

- Brucellosis is considered to be a significant public health problem in India.
- Fewer than 10% of the human cases of brucellosis in India may be clinically recognized and treated or reported.
- Most common symptoms are intermittent fever, joint pain and swelling, sweating, dizziness, headaches, chest and abdominal pain etc, though there are a wide range of symptoms that can be seen.
- Humans get infection by drinking raw milk of infected animal or by contact with infected secretions through skin or mucous membranes, especially conjunctiva. (See chapter D in Section IV on Bovine Brucellosis)
- Accidental injection with S 19 vaccine could also lead to infection.

B. HUMAN TUBERCULOSIS

- The disease in humans caused by bovine TB (bTB) (see Chapter B of Section V for bTB) and human TB bacteria are identical with respect to clinical symptoms and lesions and would require complex tests to distinguish them.
- The importance of human TB bacterium as a reverse zoonosis (causing infection in animals) is also gaining prominence with reports humans and bovines respectively having mixed infections with both bTB and human TB organisms.
- There may be no symptoms till the disease is quite advanced. The common symptoms are cough, loss of weight, poor appetite etc.
- Humans get the infection by drinking contaminated milk from infected animals or by close contact with infected animals.

C. LEPTOSPIROSIS

- Leptospirosis, a significant zoonotic disease endemic to India, affects nearly 160 animal species, including livestock, companion animals, and marine mammals.
- It poses an occupational hazard to individuals such as butchers, farmers, sewer workers, and veterinarians.
- The primary source of infection is the urine of infected animals, which contaminates water, pasture, and feed. In cattle, leptospirosis can persist for an average of 36 days post-clinical recovery.
- The pathogen primarily enters the body through skin abrasions and mucous membranes, with ingestion being a less common route, while transplacental transmission remains rare.



Zoonotic diseases can be cured if diagnosed and treated promptly

Symptoms in Animals

- Acute leptospirosis should be suspected in the following cases: sudden onset of agalactia (in adult milking cattle and sheep); icterus and haemoglobinuria, especially in young animals; meningitis.
- Chronic leptospirosis should be considered in the following cases: abortion, stillbirth, birth of weak offspring (may be premature); infertility; chronic renal failure or chronic active hepatitis.

Symptoms in Human

- In human, it takes 2-30 days to get sick after having contact with the bacteria and disease may occur in two phases
- First phase, people may have fever, chills, headache, muscle aches, vomiting, or diarrhoea. The person may feel better for a while but become ill again.
- Second phase, kidney or liver failure, or inflammation of the membrane around the brain and spinal cord (meningitis)



Body rashes, Icterus, conjunctival suffusion & uveitis (Clockwise from top left)

Prevention & Control

- The vaccine is available to control leptospirosis in cows.
- In farm animals, prevention can involve a combination of vaccination and strategic livestock management practices, including:
 - Avoiding co-grazing with other species
 - Implementing quarantine protocols
 - Restricting bull sharing for breeding

D. SALMONELLOSIS

- Salmonellosis is an infectious disease of humans and animals caused by bacteria of the genus *Salmonella*.
- It is one of the most common and economically important food-borne zoonotic diseases in humans.
- *Salmonella* bacteria are widely distributed in domestic and wild animals such as poultry, pigs, and cattle; and in pets, including cats, dogs, birds, and reptiles such as turtles.
- Salmonellosis in humans is generally contracted through
 - Direct contact with infected animal
 - Consumption of contaminated food of animal origin
 - Person-to-person transmission through the faecal-oral route

Symptoms in Animals

- Animals can harbour Salmonella without exhibiting any clinical signs, acting as carriers and shedding the bacteria intermittently.
- In symptomatic cases: diarrhoea (may be bloody) with septic tank odour, vomiting, abdominal pain, and dehydration. Affected animals often show reduced appetite and lethargy.
- In severe infections: septicaemia, high fever, depression, rapid heart rate, and sudden death.

Symptoms in Human:

- Usually appear 6 to 72 hours after exposure and can last 4 to 7 days.
- Gastrointestinal Symptoms: Diarrhoea (sometimes bloody); Abdominal cramps and pain; Nausea and vomiting; Fever and chills

Prevention & Control

- Implementing vaccination programs for poultry against Salmonella can significantly reduce infection rates.
- Enhancing farm biosecurity through controlling access to livestock areas, maintaining cleanliness, and ensuring feed and water are uncontaminated.
- In human, vaccination against typhoid fever is essential for endemic regions.
- Consuming well-cooked food and avoiding raw or undercooked items can reduce infection risks.

E. GASTRO-INTESTINAL ZONOTIC DISEASES

- There are various zoonotic diseases affecting the intestinal tract. Some examples are infections with Salmonella, E.Coli, Campylobacter, Rota virus, Cryptosporidia and Giardia.
- The infection occurs through the faecal-oral route which is always a possible route of contamination in the rural environs where close contact with cattle is common.
- The young, malnourished, immuno-compromised and pregnant women are usually more susceptible.
- The common symptoms in gastro-intestinal zoonotic diseases are fever, diarrhoea, loss of appetite , weight loss, dehydration etc.

F. TICK BORNE ZONOTIC DISEASES

- Tick-borne infections have been reported from various regions of our country and are a group of zoonotic diseases that requires attention.
- They may be difficult to diagnose due to their non-specific signs and symptoms.



- The possibility of these infections being prevalent cannot be discounted with people living in close proximity with cattle (with moderate to high loads of ticks on them). Babesiosis, Rickettsial infections, Kyasanur Forest Disease (KFD) and Crimean Congo Haemorrhagic Fever (CCHF) are some of the examples of tick borne infections.

i. CRIMEAN–CONGO HAEMORRHAGIC FEVER (CCHF)

- Crimean–Congo haemorrhagic fever (CCHF) is a zoonotic disease that spreads globally through ticks.
- CCHF Virus (CCHFV) maintains its life cycle through a tick–vertebrate–tick transmission pathway and can spread horizontally and vertically within tick populations.
- The CCHF virus is transmitted to people either by tick bites or through contact with infected animal blood or tissues during and immediately after slaughter.
- Infected animals do not exhibit any clinical signs and have no direct economic impact on livestock production.
- In human, illness begins suddenly with fever, muscle aches, dizziness, headaches and abdominal pain, followed by mood swings and confusion. Symptoms may progress to liver enlargement, rashes, and severe complications like kidney or liver failure by the fifth day.



Hyalomma Tick



Haemaphysalis spinigera tick

ii. KYASANUR FOREST DISEASE (KFD)

Kyasanur Forest Disease (KFD), is a tick-borne viral disease endemic to southwestern India, caused by the Kyasanur Forest Disease Virus (KFDV).

- Disease spreads to humans through bites from infected hard ticks or contact with diseased animals, especially monkeys & rodents.
- The reservoir species include langurs, macaques, shrews, and bats.
- In human, disease typically begins with sudden chills, fever, and headache, followed by severe muscle pain, vomiting, gastrointestinal issues, and bleeding after 3–4 days.
- People recover within 1–2 weeks, but 10–20% may experience a second wave of symptoms, including severe headache, mental disturbances, tremors, and vision problems.

Zoonotic diseases can be cured if diagnosed and treated promptly

SECTION XIII

BREEDING AND RELATED ACTIVITIES

In our country, efforts to boost milk production through selective cattle and buffalo breeding have made impressive strides in some regions. However, the productivity of the cows is still low, largely attributed to low availability of artificial insemination, late start of breed improvement programmes and lack of availability of superior germplasm across the semen stations of the country, particularly for indigenous cattle and buffalo breeds. To address this gap, there is a need to enhance the production potential of indigenous breeds through implementing breed improvement programmes including genomic selection in the breeding tracts of the animals, creating largescale AI network for delivering AI service at farmers' doorstep through trained technicians and using assisted reproductive technologies. Key strategies for enhancing milk production include increasing coverage of Artificial Insemination (AI) and extensive milk recording programmes and implementation of scientific breeding programmes like Progeny Testing (PT) and Pedigree Selection (PS) for major dairy breeds of the country. In addition to the above, AI with sexed semen can help farmers to get more genetically superior replacement heifer calves that can become future milk producers. Thrust on embryo transfer can further expedite genetic improvement by using highly elite parents more extensively. Using genomic selection can help in early selection of potential genetics and thereby help save resources and improve milk production. Further, maintaining a calving interval of 1 to 1.5 years is crucial for a successful dairy operation, ensuring a steady milk supply and maximizing the productive lifespan of the animals. By incorporating these advanced technologies and methods, it is possible to boost milk production as well as enhance the overall efficiency of dairying in the country. The following chapters would provide a good idea on the various aspects of breeding:

- A. Heat
- B. Optimal Timing of Artificial Insemination (AI) and Post AI Monitoring
- C. Advantage of Artificial Insemination
- D. Drying off an Animal
- E. Normal Calving & Dystocia
- F. Infertility in Bovines
- G. Sexed Semen
- H. Ovum Pick Up, In Vitro Embryo Production and Embryo Transfer (OPU-IVEP-ET)
- I. Brief on Field Progeny Testing (PT) Programme
- J. Pedigree Selection (PS) Programme
- K. Genomic Selection



A. HEAT

Heat or estrus is a stage of the estrous cycle when the cow is sexually receptive and allows mounting activity by bulls or other cows or heifers. Estrous cycle length ranges between 18 to 24 days in mature heifers and non-pregnant cows. Heat or estrus is the only identifiable stage as animals exhibit overt estrus signs, usually lasting hours. The heat phase is followed by ovulation, i.e., the release of an ova. Therefore, in time, artificial insemination and fertilisation by sperm will lead to a successful pregnancy.

SIGNS OF HEAT

Heat detection is a critical aspect of reproductive management of a cow or a dairy herd. Insufficient and/or inaccurate estrus detection leads to delayed insemination, reduced conception rates, and thus, extended calving intervals.

Timelines for showing Heat signs in cattle			
	Early Heat	Standing Heat	Late Heat
	(6 to10 hours)	(12 to 18 hours)	(18+ hours)
Heat Signs	• Stands and bellows • Sudden drop in milk production • Smells other cows • Headbutts other cows • Attempts to ride other cows but will not stand to be mounted • Red, moist, slightly swollen vulva • Clear mucous discharge from vulva	• Stands to be mounted • Rides other cows • Bellows frequently • Nervous and excitable	• Attempts to ride other cows but will not stand to be mounted • Smells other cows • Clear mucous discharge from vulva

For successful heat detection following should be considered:

- Ear tagging of the animal for easy identification and record keeping to track heat dates.
- Visual estrus detection by observing heat signs should be practiced during early morning or late evening hours.
- Heat expectancy charts can aid in shortlisting the cows to be observed for heat.
- Modern heat, detection devices like activity monitoring devices (pedometers and neck belts having sensors), Closed circuit television (CCTV) camera may be used to determine the time of heat onset accurately and optimal window for artificial insemination (AI).
- Tail head markers and chin ball markers are other aids which can be used for identifying cows in heat in larger herds.
- Teaser bull (Vasectomised bull) can be used for parading in buffalo barn for detection of heat in buffaloes.

Timely heat detection is very important in getting the animal conceived

B. OPTIMAL TIMING OF ARTIFICIAL INSEMINATION (AI) AND POST AI MONITORING:

- AI based on heat detection is centred on the AM–PM rule. That is, if a cow shows estrus behaviour in the morning, she should be inseminated in the evening. If she shows estrus activity in the evening, she should be inseminated in the next morning.
- If the time of onset of estrus is not precisely known, insemination should take place within 6 hours of its initial observation or perform AI when animals is observed in standing heat.
- Leverage the feature of breeding window, indicated by the software, when heat detection is done using sensor-based devices.
- It is recommended to observe and inseminate cows as late as the light allows in the evening and as early as possible in the morning, especially during the warmest months (March and May).
- After AI, observe for signs of heat. If there are no signs of heat till 21 days after AI, your cow may be pregnant. If there are signs of heat 21 days after AI then the cow is not pregnant and AI should be repeated.
- The cows should be checked for pregnancy diagnosis after 60 days of AI, if there are no signs of heat till then.

C. ADVANTAGES OF ARTIFICIAL INSEMINATION

- Artificial insemination (AI) offers several advantages:
- **Increased Pregnancy Rates:** AI can significantly enhance the chances of conception as it allows for the precise timing of insemination to coincide with the female's ovulation cycle.
- **Genetic Improvement:** It allows for controlled breeding, facilitating the use of sire with superior genetics.
- **Disease Prevention:** The semen used in AI is collected from healthy, fertile males and it undergoes stringent quality control before releasing for use. Thus, AI reduces the risk of transmitting diseases that can occur during natural service.
- **Cost-Effectiveness:** It can be more economical compared to maintaining a breeding male or transporting animals for natural service.
- **Flexibility:** AI allows for the use of frozen semen, extending the availability of genetic material over time and distance.
- **Genetic Diversity:** By using AI, farmers can access a wider pool of genetic material from diverse, high-quality sires that may not be available locally. This can enhance genetic diversity, ability to select for genetic improvement and overall fertility rates within the population.
- **Selective Breeding:** It enables breeders to select specific traits desired in offspring, such as temperament, productivity, and disease resistance.
- **Reduced Injury Risk:** Eliminates the physical risks associated with natural service, such as injuries to animals or handlers.



AI is a simple and cost effective method to improve milk production

- **Time Efficiency:** AI can be performed quickly and efficiently, saving time compared to natural service.
- **Efficient Record Keeping:** With AI, detailed records keeping is possible, which helps in tracking and managing breeding programmes and evaluate genetic progress at later stage.

In summary, AI increases pregnancy rates by ensuring optimal conditions for fertilization, prevents disease spread, helps to overcome physical and biological barriers, and utilizes high-quality genetic material, all of which contribute to higher chances of successful conception than natural service.

D. DRYING-OFF AN ANIMAL

The “drying period” in dairy farming is referred to the period when a cow is not producing milk. It is the period from date of drying off milk (usually around the 7th month of pregnancy) until its next calving. Ideally, this period should last for 60 days. During this time, the cow is allowed to rest and recover from the demands of milk production. The drying off process aims to ensure the cow’s health and prepare her body for the next lactation, optimizing milk production and quality for the future.

Importance:

- Rest and regeneration of udder tissue: This prepares the udder for the next lactation.
- Energy redirection: The cow’s energy is redirected from milk production to improving its body condition score (aiming for 3.5 – 4.0 on a 5-point scale) and supporting fetal growth.
- Increased milk production: Proper drying-off can lead to increased milk production in the subsequent lactation.
- Healthier calf: The process supports the delivery of a healthier calf.
- Reduced metabolic disorders: It helps in reducing the incidence of metabolic disorders subsequent to ensuing calving.

Drying-Off Process:

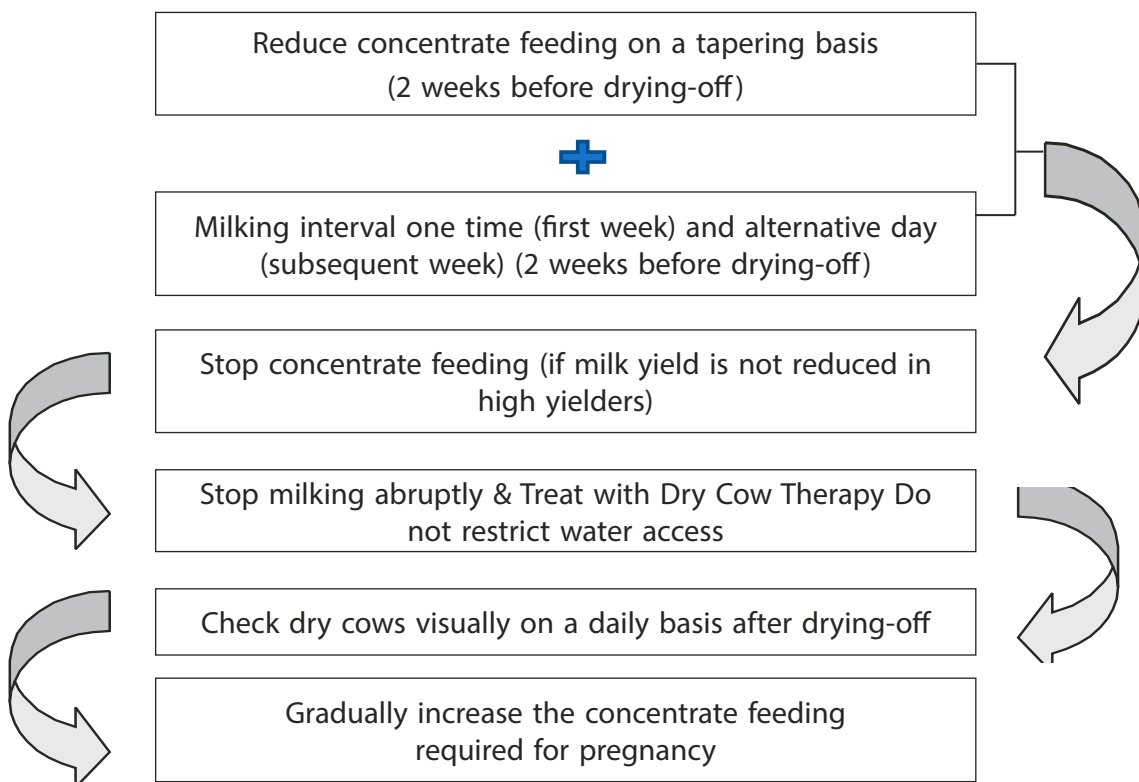
For cows producing a significant amount of milk (>10 kg/day), the drying-off process should start at least two weeks before the pre-decided dry-off date by reducing energy content in the ration by decreasing concentrates and feeding of primarily high-fibre diet (dry fodder). This ration adjustment lowers the nutrients available for milk production, helping to reduce milk yield to a safe level for drying off. The milking frequency is reduced gradually to help prevent mastitis and discomfort, particularly for the high producing animals. After the gradual reduction period, milking is stopped completely. This abrupt cessation can be used in some cases. However, it may lead to increased risk of mastitis if not managed carefully.

Ideally, cows should be kept at pasture on a maintenance diet for a week after drying-off.

DRY COW THERAPY :

- During the first two weeks of the dry period, there is a higher chance of occurrence of new infections in the udder.
- Dry cow therapy aims to cure existing subclinical infections and prevent new infections.
- It is done after the last milking before drying off.
- The process involves wiping all four teats with disinfectant and infusing intramammary antibiotic tubes into the dried cow.
- Non-antibiotic teat sealants alone or combined with intramammary antibiotic tubes are also followed for infection control.

PROCEDURE FOR DRYING OFF:



Ideally, cows should be kept in dry & clean stress-free environment or at pasture on a maintenance diet for a week after drying-off.



E. NORMAL CALVING & DYSTOCIA

Shift the pregnant animals to the calving pen two weeks before the expected date of calving and monitor the animals closely until calving occurs. The following are the imminent signs that indicates calving may occur within 24 hours:

- Restlessness (frequent getting up & lying down and)
- Tail raising
- Kicking the abdomen
- A sticky vaginal discharge

NORMAL CALVING :

- Calving usually takes place normally without any external assistance
- In older cows the calf is usually delivered within 30-60 minutes after the first water bag rupture. However, in heifers, calving may take up to 4 hours after the first water bag ruptures.
- If the head and two front/ hind legs appear after the water bag rupture, the calving usually proceeds normally.
- After calving provide energy rich feed or jaggery water as an instant energy source to the cow.
- If the calf is not delivered within one hour after the first water bag rupture, call a veterinarian for assistance.
- Normally, the placenta is expelled within 3-8 hours after the delivery of the calf. If it is not expelled within 24 hours after calving, call a veterinarian for treatment.
- After calving, ecbolic can be given for the easy expulsion of the placenta.
- If the animal does not come into heat within a period of 60 days post calving, consult a veterinarian.

DYSTOCIA:

- If calving does not occur within one hour after the first water bag rupture, it is known as dystocia. Causes include abnormal presentation, position, and posture of the fetus, larger fetal size, uterine inertia, uterine torsion, etc.
- The farmer should seek assistance of veterinarian if the head and two front/ hind legs are not seen within one hour after rupture of first water bag
- Never attempt to pull the calf unless both front/ hind legs and the head are visible (not even if one front/ hind leg and the head are visible).

Early Detection of Dystocia may save the calf

- Delay in attending to the situation will complicate the calving further and may be fatal to both the cow and calf.

POST CALVING MONITORING:

- Watch for any persistent abnormal uterine discharge (watery, red-brown, or white with a severe bad odour) even after 21 days of calving, indicating uterine infection and required to be treated by a veterinarian.
- Under normal circumstances, an animal should come into heat within 45 days of calving.
- It is recommended to breed the animal in the subsequent estrus after the first heat or within 60-90 days postpartum.
- If the animal does not come into heat within 60 days post-calving, consult a veterinarian.

F. INFERTILITY IN BOVINES

Infertility is defined as a temporary loss of fertility, which can be corrected, and the animals in question can be brought back to normal fertility. Ideally, a mature, healthy and reproductively sound bovine female should:

- Attain age at first calving according to the standard of the species/ breed
- Subsequently should calve every 13-14 months
- Post calving, should resume cyclicity within 90 days
- Post calving, should be pregnant within 5 months

Infertility can be due to several factors viz. anatomical or congenital, genetic, production, managerial, nutritional, environmental, hormonal or infectious etc. Most commonly infertility is either due to anestrus i.e., absence of estrus, silent estrus, post-partum uterine infections, or ovarian abnormalities like anovulation, delayed ovulation or cystic ovaries.

There are several human factors which contribute to infertility, such as:

- » Sub-optimal quality of feed & fodder and absence of mineral mixture
- » Poor heat detection
- » Improper timings of AI
- » Break in cold chain of frozen semen doses
- » Unhygienic AI without following SOP



MANAGEMENT OF INFERTILITY

- The human and management factors affecting fertility, like nutrition, housing environment, should be improved.
- Deworming should be done every three months for better absorption and assimilation of nutrients by cow.
- Mineral mixture should be made as an essential component of ration from the calf hood.
- Heat detection should be followed meticulously to breed cows as early as possible in age.
- Consult a veterinarian if any abnormal discharge is visible from the vulva to treat any possible uterine infections.
- Hormonal treatment should be undertaken for treating infertility with all due caution and only after diagnosing the actual cause of infertility.
- Cows/heifers found non-pregnant after three consecutive AIs with normal reproductive tract are considered repeat breeders, and such animals should be aggressively treated by a veterinarian and monitored for rebreeding.
- Record keeping for heat events and breeding should be encouraged to track any abnormality in the cyclicity of a cow.
- Remove the animals diagnosed with anatomical, congenital or genetic causes of infertility at the earliest for better utilisation of resources.
- Semen should always be sourced from an A or B-grade semen station, and AITs performing AI must be well-trained to avoid trauma to reproductive organs.
- AI should be performed in a stress-free and clean environment; otherwise, unhygienic AI might introduce uterine infections.
- SOP should be followed for handling and thawing of frozen semen doses.
- AI using one dose of semen per AI is sufficient, and repeat AI should be done if heat is prolonged.
- Pregnancy diagnosis (PD) can be done as early as 28 days using cow-side PD kits or by day 45 or later by trained AIT or veterinarians per-rectally to identify non-pregnant animals for rebreeding.

Infertility management is crucial - for calf rearing programme

G. SEXED SEMEN

Sexed semen allows the production of young ones of the desired sex. Among the several techniques available, the use of sexed semen for artificial insemination is recognized as a more pragmatic and easy way to preselect the sex of the offspring. The sexed semen is produced and available commercially for most of the cattle and buffalo breeds of India.

BENEFITS OF AI WITH SEXED SEMEN

The technology has several benefits:

1. Producing only female calves helps the farmers save resources that would have been shared with unwanted males.
2. By using sexed semen to produce the desired gender, producers can make more strategic breeding decisions.
3. Increased profitability by ensuring a higher percentage of heifer calves, which are the future milk producers: increased supply of replacement heifers, which also allows selling surplus heifers to other farmers/farms.
4. Speed up genetic improvement:
 - a. By increasing the efficiency of the progeny testing (PT) programme
 - b. By increasing the efficiency of embryo transfer, mainly through in vitro embryo production
5. An economical way to increase herd strength with no risk of introducing diseases is by purchasing heifers from outside (improves bio-security).
6. By producing more female calves using sexed semen, there will be less difficult births than male calves (dystocia). This is particularly useful for maiden heifers.

Sexed semen can be a powerful tool for optimizing herd management and improving profitability, particularly when strategic breeding and gender control are critical to a producer's goals.



Twin female calves born through sexed semen



More heifer, more milk - sexed semen for futuristic dairy farming

H. OVUM PICK UP, IN VITRO EMBRYO PRODUCTION AND EMBRYO TRANSFER (OPU-IVEP-ET)

Ovum Pick Up and In vitro Embryo Production and Embryo Transfer (OPU-IVEP-ET) is an Assisted Reproductive Technology (ART) for faster multiplication of the elite bovine population. Embryo production and transfer allow the production of a greater number of offspring from a female animal during its lifetime. The non-elite inferior animals are used as recipients (surrogates) for the embryos to produce better progenies.

TECHNOLOGY IN A NUTSHELL

OPU-IVEP is a non-invasive procedure. In this, oocytes are aspirated directly from the ovaries of elite donor animals using a transvaginal probe guided by ultrasonography (USG). In vitro embryo production (IVEP) includes in vitro maturation (IVM), in vitro fertilization (IVF) and in vitro culture (IVC). Collected oocytes are evaluated under the stereo zoom microscope, and good-quality oocytes are selected, matured and fertilized using fresh/frozen-thawed semen in Petri dishes in a controlled environment inside the incubator. Embryos are then grown by culturing in a particular medium up to the blastocyst stage, and the produced embryos are either transferred as fresh or cryopreserved for use in the future. It allows repeatable embryo production without using exogenous hormones and without altering the reproductive cycle of the donor.

BENEFITS OF OPU-IVEP-ET

The technology has several benefits, facilitating its faster adoption by several dairy developed nations. The prominent benefits of this technology are:

1. It can increase the number of progenies from an elite female bovine animal during its lifetime. Usually, one can get one calf from an elite bovine female in a year. However, by applying OPU-IVEP technology, one can get 20-25 calves from an elite bovine female in a year.
2. Genetic gain per year, apart from other factors, depends on selection intensity. By using this technology, we can produce more calves from selected elite animals, thereby increasing the selection intensity and speeding up the rate of genetic improvement.
3. Further, pre-pubertal elite heifers selected through genomic selection can be used to produce calves, reducing the generation interval and thereby increasing genetic gain per year.
4. Exceptionally high-producing female bovines with reproductive problems such as blocked fallopian tubes could be used to produce embryos.
5. Elite cows with non-functional udder and teats, which are usually culled, could also be used to produce embryos.

6. Several superior bulls can be used in the same cycle to produce calves from different sire dam combinations.
7. The use of sex-sorted semen can further improve genetic gain by producing offspring of the desired sex in higher numbers using this technology. This technology offers the most efficient use of sexed semen and also of rare superior bull's semen because the required number of spermatozoa is comparatively very low.
8. Science is developing faster than ever, and more benefits would be available for the bovine industry, such as sex selection, estimating genomic breeding value, detection of genetic diseases, etc., in the pre-implantation embryos through embryo biopsy before transferring. These benefits will further enrich the value of OPU-IVF-ET technology.

I. BRIEF ON FIELD PROGENY TESTING (PT) PROGRAMME

Progeny Testing (PT) refers to evaluation of bulls on the basis of their daughter's performance.

This long term and complex programme is considered to be scientifically best approach in achieving genetic improvement in a particular breed.

Various Steps of implementing a PT programme are as under:

Step-1: A set of young bulls produced using the elite dams and sires are put under test.

Step-2: Adequate number of semen doses per test bull are distributed in selected herds/villages to carry at least 2000 Test AI, while 3000 doses are kept under long storage for future use for nominated AI.

Step-3: Milk yield of the daughter born to test bulls are recorded by the trained milk recorders at farmers' herd at monthly intervals for the entire lactation (upto maximum 3 lactations).

Step-4: Based on complete lactation records of 80 to 100 daughters per bull, "Breeding value (BV)" of each test bulls are estimated. Based on BVs, bulls are ranked.

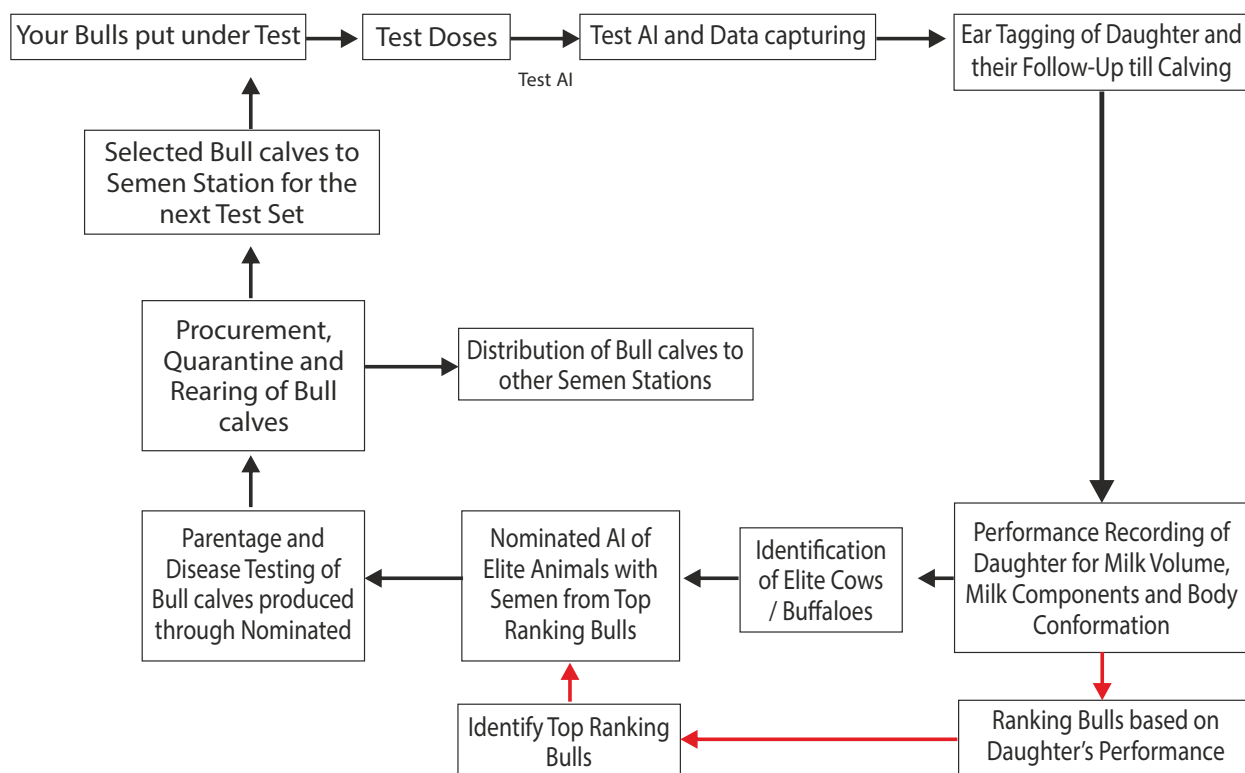
Step-5: The top 1-10 per cent of progeny tested bulls and the very best 1 to 10 per cent of recorded cows are used for producing the next generation of young bulls through Nominated AI. Breeding between closely related animals is not permitted to avoid inbreeding.

Step-6: Young bulls born through Nominated AI with positive breeding values and free from certain diseases (as mentioned in the MSP of production of Bovine semen) are purchased from the farmer herd and brought to semen stations.

Step-7: The young bulls are again put to test and the cycle is repeated.



Schematic Diagram of Progeny Testing through Young Sire Programme



J. BRIEF ON PEDIGREE SELECTION (PS)

When bulls are evaluated and selected only on the basis of performance of their parents and grand parents, the process is referred to as Pedigree Selection (PS).

In a situation where a large numbers of animals of a particular breed spread over many villages in the breeding tract and where there is a limited or no AI infrastructure is available for implementation of progeny testing programme,

Various Steps of implementing a PS programme are as under:

Step-1: Identification of villages having population of a specific breed in its breeding tract.

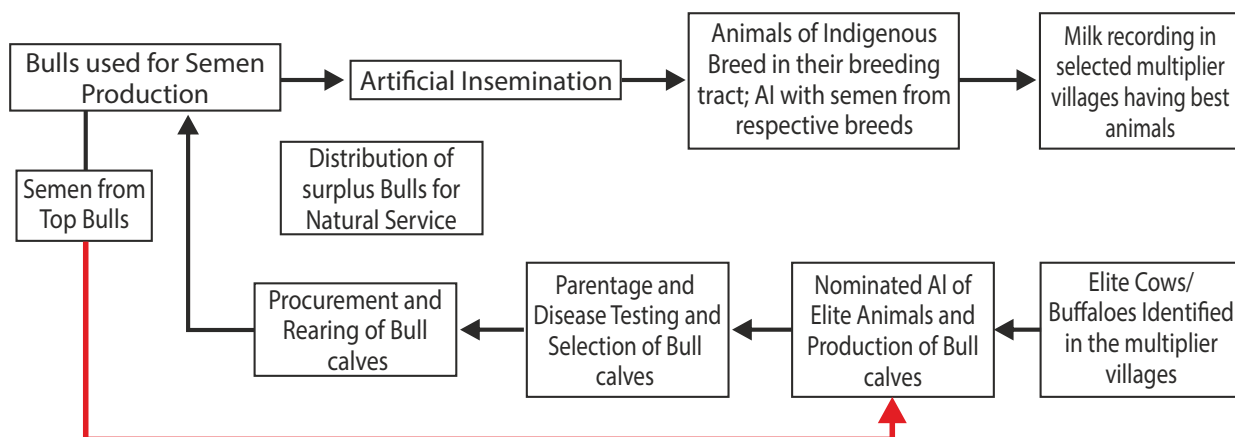
Step-2: Divide the available villages having animals of the breed into two categories: one as Multiplier villages about 20-40 having better quality animals and the remaining as other villages having animals of the breed.

Step-3: Females are performance recorded by trained milk recorders at farmers' herd at monthly intervals.

Step-4: The best animals are selected based on breeding values for milk yield and is used in multiplier villages to produce bulls.

Step-5: Young bulls (born through Nominated AI) with positive breeding values and free from certain diseases (as mentioned in the MSP of production of Bovine semen) are purchased from the farmer herd and brought to semen stations. Top ranked among them are used for bull production though nominated AI in multiplier villages while others bulls are used for breeding in other villages on a larger population of same breed.

Schematic Diagram of Pedigree Selection



Milk recording Under PT-PS Project

K. GENOMIC SELECTION

Traditional animal breeding practices involve selection of genetically superior animals on the basis of their own performance and on the performance of their relatives like ancestors, sibs, and progenies etc. However, in the beginning of the 21st century, better understanding of the genome along with technological developments opened up new possibilities of direct selection of superior animals at very young age based on their genotypic information with relatively high accuracy. Further, the advent of DNA sequencing and high-throughput genomic technologies has resulted in the discovery of a large number of Single Nucleotide Polymorphisms (SNP) in cattle and other food animal species. Selection of animals based on dense SNP markers is called Genomic Selection (GS).

PREREQUISITES FOR INITIATING GENOMIC SELECTION

Successful implementation of GS requires the following:

- i. Genotyping Chip with suitable SNPs capable of capturing the genetic variation. NDDB has developed “INDUSCHIP” & “BUFFCHIP” for genotyping Indigenous cattle & their crosses and buffaloes, respectively.
- ii. Reference population i.e. a population with known phenotypes (e.g. milk records) and genotypes. Reference population is considered to be the most important factor for successful implementation of any genomic selection programme.

ADVANTAGES OF GENOMIC SELECTION

Genomic Selection offers many advantages with regard to improving the rate of genetic gain in bovine breeding programs. The most important factors that contribute to faster genetic gain include:

- A greater accuracy of predicted genetic merit for young animals (both for male and females) in absence of their own performance records.
- A shorter generation interval due to extensive use of young, genetically superior males and females.

PART II

ANIMAL NUTRITION & MANAGEMENT

Providing balanced nutrition is the foundation for productive and profitable animal husbandry. Without adequate nutrition, animals cannot express their full genetic potential nor will they be productively efficient. Low milk production, low reproductive rates, poor growth and increased illness may be the result of imbalance or deficiency of nutrients. Proper balance of protein, energy, vitamins and minerals are needed in the ration of animals to ensure best performance with respect to production, reproduction and health. Therefore, providing nutritionally balanced ration to the animal is necessary to gain economic returns from dairying.

The following sections are included in this part:

Section I : Feeding of Animals

Section II : Fodder Production

Section III : Housing of Animals



SECTION I

FEEDING OF ANIMALS

Feeding is an important aspect of dairying as it accounts for around 70% of total cost of milk production. Different types of dietary feed ingredients for dairy cows and buffaloes include concentrates such as compound cattle feed, oil cakes, grains and grain byproducts like brans and chunnies; cultivated green fodders and grasses; crop residues like straws and stovers. Following chapters are included in this section:

- A. Feeding of Dairy Animals.
- B. Importance of Feeding Balanced Ration
- C. Importance of Compound Cattle Feed in Milk Production
- D. Importance of Bypass Protein Feed
- E. Importance of Bypass Fat Supplement
- F. Importance of Feeding Mineral Mixture
- G. Urea Molasses Mineral Block (UMMB) – A Feed Supplement
- H. Role of Feed Supplements
- I. Importance of Drinking Water For Dairy Animals
- J. Feeding of Pregnant Animals
- K. Scientific Feeding of Young Calves
- L. Feeding Management of In-Milk Animals
 - 1. Feeding Practices in Early Lactation
 - 2. Feeding Practices in Mid And Late Lactation
- M. Concept of Total Mixed Ration (TMR)
- N. Examples of Preparing Total Mixed Ration (TMR) For Cow
- O. Examples of Preparing Total Mixed Ration (TMR) For Buffalo

A. FEEDING OF DAIRY ANIMALS

- A normal adult animal should be fed 4 to 6 Kg dry and 15-20 Kg green fodder per day.
- Legume and non-legume green fodder should be fed in 1:3 proportion.
- Green fodder should be harvested at 50% flowering stage.
- Surplus green fodder should be conserved in the form of 'hay' or 'silage' .
- Conserved fodder becomes useful during summers or when green fodder is scarce.



Leguminous fodder



Non-leguminous fodder



Cattle feed

GENERAL RECOMMENDATIONS

- To optimize milk production and to meet the nutrient requirement of animals, balanced feeding using user-friendly software developed by NDDB may be adopted.
- Animals fed only on dry fodder may be provided Urea Molasses Mineral Block as a supplement to the diet, depending upon its availability .
- For body maintenance and higher efficiency of milk production, 'compound cattle feed' / 'bypass protein feed' should also be given .
- Minerals are essential for all metabolic functions of the body, animals' ration should be supplemented with area specific mineral mixture .
- Changing from one feed to another should not be sudden but in a gradual manner.
- Fodder should be chaffed before feeding, to avoid wastage and increase digestibility.
- Various feed ingredients including the additives, should be mixed to make Sani or total mixed ration (TMR). It would be more appropriate to feed this ration in 3-4 equally divided parts in a day. This would reduce spoilage and increase the digestibility.



Chaffing of fodder



B. IMPORTANCE OF FEEDING BALANCED RATION

- The feed given to animals usually comprises one or two locally available concentrate feed ingredients, grasses and crop residues.
- This leads to imbalanced feeding which means that protein, energy, minerals and vitamins in the ration are either more, or less.
- While imbalanced feeding adversely affects the health and productivity of animals in various ways, it also reduces the net daily income to milk producers from dairying because the potential of milk production of animals is not fully exploited.
- To balance the ration of animals, NDDDB has developed a user-friendly software “1962”, which can be download from google play store.

BENEFITS OF FEEDING BALANCED RATION

- Using available feed resources, ration of animals is balanced at a least cost
- Increase in milk production with more fat and solids-not-fat
- Increase in the net daily income
- Improved reproduction efficiency
- Reduction in inter-calving period, thereby increase in productive life of animals
- Improvement in general health of animals
- Improved growth rate in calves, leading to early maturity
- Reduction in methane emission, a potent green house gas (GHG)



Implementing Balance Ration in the field

Balance ration is an effective tool to improve milk production at least cost and reduce methane emissions

C. IMPORTANCE OF COMPOUND CATTLE FEED IN MILK PRODUCTION

- Cattle feed produced by the Milk Unions/Federations is a balanced source of essential nutrients required for body maintenance, growth and milk production.
- It is manufactured using good quality grains, oil cakes/ meals, brans, molasses, common salt, minerals and vitamins.
- It is comparatively cheaper and highly palatable to the animals.

RECOMMENDATIONS FOR FEEDING CATTLE FEED

- Cattle feed contains protein, energy, minerals and vitamins required for the growth, maintenance and milk production of animals. It is advantageous to feed extra cattle feed to pregnant animals for proper development of foetus.
- It increases reproductive efficiency, milk production as well as fat percentage of milk.
- Growing animals should be fed 1 to 2 kg of compound cattle feed daily.
- Milking animals should be fed 2 kg of compound cattle feed for body maintenance and additional 400 g to cows and 500 g to buffaloes for every litre of milk produced.
- In addition to this quantity, 1 kg compound cattle feed and 1 kg good quality oil cake should also be given to pregnant animals during the last two months of pregnancy.
- Always purchase BIS certified/marked cattle feed.



Cattle feed is prepared from

different grains, cakes, brans, molasses, salt, mineral mixture and vitamins.

Compound cattle feed of appropriate quality keeps animals healthy and increases milk production



D. IMPORTANCE OF BYPASS PROTEIN FEED

- Proteins are essential for growth and milk production.
- Generally, the major portion of the feed proteins are broken down in the first compartment (rumen) of the stomach.
- In case of bypass protein feed, significant portion of the protein escapes break down in the first compartment and goes to the later part of gastro-intestinal tract resulting into better utilisation of proteins in the body.
- Bypass protein feed can be prepared using chemically treated protein meals.

BENEFITS OF BYPASS PROTEIN FEED

- More nutritive feed at a cheaper price.
- The utilisation of the dietary protein increases.
- It improves growth and milk production.
- If usual 'bypass protein feed' is not available, then 1 Kg 'treated bypass protein supplement' can be fed (half Kg in the morning and half Kg in the evening) to animals producing 8-10 litres of milk.



Bypass protein plant



Bypass protein feed

Bypass protein feed is an economical source of nutrients

E. IMPORTANCE OF BYPASS FAT SUPPLEMENT

- It is ideal energy dense supplement for early and advance pregnant animals to overcome negative energy balance.
- Enhances peak milk production and persistency of lactation.
- Fulfils the nutrient requirements of high yielding animals
- Reproductive performances can be enhanced as animal return to positive energy balance
- Decreases metabolic disorders such as ketosis, acidosis and milk fever.
- Increases productivity and productivity life of animals.
- Bypass fat should be fed to early lactating animals @ 100-200 g per day for increasing energy density of the feed



Bypass fat supplements

F. IMPORTANCE OF FEEDING MINERAL MIXTURE

Minerals are essential for proper metabolic functions. Mineral mixture contains all the essential minerals in required quantities. Feeding area specific mineral mixture should be preferred.

BENEFITS OF FEEDING MINERAL MIXTURE

- Helps improving growth rate in calves.
- Better utilization of absorbed nutrients.
- Increases milk production in animals.
- Improves reproductive efficiency and reduces inter-calving period.
- Increases productive life of animals.
- Improves immunity status.
- Prevents metabolic diseases like milk fever, ketosis, haematuria etc., which occur around calving period.

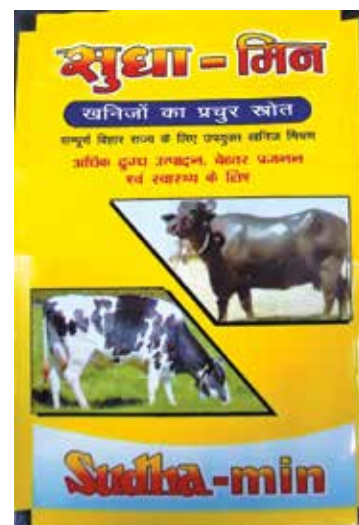




Change in hair colour due to copper deficiency



Iodine deficiency causing enlargement of thyroid gland (arrow) and zinc deficiency causing lachrymation.



Left to right: Area Specific Mineral Mixture (ASMM) manufactured by dairy cooperatives of Rajasthan, Karnataka and Bihar.

FEEDING RECOMMENDATION

Calves	20-25 g daily
Heifers and dry animals	50 g per animal daily
Milking animals	100-200 g per animal daily (as per milk production) or in view of level of mineral mixture in compound cattle feed/concentrate mixture.

Supplementation of deficient minerals improves milk production and reproduction efficiency

G. UREA MOLASSES MINERAL BLOCK (UMMB)– A FEED SUPPLEMENT

- Ruminants have a special compartment in their stomach, which is called rumen. It contains large number of beneficial microorganisms, which help in digestion of fibrous components of feed.
- During scarcity of green fodder, UMMB helps the rumen microbes to multiply and thus improves the digestibility of dry fodder.

BENEFITS OF UMMB

- Increases dry fodder intake and minimizes wastage.
- Improves the digestive efficiency of the animals.
- Improves milk production and fat percentage.
- It is a good source of essential minerals.



UMM Blocks



Animal licking UMMB

H. ROLE OF FEED SUPPLEMENTS

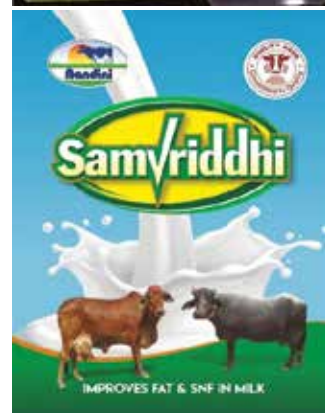
GARBHAMIN BOLUS

- GarbhaMin Bolus has been developed to address the issue of anestrus, which is primarily caused by nutritional deficiency.
- It contains chelated trace minerals (Zn, Cu, Mn, I, etc) and coated vitamins.
- Supplementation of one bolus per animal per day for 28 days helps in improving reproductive efficiency.



SAMVRIDDHI

- Milk fat and Solids-Not-Fat (SNF) are important constituents of milk that determine its price. Its lower level causes economic losses to dairy farmers.
- Low fat in milk can be caused due to low fat in diet, excessive concentrate feeding, low roughage to concentrate ratio, poor body condition score and improper rumen function.
- Similarly low SNF content in milk may be due to negative energy balance, less protein and mineral mixture feeding.
- Feeding Samvridhhi, @ 250g/animal/day lead to improvement in milk yield, milk fat and SNF content up to 8, 10 and 6 per cent, respectively.

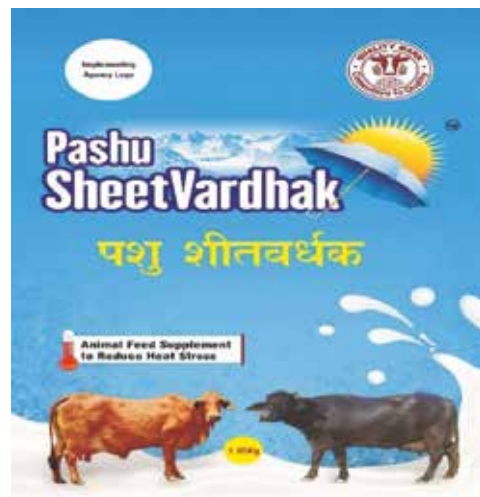


Dry fodder supplemented with UMMB can form maintenance ration for cows and buffaloes.



PASHU SHEETVARDHAK - a feed supplement to mitigate heat stress.

- High ambient temperature and relative humidity leads to heat stress in dairy animals.
- It causes reduction in dry matter intake and diversion of nutrients for maintaining physiological parameters, resulting in decreased productivity.
- This supplement minimizes productivity losses and maintain physiological parameters during heat stress period in dairy animals.
- Supplementation of this product @ 350g/day/animal improves milk yield to the tune of 11.0 per cent and fat content 7.0 per cent, in cows and buffaloes.



I. IMPORTANCE OF DRINKING WATER FOR DAIRY ANIMALS

Water is required for

- Digestion of feed and fodder.
- Distribution of absorbed nutrients to various organs.
- Excretion of undesirable and toxic elements through urine.
- Maintenance of body temperature.
- Normally, an adult healthy animal requires 70 to 80 litres of water daily. Since milk contains about 87% water, for every litre of milk produced, additional 2.5 to 3 litres water is required.

RECOMMENDATION

- Animal should have a free access to clean drinking water round the clock.
- During summer, crossbred cows and buffaloes should be given bath twice daily and at least 100 litres of water per day to manage heat.

J. FEEDING OF PREGNANT ANIMALS

- Adequate health care and nutrition can ensure rapid growth of female calf as well as attaining puberty at an early age. Timely insemination of such animals can help them to calve at 2 to 2 ½ years of age.
- About 70% growth of foetus takes place during last 3 months of pregnancy, adequate care needs to be taken during this time.

RECOMMENDATIONS

- Animals in the last trimester of pregnancy should not be taken far away for grazing, uneven paths should also be avoided.
- A lactating animal should be dried within a period of 15 days after the 7th month of gestation.
- Pregnant animals should have enough space for standing and sitting comfortably.
- Pregnant animals need suitable ration to reduce the possibility of diseases like milk fever and ketosis at the time of calving and also to ensure adequate milk production.
- Water should be provided round the clock to pregnant animals with a minimum of 75-80 litres of fresh and clean drinking water daily.
- A heifer after 6-7 months of gestation should be tied with milking animals; and its body, back and udder should be massaged.
- 4-5 days before calving, the animal should be tied in a separate clean and airy area having sunlight. Bedding materials like paddy straw should be spread on the ground for the animal.
- The animal should be kept under observation during the last 1-2 days before calving.

DAILY FEED REQUIREMENT OF A PREGNANT ANIMAL

Green fodder	15-20 Kg	Oil cake	1 Kg
Dry fodder	4-5 Kg	Mineral Mixure	50gm
Compound cattle feed	2-3 Kg	Salt	30 gm



Proper care and management of pregnant animals ensures a healthier calf and higher lactation yield

K. SCIENTIFIC FEEDING OF YOUNG CALVES

- Immediately after calving, the cow/buffalo has a low appetite and will not eat as much feed as the body may require.
- Cow/buffalo undergoes a lot of stress while calving, therefore, the animal should be given light, palatable, mild laxative ration containing warm rice gruel, boiled rice/wheat bran, boiled millet or wheat mixed with edible oil, bypass fat, Jaggery, Soya, Asafoetida, Methi, Black Cumin, ginger etc. for 2 to 3 days after calving. This kind of diet is also helpful in early expulsion of placenta.
- In addition, the animal should be given tender green fodder and fresh water as much as it wants to drink, but do not give hot water.
- Ensure the milking cow has constant access to clean drinking water and receives required quantity of Area Specific Mineral Mixture daily.
- Calf should be fed calf starter upto 6 month of the age for faster growth.
- Calf/Heifer growth meal should be fed for early sexual maturity and reduced age at first calving.



Feeding and management during the transition period has a significant bearing on the lactation length and total milk yield.

L. FEEDING MANAGEMENT OF IN-MILK ANIMALS

1. FEEDING PRACTICES IN EARLY LACTATION (UP TO 100 DAYS)

- As the demand for energy is higher during this stage, the animal starts mobilising body reserve and loose body weight.
- Sometimes animal may suffer from various metabolic disorders and may not conceive within 90 days post calving as desired.
- Ration should be formulated in such a way that the DMI could be maximised.
- Ration should be balanced for roughage and concentrates in the ratio of 50:50.
- Provide high quality concentrates feeds with higher grains (source of bypass starch) and protein content.
- Of the green fodder provided, 1/3rd should be from leguminous (about 5 kg) and 2/3rd from cereal fodder or grasses (about 10 kg)
- Provide bypass fat supplement @ 100–150 g/day/animal
- Provide mineral mixture @ 100-150 g/day/animal along with calcium supplement for high yielding animals, if required
- Add buffer like Sodium bi-carbonate in the ration to avoid acidosis (40-60 g/day/animal)
- Adopt challenge feeding to maximise milk production as per genetic potential (offer 0.5 kg cattle feed over and above its requirement).

2. FEEDING PRACTICES IN MID AND LATE LACTATION (AFTER INITIAL 100 DAYS)

- Once peak yield is attained, it is important to maintain it as long as possible.
- Animal should make up for the body weight lost during early lactation
- To maintain optimum dry matter intake, the roughage to concentrates ratio should be 60:40
- Grain part of the concentrates can gradually be replaced with good quality bran
- Bypass fat supplementation and dietary buffers may be discontinued.
- Mineral mixture should be fed based on milk production level (50-100 g/day/animal)
- Feeding of 2.5 – 3.0 kg pregnancy feed per day to pregnant animals during last 60 days of pregnancy
- Proper drying-off of the animal to be done



M. CONCEPT OF TOTAL MIXED RATION (TMR)

- TMR is an efficient way of feeding dairy animals in which all feed items like dry fodder, green fodder, and concentrates (including mineral mixture, etc.) are mixed together as per nutrient requirement.
- TMR can be formulated using ration balancing software (1962)
- Mix all the feed items together by manual mixing or with help of TMR wagon

ADVANTAGES OF FEEDING TMR

- Dairy animal gets balanced ration in every bite they eat
- Increase in dry matter intake
- Selective consumption is restricted and feed wastage is less
- Improved milk yield and fat per cent due to stable rumen environment and by balanced ration throughout the day
- Decrease in labour cost
- Unconventional feed items can be incorporated



Green fodder/silage



Dry fodder



Concentrate



Feed supplement



Machine Mixing



Feeding of TMR

- Nowadays, Total Mixed Ration (TMR) is being produced by various milk unions, offering a complete feed solution for smallholders. TMR is being made available in 25 to 35 kg bags and can be fed to animals at a rate of 15 to 20 kg per animal per day based on their milk yield.



TMR Plant



Packaged TMR

N. EXAMPLES OF PREPARING TOTAL MIXED RATION (TMR) FOR COW

1. DRY COW

Ingredients *	Quantity (Kgs)		
	Example 1	Example 2	Example 3
Dry fodder	7	7	7
Green fodder	5	10	5
Cattle feed	2	1	-
Oil Cake	-	-	1

* Mineral Mixture @ 50g per animal per day should be given

2. COW YIELDING 5 LITRES OF MILK PER DAY

Ingredients *	Quantity (Kgs)		
	Example 1	Example 2	Example 3
Dry fodder	7	7	7
Green fodder	5	10	5
Cattle feed	4	3	-
Oil Cake	-	-	2
Wheat bran	-	-	1

* Mineral Mixture @ 100g per animal per day should be given

3. COW YIELDING 10 LITRES OF MILK PER DAY

Ingredients*	Quantity (Kgs)		
	Example 1	Example 2	Example 3
Dry fodder	7	7	7
Green fodder	5	10	5
Cattle feed	6	5	-
Oil Cake	-	-	3
Wheat bran	-	-	2

* Mineral Mixture @ 150g per animal per day should be given



O. EXAMPLES OF PREPARING TOTAL MIXED RATION (TMR) FOR BUFFALO

1. DRY BUFFALO

Ingredients*	Quantity (Kgs)		
	Example 1	Example 2	Example 3
Dry fodder	6	6	6
Green fodder	2	5	10
Cattle feed	-	-	1
Oil Cake	2	-	-
Wheat bran	-	3	-

* Mineral Mixture @ 75g per animal per day should be given

2. BUFFALO YIELDING 5 LITRES OF MILK PER DAY

Ingredients*	Quantity (Kgs)		
	Example 1	Example 2	Example 3
Dry fodder	7	6	7
Green fodder	5	10	2
Cattle feed	5	5	-
Oil Cake	-	-	3
Wheat bran	-	-	1

* Mineral Mixture @ 125g per animal per day should be given

3. BUFFALO YIELDING 10 LITRES OF MILK PER DAY

Ingredients*	Quantity (Kgs)		
	Example 1	Example 2	Example 3
Dry fodder	7	7	7
Green fodder	10	15	5
Cattle feed	6	7	-
Oil Cake	2	-	5
Wheat bran	-	-	3

* Mineral Mixture @ 175g per animal per day should be given

SECTION II

FODDER PRODUCTION

Fodder production is one of the most important activities in dairying contributing to the profitability of the business. It is also one of the areas that is neglected most often. Fodder provides an economic nutrient source which is highly relished by the animals. A year round supply of fodder can be assured if farmers cultivate seasonal and perennial fodder crops by adopting suitable crop sequences and surplus green fodder is preserved properly in times of abundance for use during lean periods. There are various processes by which this can be done.

Most of the farmers in our country depend on crop residues to sustain dairying. However, these crop residues are very low in nutritive value which needs to be enriched before feeding to the animals to increase its digestibility and palatability. The following chapters are included under this section:

- A. Importance of Green Fodder in Milk Production
- B. Importance of Alternate Fodder Resources
- C. Importance of Using Quality Fodder Seeds
- D. Fodder Conservation
- E. Urea Treatment of Crop Residues
- F. Fodder Mowers and Straw Recovery Devices
- G. Densification and Enrichment of Crop Residues
- H. Package Practices for Important Fodder Crops in India



A. IMPORTANCE OF GREEN FODDER IN MILK PRODUCTION

Green fodder is an economic source of nutrients for the dairy animals. It is highly palatable and digestible. Micro-organisms present in green fodder help in improving digestibility of crop residues under mixed feeding system. It also helps in maintaining good health and improving breeding efficiency of animals. Increased use of green fodder in the ration of animals may reduce cost of milk production.

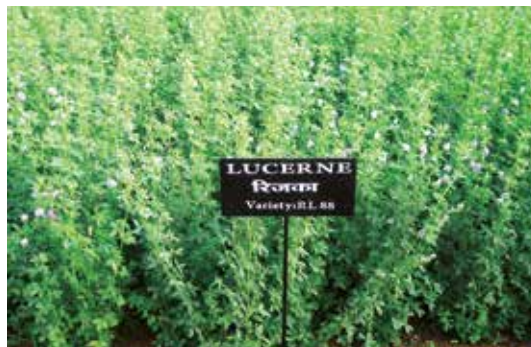
To reduce the gap between demand and availability of green fodder, there is a need to improve green fodder yield through enhanced use of improved fodder seeds. For ensuring year round green fodder production, farmers need to adopt following agricultural practices:

- Always use certified / truthfully labeled seed / planting material of improved high yielding varieties of fodder crops.
- Follow recommended package of practices for fodder cultivation such as land preparation, timely sowing, fertilizer application, irrigation, weed and pest control and harvesting schedule.
- Growing short duration varieties of fodder crops such as maize, sunflower, chinese cabbage, turnip, cowpea etc. between two main seasonal crops.
- Cultivate cereal fodder crops like maize, bajra and sorghum along with fodder legumes like cowpea, cluster bean and velvet bean.
- Cultivation of high yielding multi-cut perennial fodder crop like Hybrid Napier grass in fields and also on boundaries of other crop fields.
- Cultivate guinea grass, a shade tolerant fodder crop along with forage legumes like siratro / stylos under mixed cropping between trees rows in orchards.
- Harvest the multi-cut fodder crops at regular intervals (30 to 45 days) 10 cm height from ground level to get optimum production and quality fodder.
- Cultivate drought tolerant perennial grasses like anjan grass, sewan grass, rhodes grass and fodder trees like desi babool, neem, shisam, kanchan, aaradu, khejri, subabul and Gliricidia on fallow lands/wastelands/community for grazing.
- Some photos of important fodder crops and trees are provided in the following pages.

IMPORTANT FODDER CROPS



Fodder maize– (Variety - African Tall)



Lucerne



Oats



Multi cut Sorghum Sudan Grass (SSG)



Fodder pearl millet—GFB 1



Job Tears—Coix



Berseem—(Variety - Wardan)



Sunflower



Feeding green fodder is the key to economic milk production

IMPORTANT FODDER CROPS



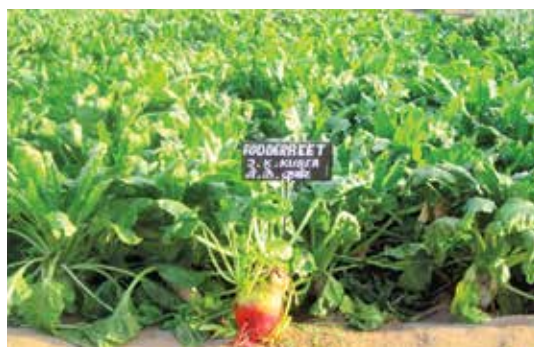
Velvet bean



Chicory



Cow pea



Fodder beet



Hybrid Napier- CO 4



Multi cut sweet Sudan grass



Teosinte



Sorghum mixed with cowpea

Green Fodder is the cheapest source of nutrient

IMPORTANT FODDER CROPS



Anjan Grass



Clitoria ternatea (Aparagita)



Barley green



Congo signal Grass



Dhaman Grass



Guinea Grass



Fodder Mustard – Chinese cabbage



Nandi Grass



Green fodder is highly palatable & easily digestible

IMPORTANT FODDER CROPS



Green Panic Grass



Para Grass



Rhodes Grass



Rice bean variety – (Variety - Bidhan 1)



Shevri (Sesbania sesban)



Siratro



Stylo hamata



Dasrath grass (Hedge Lucerne)

Feeding green fodder improves production & reproductive efficiency

IMPORTANT FODDER CROPS



Stylo (Stylo scabra)



Fodder beet

IMPORTANT FODDER TREES



Kanchnar (Bauhinia purpuria)



Maharukh/Aaradu (Ailanthus excelsa)



Subabul (Leucaena leucocephala)



Gliricidia (Gliricidia sepium)



Khejari (Prosopis cineraria)



Agasthi (Sesbania grandiflora)



Tree leaves are important source of green fodder

B. IMPORTANCE OF ALTERNATE FODDER RESOURCES

Thornless cactus, is excellent source of green fodder for semi-arid and arid regions. It is commonly known as fodder cactus. Cactus is successfully multiplied by vegetative propagation using oval stems known as cladodes or paddles. It is good source of water too as it contains 90 percent water.

- For animal feeding, large size, fleshy and 6 months old cladodes are cut from the plants, whole plant is not to be uprooted.
- At a time, up to 1/3rd of total cladodes on plant may be harvested for feeding. Subsequent harvesting is done after 6 months.
- Before feeding, cladodes should be chopped in small pieces of 2-3 inches by chaff cutter.
- After chopping, mix with dry fodder. 10-15 kg chopped thornless cactus may be fed to animals per day.



Cladodes ready for harvesting



Chopping



Feeding

Moringa, an useful nutritious green fodder for animals. It is rich in protein, minerals and vitamins. It is traditionally cultivated as a backyard plant and pods/ leaves are used for vegetable purpose. Moringa can produce green fodder for livestock like any other perennial multi-cut fodder crop.

- It contains Dry Matter 16 %, Crude Protein 15 %, Fat 2.35 %, Crude fibre 35 %, Calcium 0.8 %, and other minerals in good quantity.
- Crop is ready for first harvest at 85-90 days after sowing, harvest the crop at 30 cm above ground level. Subsequent cuttings can be taken at 55-60 days interval.
- 15-20 kg chaffed green fodder of Moringa can be fed daily to one animal after mixing it with dry fodder.



Chaffing and feeding of Moringa green fodder

C. IMPORTANCE OF USING QUALITY FODDER SEEDS

Seed is the critical input to enhance the production potential of fodder crops. Therefore, an assured supply of fodder seeds of improved varieties/hybrids to farmers at a reasonable price is crucial for enhancing fodder production.

- NDDDB assists dairy cooperatives in arranging breeder seeds and facilitating production and distribution of quality fodder seed.
- Dairy cooperatives are engaged in seed multiplication chain and make available seeds of improved fodder crop varieties to dairy farmers.
- Quality fodder seeds have good germination, vigour, resistance to diseases and have potential to give a higher and stable yield.
- Quality fodder seeds ensures increase in fodder production leading to improved milk production and reduced feeding cost.



Seed processing unit



Certified/Truthfully labelled fodder seed

D. FODDER CONSERVATION

Feeding quality roughages to the dairy animals throughout the year is essential to exploit their milk production potential. Generally, green fodder is available in plenty in few months like September/October (monsoon season) and February / March (Rabi season) under irrigated conditions while its availability is limited during summer months. The surplus green fodder can be conserved in the form of hay and silage to ensure supply of roughages during deficit period and to minimize wastage of green fodder.



Fodder conservation helps mitigate regional & seasonal deficits

(i) HAY MAKING

Hay is a sun dried green fodder, containing moisture below 15 per cent. It is a good source of digestible dry matter and crude protein for dairy animals during deficit periods. The best quality hay is prepared from thin stem cultivated fodder crops like Lucerne, Oats and Sweet Sudan Grass during hot and dry summer months from March to May. Some perennial pasture grasses like Guinea grass, Rhodes grass, Anjan/Dhaman grass, Blue panic grass are also suitable for hay making.

To get best quality hay, these crops are cut at 50 per cent flowering stage. After cutting, green foliage is evenly spread on dry surface in thin layers of 5 cm thick for sun drying. Every morning after 10 A.M. fodder is inverted manually /mechanically for quick and evenly drying. After 4 to 5 days, when moisture reaches to less than 15 per cent in the forages, hay is collected and bundles are made for storage. While drying, care should be taken that hay retain the leaves and green colour, as it is an indicator of good quality hay.

These bundles of hay should be stored in moisture and dust free places like bunkers/godowns to maintain quality for longer period. Hay can be fed @ 5 kg per animal per day with or without chaffing.



Sun drying of green foliage



Bundles of hay

Hay - an alternative to green fodder during deficit period

(ii) SILAGE MAKING

It is known as pickle of green fodder. It is easily digestible and highly palatable. Best quality silage can be prepared from cereal fodder crops like Maize, Sorghum, Pearl millet, Oats and Barley which are rich in carbohydrates/sugars. Green fodder should be harvested at milking to dough stage of the crop, containing moisture content around 65 to 70 per cent, ideal for silage making. After harvesting, fodder is chaffed to 1 to 2 inch size for filling in silo pit.

Silage storage structure (Silo pit) is to be constructed prior to initiating silage making. Surface silo is an ideal storage structure and to be constructed on raised ground to minimize inflow of water. Size of the silo pit depends on the quantity of fodder to be ensiled. Silo pit with area of one cubic meter (1 metre length x 1 meter width x 1 meter height) is sufficient for ensiling 500 to 600 Kilograms of chaffed fodder.

The chaffed fodder is filled in tightly pressed layer of 10 cm each. Pressing of fodder can be done manually in small silo and through tractors in big size silo. After complete filling of silo pit, silage heap should be well sealed at the top with polythene sheet and 5 inches thick moist soil layer. Later, if some cracks are visible in the covered layer, more soil should be spread to seal it. Use of additives should be avoided in silage making. However, if fodder is not harvested at proper stage, suitable additives (molasses/common salt/ urea/formic acid) can be used during fodder filling.

After 45 days silage is ready for animal feeding. When green fodder is in deficit, silo pit can be opened from one side to take out the silage as per daily need of animals. It may be covered properly with polythene sheet after taking out of silage daily. Silage is a substitute of green fodder. However, initially for 3 – 4 days, its feeding is limited @ 5 to 10 kg/animal/per day to adjust the animals on silage feeding. Then it can be fed as per the green fodder requirement of animal.



Chaffed fodder



Filling and pressing in silo pit



Fully sealed silo pit

Silage making in kaccha/ paccka pit or surface silo are suitable primarily for own consumption of the dairy farmers.

For ease of transportation now a days silage is also made in the form of bales using silage balers. Entrepreneurs/ cooperative dairies are generally making silage in bags/ bales to make it available to small-dairy farmers.



Silage making is an effective way to conserve green fodder



Silage Bags



Silage Bales

E. UREA TREATMENT OF CROP RESIDUES

Generally, paddy, wheat, bajra, sorghum, and pulse straws are available in plenty with the farmers but these straws are deficient in nutrients and low in digestibility. Straws have less than 4 per cent protein. Urea treatment of straw increases its nutritive value by raising the protein content to about 8 per cent. Feeding urea treated straw may reduce the cattle feed requirement up to 20 per cent.

Straw Treatment Method

- 40 kg urea and 400 litres of water is needed for the treatment of 1 ton straw. Dissolve 4 kg urea in 40 litres of water.
- Spread 100 kg straw on the floor to form 3-4 inch thick layer and sprinkle 40 litres of prepared urea solution on the straw using gardener's sprinkler. Then press the straw with feet by walking on it.
- Spread another 100 kg of dry straw on top of this compressed straw repeat the procedure 10 times by spreading 10 layers of straw, sprinkling it with 4 % urea solution and then pressing.
- Cover the treated straw heap with a plastic sheet and spread some quantity of mud at the point where it touches the ground to prevent the formed ammonia gas to escape.
- It takes 21 days to complete the treatment.

Precautions

- Keep urea or urea solution away from the animals as it is fatal to them.
- Cemented floor is more appropriate for treatment of straw.

- If the floor is kaccha, use a plastic sheet on the floor before spreading the first layer of straw.
- It is convenient to undertake straw treatment in a closed room or in the corner location.
- Treated straw should be opened after 21 days in summer and 28 days in winter.
- Before feeding, the straw should be spread in open air for the ammonia gas to escape.
- Start with feeding small quantities of treated straw. Slowly the animal gets habituated.
- Avoid feeding urea treated straw to calves below six month of age.

UREA TREATMENT OF CROP RESIDUES



Ensure correct quantities of urea & water



Urea treatment of crop residues

UREA TREATMENT OF CROP RESIDUES



Ensure proper pressing and sealing



Ensure proper mixing



Urea treated straw after opening the seal

Urea treatment improves the nutritive value of straws



F. FODDER MOWERS & STRAW RECOVERY DEVICES



Photo A

Auto Pick up Balers



Photo B

Flail Mower, Chopper Loader



Photo C

Reaper binder mower



Photo D

Raker

Due to labour shortage many farmers are adopting combine harvesters intensively for managing food crops like wheat, rice, maize, oil seeds and pulses leading to huge loss of fodder biomass which was otherwise available to dairy cattle in manual harvesting system. For reducing fodder wastage, the farmers need to introduce fodder mowers and auto pick up devices for effective management of fodder and recovery of straw after combining. Mowers are high speed green fodder and straw harvesting machines having inbuilt options for threshing / chopping / trailer loading / stem cracking/ conditioning. They are the most economical devices for straw recovery, silage making, hay making and fodder harvesting. Mowers are also known as roughage management machines used for intensive fodder production for higher protein and higher energy recovery at right stage of harvesting, storage, banking and ware housing.

Depending on season, crop hardness, tenderness, thickness, height and moisture of different crops, various types of mowers are to be propagated. Following three kinds of straw securing and fodder management devices will be extremely useful,

a) Auto Pick up Balers (Photo A)

b) Flail Mower/Chopper Loader (Photo B)

c) Combine prevention / mowers (Photo C)

a) Auto Pick up Baler is driven by 50 - 75 hp tractors. It picks up a swath width of about 1500-1800 mm. Straw or hay pick up rate of this machine is about 1 to 2 MT per hour depending on crop and swath. Size of the bales can be adjusted from 10 to 20 kg. Small bales are easy to handle and can be transported to transit storage points with ease and minimum drudgery. Loading, unloading and stacking of fodder becomes very convenient after baling. Also, onward trading and distribution is quite convenient after baling. Left out straw from dwarf varieties can be baled directly after combining. But for taller biomass additional disc or drum or sickle type mower is essential before baling. For managing high moisture biomass we need another machine called collection inversion cum liner rake (Photo D) so as to sun dry the biomass before pick up & storage. The baler machine can work on almost all types of biomass. About 20 MT of straw can be secured in one day by employing 50-75 HP tractor driven baler. Many leading international brands of straw or hay baler machines are active in India now – Claas, New Holland, John Deere, Kuhn are among the top players.

b) Flail Mower, Chopper Loader is also driven by 50 - 75 hp tractors. It pick up swath width of about 1300 to 1900 mm. Straw recovery rate with this machine is about 2 to 3 MT per hour depending on crop height and swath. Machine has option of blowing the fodder biomass back into field for sun drying or mulching as per specific needs of the farmer. For high moisture biomass collection, inversion cum liner rake (Photo D) is also required so as to sun dry the biomass before pick up and storage. The machine can work on almost all types of biomass. The mower ensures added benefit of high speed silage and hay making due to inbuilt chopping and cracking facilities. About 20 MT of straw can be picked up in one day with this mower in loose form. Mechanisms used in the flail mowers are simple, but strong & sturdy. Therefore, low skill level workers and operators can also run these type of biomass recovery mowers. Based on the requirement there are two variants of these machine available in market – Single Chop (length of cut is long) & Double Chop (Chop length is relatively short). Major players for flail harvesters in India are Fimaks, John Deere, Celikel.

c) Combine prevention /mowers -Under this category many kinds of smaller crop mowers are available like walk behind reaper, tractor mounted reaper liner etc. Self propelled Reaper Binder with 10 HP diesel engine is gaining momentum in India due to its versatile usefulness in fodder as well as grain crops like wheat, rice, rain-fed sorghum, bajra, pulses, oil seeds etc. The machine harvests the crops at almost zero level - just 60 mm above the ground thus guarantees 100% straw recovery. Bundles made by the reaper binder are fully automatic (labour free) and are quite handy. BCS and Jashoda are top suppliers for reaper binders in India. The mower machine can harvest about 8 acre in one day.



G. DENSIFICATION AND ENRICHMENT OF CROP RESIDUE

Nutritive value of crop residues is low and these form the bulk of basal diet of ruminants. If crop residues are supplemented with low cost deficient nutrients and then densified, it is possible to save the transportation cost & storage space and at the same time nutritive value of straws can be improved. Hence dairy cooperatives have started production of straw based blocks/ pellets using various kind of straws.

Benefits of straw densification and enrichment

- Nutritive value and palatability of crop residues can be improved through enrichment.
- Transportation cost of straws and stovers can be reduced.
- Storage space requirement of enriched and densified crop residues is 2-3 times less.
- Through straw based feed blocks, it is possible to meet the macro and micro nutrient requirement of animals. Animals, thus, get balanced ration and there is improvement in productivity of animals on feeding straw based blocks.
- Straw based pellets/ blocks, enriched with concentrates and molasses can be fed 8-12 kg per animal per day, depending upon the level of milk production.



Straw Based Blocks



Straw Based Pellets

SUMMER-RAINY/ KHARIF CROPS

Crop	Soil type	High yielding varieties	Sowing time	Seed rate (kg / ha)	Row Spacing cm	Fertilizer rate (kg/ha)	No. of irrigations	Harvesting time (days)	No. of cuts / year	Fodder yield (ton/ha)
Sorghum (Single cut)	Sandy Loam to Clay Loam	HJ – 541 CSV 35 F CSV 21 F CSV 38 F Pant Chari 7	June – July (North India) Feb to Nov (South India)	45-50	30-40	N – 90 P- 30	2-3	80-90 for late varieties and 65-57 for early ones	1	30-50
Sorghum (Multi-cut)	Sandy Loam to Clay Loam	CSH 24 MF CSH 43 MF CO 31 Pant Chari 6 CSV 33 MF	March – July (North India) Feb to Nov (South India)	25-30	30-40	N - 60 P - 30 & N - 30 kg after every cut	5-6	First cut at 60 days and rest at 45 days interval	3-4 & 6-7 in case CO FS29	70-90
Maize	Sandy Loam to Clay Loam Good drainage	African Tall J-1006 J-1007 Pratap Makka Chari 6 TSFM 15-5	March – August (North India) Feb to Nov (South India)	50-60	30-40	N – 80 P- 40 & N – 30 kg after every cut	3-4	75-80	1	35-55
Pearl Millet	Sandy Loam	Baif Bajra-5 Baif Bajra-6 Baif Bajra-7 TSFB 17-7 Raj Bajra-1 APFB-09-1	March to July	8-10	30	N – 40 P- 20	2-3	First cut at 50 days and rest cuts at 35 days interval	3-4	25-50



SUMMER-RAINY /KHARIF CROPS (CONTD)

Crop	Soil type	High yielding varieties	Sowing time	Seed rate (kg/ha)	Row Spacing cm	Fertilizer rate (kg/ha)	No. of irrigations	Harvesting time (days)	No. of cuts / year	Fodder yield (ton/ha)
Teosinte	Sandy Loam to Clay Loam	TL – 1	July	30-40	40-45	N – 90 P- 30	2-3	75 days stage	1	35-40
Cowpea	Sandy to Loam	UPC 618 UPC 625 UPC 622 MFC-09-1 Vijaya Bundel Lobia-4	March to July	30-35	30-35	N – 30 P- 40	2-3	60 -80	1	25 -30
Rice bean	Sandy Loam to Clay Loam	Bidhan 1 RBL – 6	April to August	20-25	30-35	N – 30 P- 40	2-3	70-90	1	20-25
Cluster bean	Sandy to Sandy Loam	Bundel Guar – 1,2,3 RGC-1033 RGC-1066 RGC-1055 HG 2-20	April to August	25-30	30-35	N – 30 P- 40	2-3	60-75	1	20-30

WINTER/ RABI CROPS

Crop	Soil type	High yielding varieties	Sowing time	Seed rate (kg/ha)	Row Spacing cm	Fertilizer rate (kg/ha)	No. of irrigations	Harvesting time (days)	No. of cuts / year	Fodder yield (ton/ha)
Berseem	Loam to Clay Loam	BL-42, 43,44, 45 JHB 17-1 JHB 17-2 BB-3 Jawahar Berseem-1	October to November	25	20	N – 30 P- 60 K - 40	10-15	First cut at 60 days and rest at 25 days interval	5-6	70-110
Lucerne	Sandy to Loam	Anand Lucerne 3 RL – 88 Krishana CO 2	October to November	25	20	N – 30 P- 80 K - 40	10 (Annual) 15 (Perennial)	First cut at 50 days and rest at 30 days interval	Annual – (6) Perennial (8 cut)	60-80 (Annual) 80-110 (Perennial)
Oats	Sandy Loam to Loam	OL-10 OL-13 OS 377 OL 1802-1 JHO 2009-1	October to November	80-100	20-25	N – 80 P- 40	3-4	First cut at 60 days and second cut at 50 % flowering	1-2	30-45
Fodder Mustard	Sandy Loam to Loam	Chinese Cabbage	September to November	6-8	30-40	N – 60 P- 30	2-3	At 50 % flowering	1	25-30
Fodder beet	Loam	Jamon, JK Kuber,	November to December	3	50	N – 120 P – 60 K - 40	8	Digging of roots at 100 days onward	1	75 – 100



PERENNIAL GRASSES/PASTURE LEGUMES/FODDER TREES

Crop	Soil type	High yielding varieties	Sowing time	Seed rate (kg/ha)	Row Spacing cms	Fertilizer rate (kg/ha)	No. of irrigations	Harvesting time (days)	No. of cuts / year	Fodder yield (ton/ha)
Hybrid Napier Grass	Sandy Loam to Clay Loam	CO 5, 6 PBN – 351, 342 BNH 10, 14 11 IGFRI 10	March to October in North India Year Round (South India)	20000 root slips/ stem cuttings	100 x 50	FYM – 15 ton N – 50 P- 80 K – 60 at planting N - 50 kg/ha after every cut	Every 15-20 days interval	First cut at 90 days after planting rest of cut at 45-60 days interval	7-8	200-350
Guinea Grass	Sandy Loam to Clay Loam	CO PGG-518, 616 Bundel Guinea – 1	March to August in North India Year Round (South India)	40000 root slips or 3-4 kg per ha	50 x 50	FYM -10 ton N – 50 P- 60 K – 40 at planting N 30 kg/ha after every cut	Every 30-35 days interval	First cut at 75 days after planting Rest cut at 45 days interval	7-9	100-120
Anjan/ Dhaman Grass	Sandy to Sandy Loam	Bundel Anjan -1, 3 CAZRI 78 TNCS 265 AS CO 2	March to September in South India June-July in North India	5-6 kg / ha	45 x 30	N – 40 P- 30 K –30 at planting	Rainfed	First cut at 60 days after planting Rest cut at 50 % flowering stage	3-4	10-12

Crop	Soil type	High yielding varieties	Sowing time	Seed rate (kg/ha)	Row Spacing cms	Fertilizer rate (kg/ha)	No. of irrigations	Harvesting time (days)	No. of cuts / year	Fodder yield (ton/ha)
Para Grass	Loam to Clay Loam	Local	July -August	5-6 quintals of stem cuttings	50 x 50	FYM – 10 ton N – 25 kg after each cut	Rain fed	First cut at 75 days after planting Rest cut at 30 days interval	6-8 in North India and 8-10 cuts in South India	18-25
Stylo	Loam to Sandy Loam	Verano, Scabra Hamata	June-July in North India and March to September in South India	6-8	30	N – 25 P – 40	Rainfed	First cut at 60-70 days after sowing Second cut at 60 days interval	3-4	15-35
Siratro, Clitoria ternatea	Sandy Loam to Clay Loam	Local	June-July in North India and March to September in South India	8-10	30	N – 25 P – 40	Rainfed	First cut at 70-80 days after sowing Second cut at 60 days interval	2-3	15-25



Crop	Soil type	High yielding varieties	Sowing time	Seed rate (kg/ha)	Row Spacing cms	Fertilizer rate (kg/ha)	No. of irrigations	Harvesting time (days)	No. of cuts / year	Fodder yield (ton/ha)
Hedge Lucerne	Sandy Loam to Clay Loam	Local	June-July in North India and March to September in South India	2-3	45 x 10	N – 25 P – 60	Rainfed	I first cut at 70- 80 days after sowing Second cut at 45 days interval	4-5	30-40
Gliricidia sepium	Loam to Clay Loam	Local	July to August in rainy season	2000 stem cuttings	500 x 100	N – 25 P – 60	Rainfed	After 5-6 months of planting lopping of tree branches as per need	2 -3 times	10-15
Subabool, Agasthi, Shevri	Sandy to loam	Local	July – August	4-5	500 x 100	N – 25 P – 60	Rainfed	After 5-6 months of planting lopping of tree branches as per need	2-3 times	10-15

SECTION III

HOUSING OF ANIMALS

Animal housing is also very important in harnessing the maximum potential of the animal. Stressful conditions significantly reduces productivity and it is therefore important to protect the animal from inclement weather.

Improper housing also predisposes the animal to hoof conditions.

The following chapters are included in this section:

- A. Animal Housing
- B. Heat Stress
- C. Measuring Heat Stress Through Symptoms
- D. Measuring Heat Stress Through Indices
- E. Managing Heat Stress

Some high cost cattle shed options



Some low cost cattle shed options



A. ANIMAL HOUSING

It is important to provide clean and comfortable housing facilities to the dairy animals for their proper growth and optimum productivity. The milch animals should be protected from extreme weather conditions of summer, winter, scorching direct sunrays and winds by providing proper animal sheds.

During summer, the animals suffer from heat stress and they become restless. Sweating and panting, to some extent helps them cool their bodies. Reduced feed intake of the animals results into decreased milk production. Therefore, we must have a suitable housing for the animals.

- Animal shed must ensure minimum 5.5 feet x 10 feet floor space for one cow / buffalo. The flooring should be of rough concrete finish with 1.5% slope towards drain. The drain should be open, 8 inch wide, 3 inch deep having 1.0% cross slope so that the shed remains clean.
- Height of the ceiling should not be less than 10 feet may it be thatched or of AC Sheets, Brick or RCC.
- Shed should be open from three sides. Only western side should have wall. For every animal there should be ventilator of size 3 feet x 1 feet at the ceiling level. During winter remaining three open sides may be covered by gunny cloth.
- 2 feet wide and 1.5 feet deep manger should be located on western wall of the shed. Base of the manger may be 1 feet above the floor level. Trough for drinking water should be provided by the side of the manger.
- Eastern side of animal shed should have free loafing area. Animals are more comfortable under the shade of the tree. Loafing area, therefore should have 2-3 shady trees e.g. Neem.
- During summer, sprinkling of water on the animal at an interval of 15 to 20 minutes reduces heat stress as evaporation of water causes cooling of body.



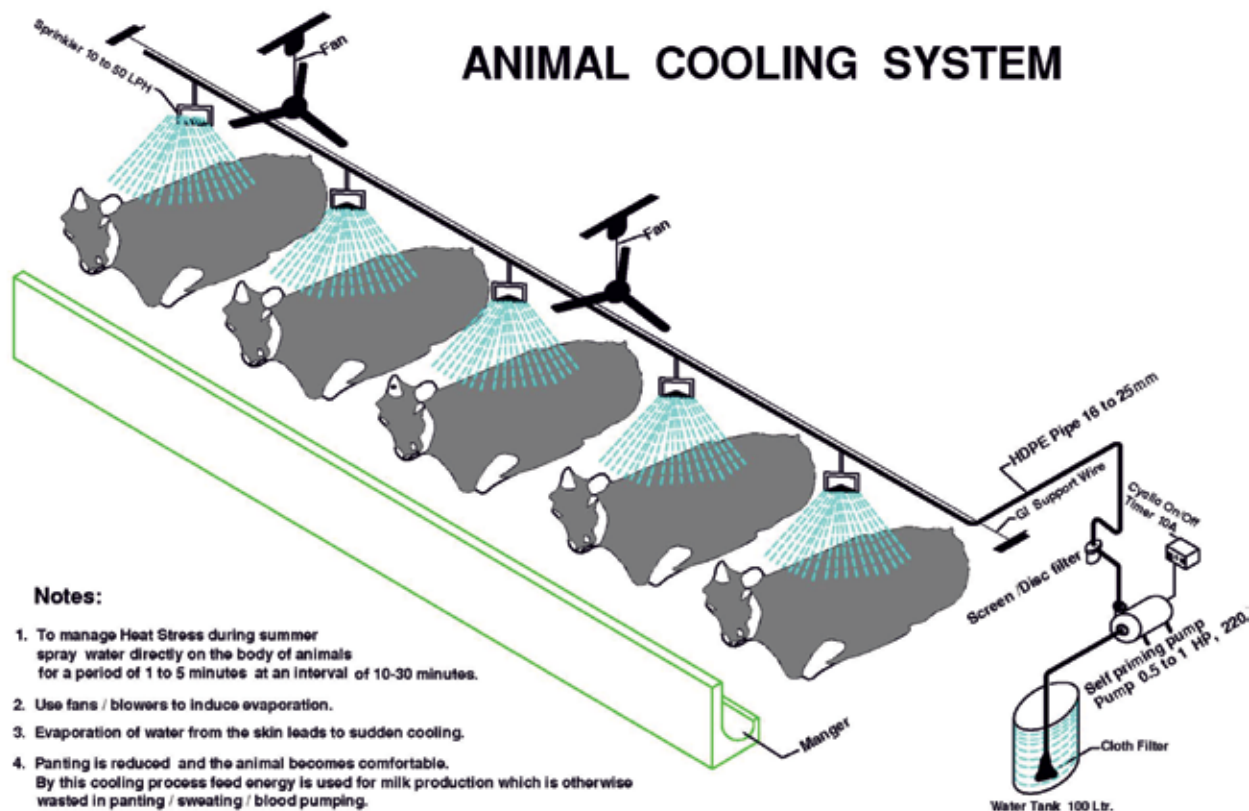
Animal cooling systems are very important especially in high yielding crossbreds and exotic animals.

Cooling systems reduces heat stress and maintains milk production

B. HEAT STRESS

Heat stress on animals leads to productivity loss on account of following:

- Rise in body temperature, reduced feed intake, sweating, panting, increased pulse rate, increased peripheral blood flow, reduced growth hormones, high mortality, increased water intake, reduced milk production & reduced breeding efficiency.
- To combat the ill effects of heat stress, NDDB has developed a water misting based Animal Cooling System costing Rs 11000 for six animals.



- One gram of water evaporation takes away 540 calories of metabolic heat generated by animals.
- Drop in temperature by water evaporation (so called zero energy cooling) from the animals body could exceed 13°C depending on humidity, thus bringing them back into comfort zone during hot summer days.



Cooling systems reduces heat stress and maintains milk production

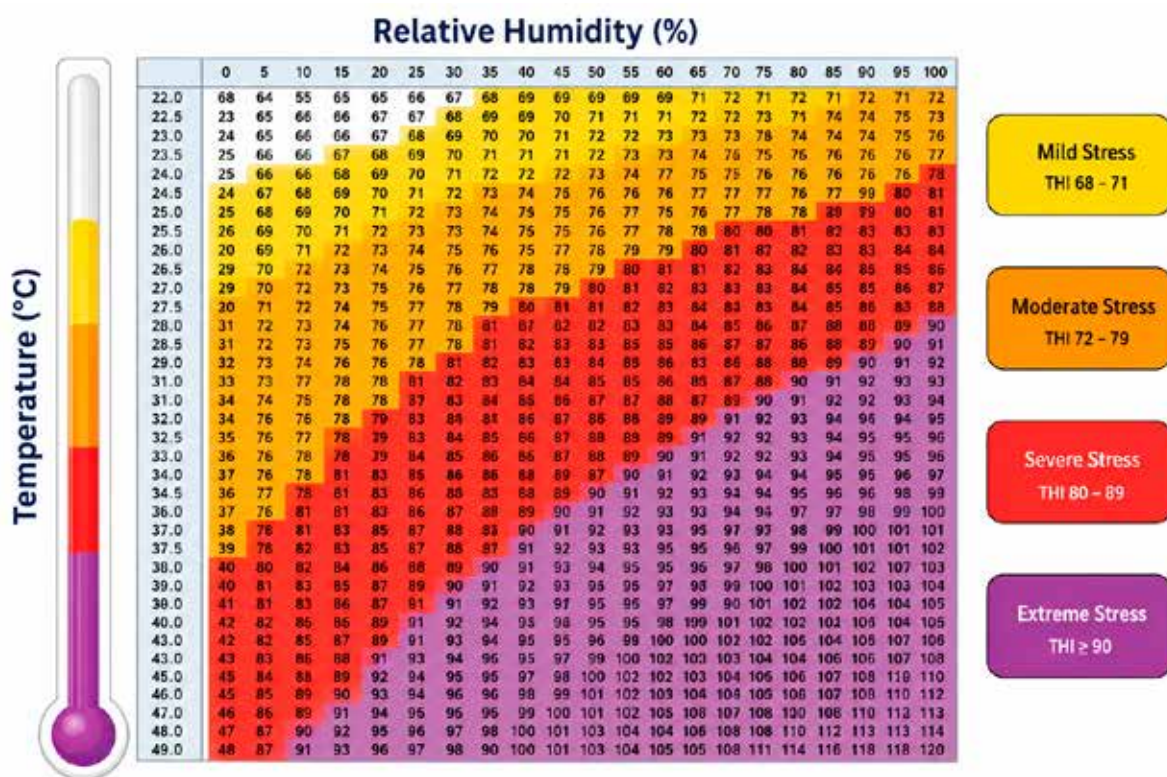
C. MEASURING HEAT STRESS THROUGH SYMPTOMS

- Assessing the level of heat stress is important to prevent or reduce production losses due to heat stress or even prevent mortality in severe cases.
- Scoring the levels of heat stress by the symptoms (Panting Score) shown by animals would give an idea about the condition of the animals.

Breathing condition	Panting Score	Breaths/ minute
No panting– normal Difficult to see chest movement	0	<40
Slight panting, mouth closed, no drool or foam. Easy to see chest movement	1	40-70
Fast panting, drool or foam present. No open mouth panting	2	70-120
As for 2 but with occasional open mouth, tongue not extended	2.5	70-120
Open mouth + some drooling. Neck extended and head usually up.	3	120-160
As for 3 but with tongue out slightly, occasionally fully extended for slight periods + excessive drooling	3.5	>160
Open mouth with tongue fully extended for longer periods +excessive drooling. Neck extended and head up.	4	>160
As for 4, but head held down. Breath from flank. Drooling may cease.	4.5	May decrease

D. MEASURING HEAT STRESS THROUGH INDICES

- Measuring the level of heat stress through indices can give a fair idea on its effect on the animals so that preventive measures can be implemented well in time.
- The Thermal Humidity Index (THI) is used for this purpose.
- The principle of THI is that as the relative humidity at any given temperature increases, then the comfort factor decreases.
- Milk production begins to be affected above a THI of 72 which will occur at 23°C and 80% relative humidity or at 30°C at 10% relative humidity (RH). At a THI of 89, the animal is on the verge of severe heat stress.
- The chart below gives an indication of THI indices and levels of heat stress.



THI chart: AI-generated image. Google Gemini (2026), based on [Collier et al., 2012](#).



Knowing heat stress indices help to identify the issue early



Digital Hygrometer

E. MANAGING HEAT STRESS

- Ensure adequate water availability to animals. A healthy normal cow needs about 100 liters of water to manage heat.
- Drinking water should be provided under shade to ensure cooling by evaporation.
- Ensure shade over the animals. If trees are not available thatched roof of a minimum height of 9 feet should be constructed. Agri-nets with 20% perforation could also be useful. In desert like situations, community shades could be introduced.
- Misting of water over the body of animals at least thrice in an hour is useful. Auto sprinklers with mini pumps and cyclic timers should be preferred.
- Air circulation in covered sheds should be increased. Ensure one ventilator of 3 x 1 feet per cow. Use ceiling fans or blowers wherever power is available.
- Create barriers against hot wind. Thatched wall should be preferred. Wet gunny cloth is another option.
- Feed the animals during morning, evening & night time.
- Prefer grazing during early morning & evening hours.
- Shave the hair coat (remove hair).
- Ration to be changed so as to provide same nutrients at reduced dry matter intake.
- Potassium rich mineral mixture should be preferred.

PART III

BHARAT PASHUDHAN DIGITAL ECOSYSTEM FOR BETTER PRODUCTIVITY

The important facets of animal health, breeding and nutrition mentioned in the previous sections should be supported by an information system for recording the activities in the field so that a rich database is created which would be beneficial both to the farmers and policy makers.

NDDB and DAHD jointly established an end-to-end farmer-centric, technology-enabled eco-system BHARAT PASHUDHAN under NDLM for effective implementation of livestock management programs/schemes by various organizations in the country.

It is cloud based ecosystem available on desktop and mobile platform, both facilitates field level workers to upload services delivered to farmers like animal registrations, farmer registration, change in ownership, artificial inseminations, pregnancy diagnosis, calving, vaccinations, treatment/e-prescriptions, disease reports, post mortem reports, milk recordings, etc. alongwith GPS coordinates.

This application also gives emphasis on development of connected livestock market, closed-loop breeding, disease surveillance system and improvement in traceability of animals and animal products. The Application is working live in all the 28 states and 8 UTs of the country.

A brief description of the information system and the benefits to the farmers are mentioned in the following sections:

Section I. Bharat Pashudhan and Animal Management

Section II. Bharat Pashudhan and Animal Health

Section III. Bharat Pashudhan and Animal Breeding

Section IV. Bharat Pashudhan and Animal Nutrition

Section V. Bharat Pashudhan Dashboard and 1962 Farmer's App



SECTION - I BHARAT PASHUDHAN AND ANIMAL MANAGMENT

- Animal Management module includes unique identification and Registration of animal, Owner, Ear tag Change and Ownership transfer.
- The process of uniquely identifying an animal using a marking on the body of the animal is known as animal identification.
- Identification of an animal is very important while recording any interventions on it for creation of a reliable and rich database.
- The GOI has already passed a Prevention and Control of Infectious and Contagious Diseases in Animals (PCICDA) Act, 2009 which makes identification of the animal compulsory.
- This Act has been passed by the GOI so that adequate measures are taken to be in line with international policies.
- There are various methods for identification like tattooing, branding, ear tagging, RFID, injectables, bolus, etc.
- Ear tagging is the most common method of identification. It uses ICAR recommended 12-digit unique number along with barcode to be printed on the ear tag. It is to be ensured that the number remains unique across the country.
- Ear tag does not cause any problem if applied properly and remains for many years on the ears of the animal.
- Bharat Pashudhan application is able to record the ear tag number of each animal registered with it along with all the details of the animal (species, breed, age, pregnancy status, milk yield, owner's details, village name, image of animal, etc.) so that a permanent passport of the animal is created which can be transferred or traced to any location in the country.
- Individual as well as Flock of the animals can be registered in the system. The ownership of the animal/Flock can be given to the individual farmer or an institution.
- Presently, ten species of the animal can be registered in the system like Cattle, Buffalo, Goat, Sheep, Pig, Yak, Mithun, Horse, Donkey and Mule.
- On Sale/Purchase of the animal, the ownership can be transferred.
- In case of eartag fall/loss, the new eartag can be applied to the animal. Previous information recorded for the animal using old eartag will be automatically attached to new eartag, leading to no loss of information due to eartag loss. DAHD, GOI has authorised NDDB to centrally manage unique animal identification system in the country.



Ear tag



Ear tag applicator



Ear tag applied correctly

SECTION - II BHARAT PASHUDHAN AND ANIMAL HEALTH

The animal health module facilitates recording of all interventions carried out for animal health like deworming, vaccination, first aid, treatment, disease testing, outbreak management, infertility camps, post mortem, sero-surveillance and sero-monitoring etc.

The recordings can be made both at individual animal level where an identification number is mandatory, or at a mass level (vaccination of flock).

The farmer is benefitted in the following ways:

1. Animals are uniquely identified by an ear tag. Therefore, farmer can receive the benefits of various government and non-government programmes like vaccination, treatment, livestock insurance, etc.
2. The farmer receives OTP/SMS alerts on his registered mobile number on various services/verification related to his animals.
3. A health card of the animal detailing all the interventions carried out on the animal can be generated for reference just by entering the tag no. of the animal.
4. All information of the animal is also available in 1962 farmer's mobile application.
5. Analysis of vaccination and disease monitoring data helps in reviewing the disease control status of a particular region, which ultimately benefits farmer in maintaining good health and productivity of animals.
6. Central and State departments use Bharat Pashudhan data in implementing vaccination/disease control programmes.



SECTION - III BHARAT PASHUDHAN AND ANIMAL BREEDING

Bharat Pashudhan application records all the interventions carried out in breeding and performance recording programmes like Artificial Insemination, Pregnancy Diagnosis, Calving, Performance/milk Recording, Typing, Growth Monitoring, Embryo Transfer (ET/IVF), etc.

Recording of the programme events in this system is done individual animal wise where a unique animal identification number (ear tag) is required. The data is used to manage programmes like AI delivery, progeny testing, pedigree selection, NMRP, NAIP, ABIP-SS, etc. It is used to select elite cows for production of high genetic merit bulls through Progeny Testing (See chapter F in Section XIII in Part I). The module also enables all semen stations to maintain their Bulls/Semen in the system. Use of Bharat Pashudhan facilitates following benefits to farmers and concerned institutions:

1. The farmer receives SMS notification on registered mobile on the breeding services delivered on his/her animal for verification by Field level officer.
2. Institutions associated with the farmer receives information about animal management practices being followed by the farmer.
3. Bharat Pashudhan data is available to various institutions implementing breeding programmes in the country. The data helps research institutions to identify best milking animals and bulls in the country which should be used to increase the milk production of the future generations of dairy cattle and buffalo.
4. Provision for managing the sex-sorted semen, separately in the system facilitates farmers to produce high-genetic-value female calves.
5. National Milk Recording Programs onboarded Bharat Pashudhan App are being implemented across the country to locate superior germplasm in breeding tracts and to introduce systematic milk recording.
6. All information on milk yield of the animal in various lactations like quantity, Fat, SNF, Protein, Lactose, SCC, MUN are available in the system. Provision for Automatic milk recording using SWS (Smart weighing scale) alongwith longitude and latitude (coordinates), available.
7. Central and State governments use Bharat Pashudhan data in making various breeding policies for livestock.

SECTION - IV BHARAT PASHUDHAN AND ANIMAL NUTRITION

Ration Balancing is a module of Bharat Pashudhan application pertaining to Animal Nutrition. The ration balancing system formulates ration of animals meeting nutritional requirements of various categories of dairy animals using feed library comprising of nutritive value of feed and fodder available in various parts of the country.

Using this feature, least cost balanced ration for given animal can be formulated based on production and other physiological parameters with available feed resources.

Balanced ration formulation can be made both at individual animal level and at a herd level for group of animals having similar physiological and production profiles and such ration is recommended to the farmers. Ration Balancing can also be done for the animals under CRP (Calf Rearing Program) and Challenge Feeding.

The farmers feeding balanced ration to their animals are benefitted in the following ways:

1. The farmer gets a clear picture on the present cost of production per kg of milk.
2. The farmer understands the deficiencies or excesses in the present feeding regime especially with respect to availability of protein, total digestible nutrients, calcium and phosphorous.
3. The farmer is provided with a formula of a balanced ration based on the production and physiological status of the animal by re-adjusting the proportions of the feed being fed to the animal and/or by incorporating unconventional feed resources that may be available with farmer/in the village.
4. The feed costs are optimized for the present levels of production.
5. Improvement in productivity, reproductive efficiency and general health of animals, resulting in to increased profitability to the farmers.



SECTION - V BHARAT PASHUDHAN DASHBOARD & 1962 FARMER'S APP

- The Bharat Pashudhan dashboard is available at the web portal **<https://bharatpashudhan.ndlm.co.in/>**. The dashboard shows the present status of animals and farmers registered location (state/District) wise, along with vaccination and breeding interventions recorded on animals.
- 1962 Farmer's application connected to Bharat Pashudhan database and Ministry website provides the latest information to the Farmers/Livestock owners about various schemes provided by Gol.
- The App facilitates automatic verification of registration of livestock owner in Bharat Pashudhan Application without sharing OTP with FLWs. The system also verifies animals attached to a registered owner, giving farmers complete control over verification.
- A unique QR code for each farmer is available having farmer details as well as each animal Tag ID attached to the farmer. Complete detail of all animals like species, breed, age, sex etc. belonging to the Farmer registered in Bharat Pashudhan application are available along with services given to these animals.
- Availability of all types/quality of technologies and related material like semen straws / embryo. etc. would be visible to the farmers encouraging use of latest technologies like AI, ET, etc.
- Use of Ayurvedic medicine practices are also available for farmers in form of videos and document.
- Pashu Bazaar: Farmers will be able to do sale/purchase of animals.
- Complete details of all the schemes/facilities being provided by Gol for Livestock farmers in this sector will be available for view of farmers.
- Success stories achieved by the farmers throughout the country using various government schemes/innovative methods are available for all the farmers in form of videos, writeups and testimonies.
- Pashupedia a complete guide book is available for the farmers which will provide them details and information about all breeds and species of Cattle, Buffalo, Sheep, Goat and Pig.
- A farmer can do the individual ration balancing by himself/herself using 1962 app.
- Bharat Pashudhan database is backbone for the 21st Livestock census.

FREQUENTLY ASKED QUESTIONS

ANIMAL HEALTH

1. Question: What are the main reasons for red-coloured urine in animals?

Answer: Red urine in dairy animals can often be attributed to various Bacterial, Viral, Protozoan and Rickettsial Diseases/conditions such as anthrax, babesiosis, toxoplasmosis, trypanosomiasis, urinary tract injury, urinary calculi, chemical poisoning (Lead, Arsenic & Copper) and also vitamin K and phosphorus deficiency.

2. Question: What is Ethnoveterinary practices (EVP)?

Answer: Ethnoveterinary practices, encompassing traditional beliefs, knowledge, and skills, have been integral to animal healthcare since the domestication of livestock. In India, these practices involve the use of locally available medicinal plants to prevent and treat various animal ailments, such as tympany, diarrhoea, and mastitis etc. Despite the advent of modern veterinary medicine, ethnoveterinary practices remain vital, especially in rural areas, due to their accessibility, cost-effectiveness, and cultural significance. Always consult a veterinarian before using any new remedies to ensure the safety and effectiveness for your animals.

3. Question: What is antimicrobial resistance (AMR)?

Answer: It refers to when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines, failing to prevent and treat infections.

4. Question: Do recovered animals become carriers for LSD?

Answer: There is no known carrier state. Once an animal has recovered, it is well protected and cannot be the source of infection for other animals. In infected animals that do not show clinical signs, the virus may remain in blood for a few weeks and eventually disappear.

5. Question: How is Lumpy Skin Disease (LSD) spread?

Answer: The virus primarily transmitted by arthropod vectors like common biting flies (*Stomoxys* and *Biomjje*), mosquitoes (*Aedes* and *Culex*) and some ticks (*Rhiphicephalus appendiculatus* and *Amblyomma hebraeum*) are mainly responsible for disease spread.

6. Question: Should we allow animals to be vaccinated if the vaccinator does not bring vaccine in ice box?

Answer: Never, vaccines get spoiled in ambient temperature and is unable to provide protection to animals.

7. Question: Which animals cannot be vaccinated?

Answer: Sick animals, just calved animals (up to 3-4 weeks after calving) & calves till they attain 3-4 months of age should not be vaccinated.

8. Question: Can a pregnant animal be vaccinated?

Answer: Yes, there is no harm in vaccinating a pregnant animal. However, one should avoid vaccinating animals in the last month of pregnancy, as the animal as well as the fetus could be injured during restraining.



9. Question: Should we vaccinate unaffected animals during FMD outbreak in a village?

Answer: In an FMD affected village, it is not advisable to vaccinate animals not showing symptoms of FMD since it may already be in various stages of incubation even before any symptoms are seen. However, ring vaccination starting from 2-3 km away from the infected village and moving inward from periphery to the point of infection is very important in limiting the spread of the disease. Strict control on movement of animals, feed, fodder and people from infected areas are also equally important in controlling the outbreak.

10. Question: Can an animal be vaccinated against several diseases at a time?

Answer: Yes, in human beings and dogs, combined vaccines for multiple diseases are already in use for a long time. Now combined vaccines against FMD, HS and BQ are available for cattle and buffaloes also.

11. Question: What should we do if a rabid dog bites an animal?

Answer: Wash the wound immediately under running tap water for 5-10 minutes. In absence of a tap, pour clean water from a vessel. Clean the wound with ordinary bath soap gently. Apply tincture iodine and take the animal to the nearest Veterinary Officer.

12. Question: What should we do if a snake bites an animal?

Answer: Tie a tourniquet 3-4 inches above the site of the bite. Give a small incision at the site with clean blade and allow the wound to bleed. Wash the wound with detergent. Call the Veterinarian immediately.

13. Question: What should we do to treat tympany/bloat?

Answer: Feeding of lush green leafy fodder like Berseem, lucerne may result in formation and accumulation of gases in the rumen causing distension of rumen. In such cases, don't allow the animal to sit and do not provide water to drink. Give the animal a mixture containing 100 gm of rock salt, 30 gms of asafoetida, 100 ml turpentine oil and 500 ml linseed / vegetable oil and then consult a Veterinary officer immediately.

14. Question: Is there any harm if we consume milk from a cow suffering from subclinical mastitis?

Answer: Milk from cows having subclinical mastitis may contain toxins of certain bacteria that are not destroyed even by boiling. The toxins may produce diarrhoea or throat infection in humans.

15. Question: Is oxytocin injection given for letdown of milk harmful to animal or milk consumers?

Answer: Use of oxytocin injection is not recommended for milk let down except when used by a veterinarian for treating animals for some diseases.

16. Question: Should colostrum need to be fed to a new born calf?

Answer: Colostrum should be fed as early as possible to a new born calf in adequate quantities (minimum 1/10th of the body weight).

17. Question: Can we deworm pregnant animals?

Answer: Pregnant animals should be dewormed near the time of calving and again 6-7 weeks after calving after consultation with a veterinarian.

ANIMAL NUTRITION

1. Question: What is ration balancing?

Answer: All species require balanced ration for optimal growth, ration balancing is a process to balance the level of various nutrients of an animal, from the available resources, to meet its nutrient requirements for maintenance and production.

2. Question: Can we incorporate gram chuni, wheat bran, banana stem, bamboo leaf etc. and other home grown produce while balancing ration?

Answer: Yes, home grown produce, tree leaves etc. which are normally fed to animals can be incorporated while balancing ration. In fact the objective of ration balancing is to produce an optimum quantity of milk at the least cost from milch animals by readjusting, wherever required, the proportion of locally available dietary feed ingredients, so as to provide adequate amount of proteins, minerals, vitamins as well as energy.

3. Question: In case UMMB is being offered to the animal for licking, how much quantity of urea treated straw should be fed to animal?

Answer: UMMB and urea treated straw both should not be fed to animal at a time. If UMMB is not given, we can offer urea treated straw to animal to the extent it eats.

4. Question: Is cattle feed required if we feed urea treated straw to the animal?

Answer: In case animal is neither pregnant nor lactating and is getting sufficient urea treated straw or ordinary straw along with UMB lick, cattle feed is not required. But for lactating and pregnant animals, cattle feed/bypass protein feed should also be fed along with urea treated straw as per recommendation made earlier in this booklet.

5. Question: Do we need to provide extra mineral mixture when we are feeding balanced cattle feed to animals?

Answer: As balanced cattle feed contains mineral mixture, we can reduce the recommended quantity of mineral mixture to 50%.

6. Question: What should we do if the animal does not lick urea molasses mineral block?

Answer: To make the animal habituated to licking UMMB, sprinkle flour, bran or cattle feed on the block for few days. Animal will start relishing it gradually.

7. Question: For how many days does one urea molasses mineral block last?

Answer: One urea molasses block weighing 3 kg lasts for 5-7 days for one animal

8. Question: How much mineral mixture should be fed to dairy animals for every kg of milk production?

Answer: Approximate requirement of mineral mixture for maintenance, dry, pregnant and lactating animals yielding up to 5 ltr milk per day is 50 g. For lactating animals yielding more than five litres, 10 g mineral mixture per litre of additional milk can be provisioned.

9. Question: Can mineral mixtures be given during the last 10–15 days of pregnancy?

Answer: Stopping mineral mixture feeding during last fifteen days of pregnancy is beneficial as it helps in mobilising calcium from body thus reducing the occurrence of milk fever.



10. Question: Is feeding sodium bicarbonate/ buffer beneficial to animals?

Answer: When concentrate feeding is more i.e. 60 percent or more of total feed intake, sodium bicarbonate/ buffer should be given to dairy animals. If, concentrate/ cattle feed is given more than 6 to 7 kg per animal per day, 50 to 75 g buffer can be added.

11. Question: Can sugarcane tops/ leaves be used as a feed for dairy animals?

Answer: Yes, green sugarcane tops/ leaves can be fed to dairy animals. Before feeding, proper chaffing and mixing with dry fodder is recommended. Along with this optimum feeding of mineral mixture is also required.

12. Question: What is Total Mixed Ration (TMR)?

Answer: TMR is an advance way of feeding dairy animals in which all feed items (green fodder, dry fodder, silage, concentrate, cattle feed, mineral mixture, etc.) are mixed together thoroughly and offered to them. Mixing of feed items ensure proper nutrient in each bite which avoids diurnal variation of pH in the rumen leading to enhanced productivity and improving milk quality.

13. Question: How much TMR should be given to dairy animals?

Answer: Quantity of TMR to be given to dairy animals depends on their body weight and milk yield. For example, animal producing 12 to 15 litres of milk per day would require 20 to 22 kg TMR daily. For high yielding animals (20 to 22 ltrs milk per day), about 28 to 30 kg TMR would be required.

14. Question: How to take care of the animal during summer?

Answer: Drinking water should be given ad-libitum and animals should be kept at cooler places/ under the shade of trees. They can be given bath or fogger/ mist sprayers can be installed in milk shed. Feed should be given during the cooler parts of the day. Feeding of "Pashu SheetVardhak" (heat stress supplement) would also be beneficial.

15. Question: How much Distiller's dried grains with solubles (DDGS) can be fed to dairy animals?

Answer: Good quality DDGS can be fed to dairy animals as a protein source. In concentrate portion, about 1 to 2 kg DDGS can added. However, care should be taken that it is properly dried and its long storage should be avoided.

16. Question: How much silage can be given to dairy animals?

Answer: Silage is an alternative to green fodder and can be fed as per the requirement of animal based on milk yield. However, its introduction should be gradual from 2 to 3 kg per day per animal. For high yielding animals, 15 to 20 kg silage can be offered.

17. Question: Is it required to soak cattle feed in water before feeding to animals?

Answer: No, there is no need to soak cattle feed in the water. However, it is recommended to feed the animal by mixing it with green and dry fodder.

18. Question: What is the optimum stage of harvesting of Maize for silage making?

Answer: The best stage to harvest maize fodder for silage making is when milk line in the cob is about 1/2 to 2/3rd of the grain from the top. Maize cobs need to be checked for milk line when crop is about 75 to 90 days old. Approx. dry matter content need to be 30 to 35 per cent at the time of harvest.

19. Question: What are various intercropping systems for fodder crops, please give few examples?

Answer: Intercropping/ mix cropping system is growing cereal and legume crops together.

For Kharif crops:

- a) Maize: Cowpea (1:1 or 2:1 row to row ratio)
- b) Sorghum: Cowpea (1:1, or 2:1)
- c) Bajra: Cowpea (1:1, or 2:1)
- d) Maize: Cluster bean (1:1, or 2:1)
- e) Sorghum: Cluster bean (1:1, or 2:1)
- f) Bajra: Cluster bean (1:1, or 2:1)

For Rabi crops:

- a) Oat + Berseem
- b) Berseem + Chinese cabbage

20. Question: From where good quality fodder seed be purchased?

Answer: Good quality fodder seeds and fodder cuttings can be sourced from following agencies:

- a) Milk unions/ dairy cooperatives
- b) State agricultural universities/ Fodder seed producing ICAR institutes
- c) Krishi Vigyan Kendras (KVKs)



ANIMAL BREEDING

1. Question: *Why is improvement of indigenous breeds important? What are important indigenous breeds and where are they available?*

Answer: Indigenous breeds are well adapted to our agro-climatic conditions and are resistant to many tropical diseases and can survive and produce milk by efficiently converting poor feed and fodder resources. Some of these breeds are well known for their high milk yield and fat content. However, in the absence of scientific breeding the production potential of these animals has deteriorated over a period of time.

On the contrary, the high producing exotic cattle breeds are disease prone, require good quality feed, fodder and plenty of water to survive and sustain production. Thus, are very difficult to manage under tropical Indian scenario. Hence, genetic improvement of indigenous breeds is very important for sustainable dairying under small holders dairy production system in India.

Please see the inside covers for the various indigenous milch breeds of cattle & buffalo and their native breeding tracts.

2. Question: *Which is most suitable animal for Dairying – indigenous cattle, crossbred cattle or buffalo?*

Answer: Choice of breed or breed combination primarily depends on resource availability, climatic conditions, availability of feed, fodder and water, availability of veterinary healthcare facilities, market for milk, criteria for milk pricing etc.

In resource poor conditions, indigenous cattle and/or buffaloes could be preferred, while in the areas with moderate to good resources, crossbred cow could be preferred. However, in places where fat % is the main price criteria for milk, buffaloes may be preferred.

3. Question: *Which type of animals are profitable for dairying?*

Answer: Animal which produces one calf in a year, resistant to diseases; provide maximum output in terms of milk yield or milk components with minimum input cost is considered to be profitable for dairying.

4. Question: *What is “Breeding Value” of an animal? What is Genomic Breeding Value (GBV)? How the GBV is beneficial to the farmers?*

Answer: The genetic worth of animals in terms of what they can transmit to their progenies is expressed as Breeding values (BV). In simplest manner, the concept of BV can be explained in the following manner:

- o BV of a bull +100 means its progeny would produce on an average $(100/2) = 50$ litre more milk than that of population mean.
- o BV of a bull -200 means its progeny would produce on an average $(-200)/2 = -100$ litre less milk than that of population mean.

When genetic worth of the animal is using DNA level information, it is called “Genomic Breeding Value”. On the basis of GBV, Farmers can select superior animals at the very early age and save money from rearing low producing animals.

5. Question: *What is a state breeding policy? Why should it be followed?*

Answer: Breeding policy is a guideline to indicate what breed and breed combination or exotic blood level is most suitable in the given agro climatic condition of the state. Every state has notified its own breeding policy based on geographical and climatic conditions of the state and distribution of different breeds in the state.

It should be followed to get the optimum output from your animals utilizing the available resources, avoid indiscriminate breeding and also to conserve the indigenous breeds available in the breeding tract of the state.

6. Question: *What type of semen should be used to breed different type of animals? Whether AI Technician (AIT) carries semen doses of all breeds of semen so that I can choose the best option for my animal? What is sire directory? Is it available with every AIT?*

Answer: Semen procured from A and B graded semen stations should be used for breeding purpose. The semen doses available with the AITs should be in accordance with the breeding policy of the state. The semen doses must be carried in cryocan (not in any other container) at -196°C .

All AITs should carry the semen doses of those breeds available in their respective allocated areas. But on many occasions, AITs may not always carry the semen as per the breeding policy of the state, hence farmers need to be vigilant and insist to know the breed, exotic blood level (in case of crossbred), pedigree details of the bull, and Breeding value of the bulls, before using semen doses to breed his animal.

Sire directory contains pedigree details of all bulls in the semen station. Ideally it should be available with AI technician. If not, the AIT should obtain it from the semen station.

7. Question: *Is Artificial Insemination (AI) a treatment for infertility/repeat breeding?*

Answer: No, AI is not a treatment for infertility or repeat breeding. It is an artificial method to inseminate an animal with semen of disease free High Genetic Merit (HGM) bull.

8. Question: *Is there any advantage of using more than one dose of semen in one heat?*

Answer: If AI is carried out at appropriate time of heat using good quality semen and using correct AI technique following prescribed Standard Operating Procedure (SOP), then one dose of semen is sufficient for successful conception. However, in a few cases, if the heat period is extended beyond normal duration; ovulation is also delayed and in such cases, second insemination may be required.

9. Question: *Should I take the animal to a bull after AI?*

Answer: No, the animal should never be taken to a bull after AI.

10. Question: *What is the average conception rate of AI under Indian conditions?*

Answer: It varies from place to place. However, under PT and PS projects, where 100% AI is followed up, average conception rate is observed to 40% or above.

11. Question: *Is AI successful in buffaloes?*

Answer: Yes, AI in buffaloes is as successful as in cows. However, as the buffaloes exhibit silent heat, proper detection of heat and timely insemination of buffaloes results into higher conception rate.



12. Question: Does AI produce only male calves or weak calves or, reduce milk yield of the dam?

Answer: Analysing large number of observations has revealed that there is no adverse effect of AI on male: female ratio, calf birth weight or milk production of dam. These are superstitions or myths which are propagated by vested interests without any scientific evidence.

13. Question: Which bull semen is most suitable for breeding a non-descript Indian cow to get better milk from its progeny?

Answer: Use of semen from indigenous bulls like Sahiwal/Gir/Red Sindhi etc. is most suitable depending on resources or breeding policy of the state. But, if the farmer has resources to maintain a crossbred animal and the state breeding policy permits it, he can use pure HF/Jersey semen for production of a crossbred progeny.

14. Question: How does milk recording help the farmer in general?

Answer: Milk recording helps the farmer to get a complete lactation record of his animal. He also gets an idea of performance of his animal as compared to the performance of other animal in his herd or village. This information helps him to take a decision on managing the animal, whether to retain it, cull it or use it as elite Dam's for production of progenies for herd replacement using sexed semen or use it as donor for embryo production.

15. Question: Why are different traits such as body conformation, milk components and growth rate being measured?

Answer: To ensure profitable and sustainable dairying for the farmers, different traits such as body conformation, milk components and growth rate being measured in place of measuring solely milk production.

For an example, components like Fat%, SNF%, Protein% etc. determines milk price hence affect farmers income. Similarly, Body confirmation and growth rate are highly and positively correlated to production and reproduction traits.

16. Question: Why are my animals being tested for diseases under bull production programmes (PT & PS)?

Answer: For production of disease free semen, selected bull and its dam should be free from disease because certain diseases are spread to other animals through semen.

17. Question: What is sexed semen? Where it is available? What is the cost? Is it available with all AITs? How to verify whether sexed semen has been used on my animal? Is it available for all breeds and for buffaloes also? What are the advantages of using sexed semen over conventional semen? What is the success rate?

Answer: Semen doses in which sperms of a single gender is present and thus result into birth of calf of desired gender (with approx.. 90% accuracy) is called sexed semen.

At present, 11 semen stations are producing sexed semen in India. Besides, mobile sexing laboratories are also in use in few of the semen stations. Further, to bring down the cost of the sexed semen doses, NDDB, through its wholly owned subsidiary, NDDB Dairy Services (NDS), has developed an affordable indigenous technology for the sexing of bovine sperm.

Under ABIP_SS project of RGM, sexed semen is available at the rate of Rs.675/- per dose. However, it is available at subsidized rate in a few states also.

Sexed semen straws may not be available with all AITs operating in the country.

Sexed semen doses can be identified seeing the colour of the straw colour and straw plug. Sexed semen doses are packed in white coloured French mini straws with coloured cotton plug (complying color specification of straws mentioned in MSP for production of Frozen Bovine Semen circulated by GOI).

Sexed semen is available for all the major dairy breeds in the country.

By using sexed semen, calf of desired sex (preferably female) may be obtained.

Referring the pilot study carried out in the field, the conception rate was varying from 12.5% -37.5%.

18. Question: *What is embryo transfer (ET)? What is its advantage? Is it an alternative to AI to get my cow/buffalo conceived? Who can provide me ET services? What is the cost? Can I have a choice of sex of calf through ET?*

Answer: ET is an assisted reproductive technique (ART), in which the embryos produced from elite cow and buffalo is transferred to a recipient animal which acts as a surrogate mother and carries the embryo to full term of pregnancy.

Through ET, it is possible to get more calves in a life time from an elite animal than through normal reproduction.

ET should not be considered as an alternative to AI.

Under, ABIP-IVF project of RGM, activities are being carried out to establish pregnancy through transfer of invitro fertilized embryos at farmers doorstep by various implementing agencies across the states. Under ABIP_IVF, rate of establishing pregnancy through IVF-ET is Rs. 21,000 plus applicable taxes. Out of which a subsidy of Rs.5000 is given by Govt. of India.

Calves of desired sex can be produced through transfer of in vitro fertilized embryos produced using sexed semen.

19. Question: *How an individual farmer can avail Genotyping services? What information a farmer would get after genotyping?*

Answer: An individual farmer can avail genotyping services on chargeable basis from NDDDB CALF Ltd. To avail the services, he/she has to submit 4-6 ml blood sample of the animal concerned in EDTA tubes (violet cap) to the lab maintaining cold chain along with duly filled declaration and customer registration form. For details, farmers may contact customer cell of NDDDB Calf Ltd. at. 9974001283.

After Genotyping, Farmers' will get information like Genomic Breeding Value (at present, Genomic Breeding value is provided for Sahiwal, Gir, HF Cross bred, Jersey crossbred of cattle and Murrah and Mehsana buffaloes) and Breed purity status of individual animal.



QR codes for various EVM formulations



Bloat/Indigestion



Deworming



FMD foot
lesions/Wound



FMD mouth
lesions



Prolapse



Repeat Breeding

QR codes for various EVM formulations



Tick/Ectoparasites



Udder Oedema



Anoestrus



Blood in Milk



Hygroma (swelling
of joints)



Lumpy skin
disease



QR codes for various EVM formulations



Diarrhoea



Fever



Mastitis- Oil based



Mastitis- water
based



Retention of
placenta



Teat Obstruction

QR codes for various EVM formulations



Wart/Pox/Cracks



Allergy/Poisoning



Cough



Downer
(Not able to get up)



Toxicity (pesticide/HCN/



QR codes for various awareness Material



Brucellosis Film



IBR



EVM trifold



EVM poster



Pashupalan
Nirdeshika



AMR poster

QR codes for various awareness Material



Lumpy skin disease
(LSD) Film



LSD poster



EVM booklet



Cow comfort
booklet



Brucellosis
Veterinarian



Hoof Management



QR codes for various awareness Material



Microplastic



Tick Control



Brucellosis farmer



EVM poster



EVM Trifold



BREEDS OF BUFFALO

BULLS



Murrah

Native tract: Hissar, Rohtak, Gurgaon and Jind districts of Haryana



Jaffarabadi

Native tract: Junagadh, Jamnagar, Rajkot, Bhavnagar, Porbandar & Amreli districts of Gujarat



Nili Ravi

Native tract: Originally from Pakistan, found in bordering districts of Ferozpur and Amritsar in Punjab



Pandharpuri

Native tract: Solapur, Sangli and Kolhapur districts of Maharashtra



Mahesani

Native tract: Mahesana, Banaskantha & Sabarkantha districts of Gujarat



Surti

Native tract: Anand, Kheda and Baroda districts of Gujarat

BUFFALO COWS



National Dairy Development Board

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