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आज़ादी का  
अमृत महोत्सव

आजीविका से उद्यम विकास की ओर...



# 3 Fs

For Sustainable  
Dairy Production

# Feed Fodder & Feeding



Department of Animal Husbandry and Dairying  
Ministry of Fisheries, Animal Husbandry and Dairying  
Government of India

Feed, Fodder & Feeding  
enhances  
**GROWTH, PRODUCTIVITY** and  
**HEALTH** of **LIVESTOCK**



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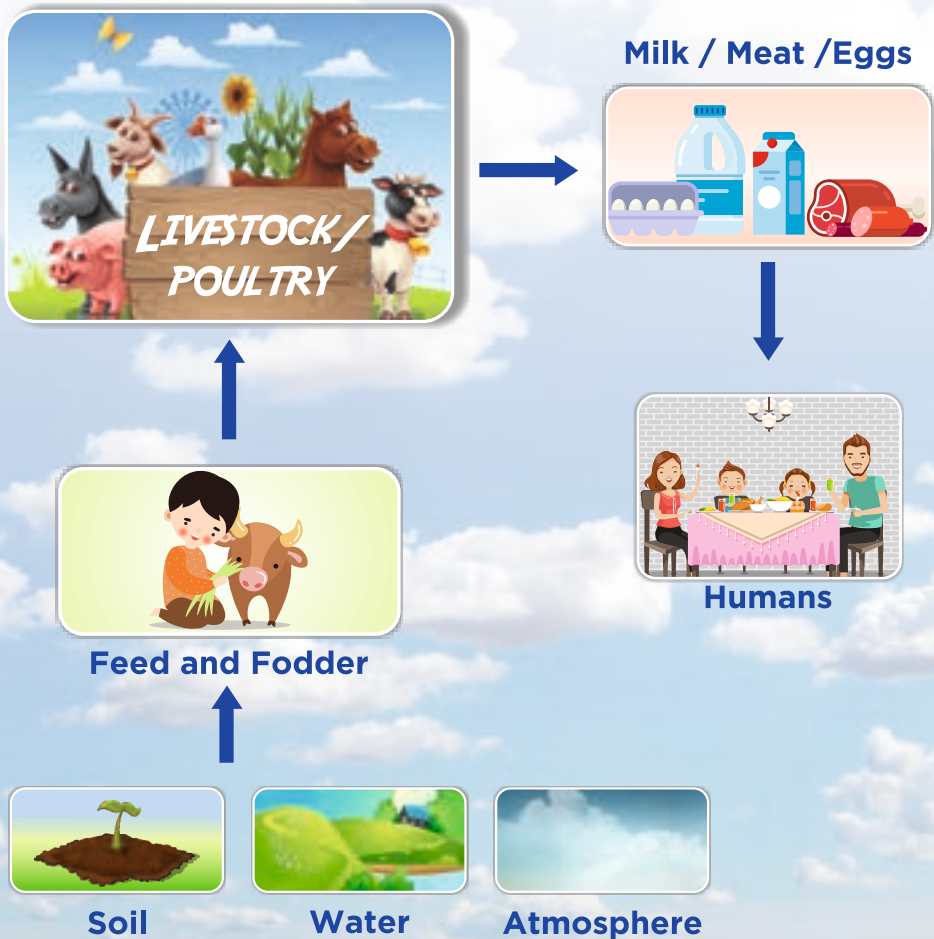




## The Natural Food Chain

Living beings depend on land, water, and atmosphere for sustenance, and food is obtained from these three.

Livestock, including buffaloes, cattle, sheep, goats, pigs and poultry, are crucial in the food chain, providing important protein-enriched foods like milk, meat, and eggs for the human diet.







## A. Livestock Feeds and Fodders

Livestock feeds are broadly classified into two groups:

### 1. Roughages



Roughage feed typically includes materials such as grass, hay, straw, silage, and other similar plant-based sources. These feedstuffs provide bulk and stimulate the digestive system of animals, helping to maintain their overall health and well-being.

### 2. Concentrates



Concentrates are a mix of grains and other ingredients, including proteins, oils, vitamins and minerals to improve the nutritive balance.

### Feed additives

Non-nutritive feed additives, including antibiotics, hormones, and coccidiostats, have been used to improve productivity, but caution is now advised due to potential secondary effects and leftover residues.



## Compound Cattle Feed

### A balanced supplement for increasing growth and milk production

- ◆ Compound cattle feed contains grains, brans, cakes, mineral mixture, and vitamins, as sources of protein and energy.
- ◆ It can be fed according to the level of milk production.
- ◆ Its composition can be adjusted, region-wise and season-wise, so as to meet requirements of the animals.
- ◆ If fed along with dry forages (straws), it helps in improving intake and utilization of straws, by way of associated effect.
- ◆ It is a balanced and palatable source of nutrients for growing, adult, milk producing and pregnant animals.
- ◆ Its regular use helps in improving growth rate in young calves.
- ◆ As it contains desirable amount of minerals and vitamins along with other nutrients, its use helps improving reproductive efficiency.
- ◆ Healthy calves are born, if it is fed to pregnant animals.
- ◆ Cost of milk production from dairy animals can be minimized and net profitability maximized through its regular use in prescribed quantity.





## Main ingredients of Cattle Feed

<b>Grains</b>	Maize, sorghum, wheat, rice, oats, barley, ragi, millets etc.
<b>Brans</b>	De-oiled rice bran, rice polish, wheat bran, maize bran etc.
<b>Protein meals/cakes</b>	Rapeseed meal/cake, soybean meal, cottonseed meal/cake (decorticated and un-decorticated), groundnut meal/cake, coconut meal/cake, palm kernel meal/cake, sesame cake, linseed cake, maize germ oil cake, maize gluten meal, sunflower meal, kardi (safflower) meal, guar meal etc.
<b>Chunnies</b>	Guar, tur, urd, moong, gram and chunnies of other locally available pulses.
<b>Agro-industrial byproducts</b>	Molasses, babul chunni, tamarind seed powder, mango kernel extraction, Prosopis juliflora pods, tapioca waste etc.
<b>Minerals and Vitamins</b>	Mineral mixture, calcite powder, common salt, di-calcium phosphate, Vitamins A, D, & E.

## How much compound cattle feed is to be fed



Compound cattle feed	Small breed cows (300-400 kg body wt.)	Large breed cows (400-500 kg body wt.)	Small breed buffaloes (300-400 kg body wt.)	Large breed buffaloes (400-600 kg body wt.)
For maintenance	2 kg	2.5-3.0 kg	2 kg	2.5-3.0 kg
For milk production (per litre)	0.4 kg	0.5 kg	0.4 kg	0.5 kg
For pregnancy	2 kg (last 2 months)	3 kg (last 2 months)	2 kg (last 2 months)	3 kg (last 2 months)

## Total Mixed Rations (TMR)

- ◆ A total mixed ration is a mixture of roughages, concentrates, feed supplements and non-nutritive additives in place of separate feeding of roughages and concentrates.
- ◆ There is no selective eating by the animal since the particulate size is small and uniform.
- ◆ Such formulations are more palatable, and wastage is considerably reduced.





## Grain Sprouts

- ◆ A modified version of hydroponics that eliminates the need for electricity to sprinkle water, as water is sprayed manually or with a battery-operated sprayer.
- ◆ ICAR-NIANP, Bangalore has developed an economical technique for producing grain sprouts on crop residue.

## Advantages

**Easy and cost-effective method**

**Mold-free sprouts and efficient utilization of crop residues**

**Practical contingency measure to tide over periods of green fodder deficit**

**Minimum requirement of water**







## Fodder

- ◆ Fodder is a type of food made from farming or other agricultural processes for feeding domesticated animals like cattle, cows, bulls, buffaloes, rabbits, horses and so on.
- ◆ Fodder crops are crops that are cultivated primarily for animal feed.

Feed and fodder cost constitutes about 60-70% of cost of milk production, thus cultivated fodder has an important role in meeting requirements of various nutrients and roughage to produce milk most economically as compared to concentrates

Fodder crops like Combo Napier, Guinea, Congo Signal, Stylosanthes, Cow Pea etc. are very cheap sources of nutrients and provide all the critical elements like highly digestible protein, carbohydrates, fats and minerals

Fodder from common cereal crops like Maize, Sorghum and Oats are rich in energy and leguminous crops like Lucerne, Berseem and Cow Pea are rich in proteins.

## Fodder consists of

Fodder includes hay, straw, silage, compressed and pelleted feeds, oils and mixed rations, and sprouted grains and legumes

Manufacturers add ingredients to processed feeds that are of animal origin





## Types of fodder

Fodder is available in the following three types :

### Dry Fodder

### Green Fodder

### Processed Fodder

## Dry Fodder

- ◆ Dry fodders are basically crop residues – left over portion of crops after the main crop is harvested
- ◆ Grasses from legumes that are harvested, dried and stored as 85 to 90 percent dry matter
- ◆ Moisture content of the green crop is reduced to 10-15% to inhibit the action of plant and microbial enzymes, so that it can be stored safely without undergoing fermentation or becoming mouldy

## Green Fodder

- ◆ Any feed that is made from green crop like legume crops, grass crops, cereal crops or tree-based crops is green fodder
- ◆ It is grown in tropics, sub-tropics and warm temperature regions for feeding in green form, for hay making
- ◆ It can be grown during Kharif, Rabi and summer seasons and suitable for year-round cultivation

## Processed Fodder

- ◆ Processing converts raw agricultural materials into more easily digestible and palatable nutritionally balanced forms through grinding, chopping, pelleting, extrusion, fermentation, and chemical treatments.
- ◆ Processing will reduce the presence of anti-nutritional factors, such as toxins or inhibitors, and improve the overall efficiency of feed utilization by animals.



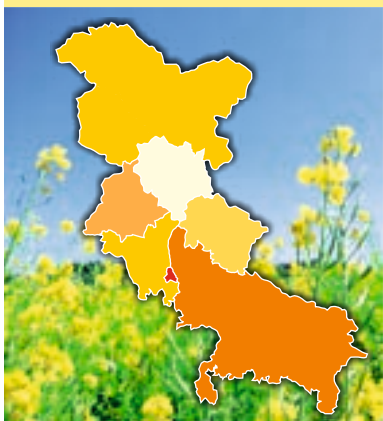
## Categorisation as per Climatic Zone

There are four Argo Climatic Zones in India...



### Northern Zone

Himachal Pradesh, Punjab, Uttarakhand, Haryana, Delhi, Rajasthan and Uttar Pradesh and the Union Territories of Jammu & Kashmir and Chandigarh

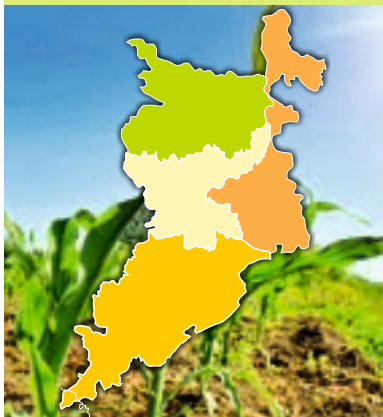


#### Major crops cultivated :

- Maize + Cow Pea – Sorghum + Cowpea – Berseem + Mustard
- Sudan grass + Cow Pea – Maize + Cow Pea – Turnip – Oats
- Hybrid Napier or Setaria interplanted with Cow Pea in summer and Berseem in winter
- Teosinte + Cow Pea – Carrot – Oats + Mustard / Senji

### Eastern Zone

Bihar, Jharkhand, Odisha and West Bengal



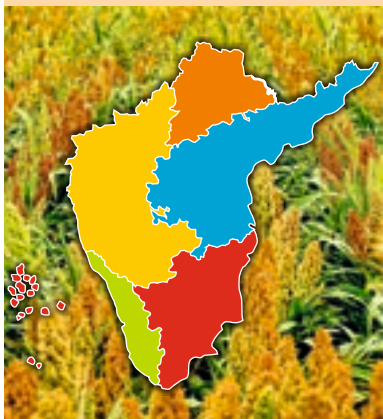
#### Major crops cultivated :

- Maize + Cow Pea – Teosinte + Rice bean, Berseem + Mustard
- M.P. Chari + Cow Pea – Dinanath grass, Berseem + Mustard
- Para grass + Centrosema pubescens
- Hybrid Napier or Setaria grass interplanted with Subabul or Common Sesban (Sesbania sesban)



## Southern Zone

Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, and Telangana, and the Union Territories of Lakshadweep, Puducherry Andaman and Nicobar Islands



### Major crops cultivated :

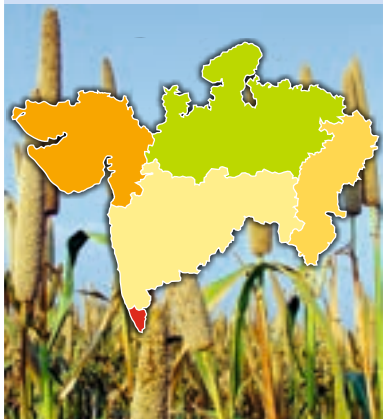
- Sorghum + Cow Pea, Maize + Cow Pea – Maize + Cow Pea.
- Hybrid Napier or Guinea or Setaria grass inter-planted with Lucerne or Hybrid Napier + Subabul / Sesbania.
- Sudan grass + Cow Pea, M.P. Chari + Cow Pea
- Para grass + Centro (Centrosema pubescens)

## Western Zone

Goa, Gujarat, Maharashtra, and the Union Territories of Daman, Diu, Dadra and Nagar Haveli

## Central Zone

Chhattisgarh and Madhya Pradesh



### Major crops cultivated :

- Bajra + Guar (Clusterbean) (two cuts) – Annual Lucerne
- MP Chari + Cow Pea (2 cuts) – Maize + Cow Pea - Teosinte + Cow Pea
- Hybrid Napier or Guinea or Setaria grass inter-planted with Cow Pea in summer + Berseem in winter
- Hybrid Napier or Guinea or Setaria grass interplanted with Lucerne

# Types and Seasonality of Fodder Crops

## A) Legume Fodder

Legumes as fodder (or forage) crops can be planted for cultivation each year in the same way as annual summer crops

Some of the legume Fodder are:

### Cow Pea / Lobia

- ❖ This crop is grown in tropics, sub-tropics and warm temperature regions.
- ❖ Is grown for feeding in green form, for grazing, for hay making or for ensiling in mixtures with sorghum or maize.
- ❖ Can be grown in all the three seasons.
- ❖ Is suitable for year round cultivation.
- ❖ Harvest 50-55 days after sowing (50% flowering stage).

### Desmanthus - Hedge Lucerne

- ❖ It is grown throughout the year under irrigation and during June - October as a rainfed crop.
- ❖ Irrigate immediately after sowing, life irrigation on the third day and thereafter once in a week.
- ❖ First cut on 90th day after sowing at 50 cm height and subsequent cuts at intervals of 40 days at the same height.



### Lucerne

- ❖ Lucerne, also termed as 'Queen of forages'
- ❖ It is a deep rooted perennial forage legume adapted to a wide range of conditions ranging from tropical to alpine.
- ❖ Lucerne adds nitrogen to soil and improves soil fertility.
- ❖ It is grown for green fodder, hay, silage but does not tolerate close grazing.
- ❖ Suitable for growing during July - December.
- ❖ Not suitable for very hot and very cold climates.
- ❖ First harvest 75 - 80 days after sowing. Subsequent harvests are made at intervals of 25 - 30 days.

### Stylo

- ❖ It grows 0.6 to 1.8 m tall.
- ❖ Stylo is adapted to tropical climate and tolerant to low fertility, drought, acidic soils and poor drainage.
- ❖ Stylos are drought resistant legumes coming up well in areas receiving a minimum rainfall of 450 - 840 mm annually.
- ❖ These can be grown in a wide range of soils.
- ❖ The crude protein content of stylos ranges from 15 to 18%.
- ❖ Season is June - July to September - October.





## B) Cereal Grass Fodder

Grasses belonging to the members of the monocot families Poaceae or Gramineae. These are cultivated for the edible components of their fruit seeds having the endocarp, germ and bran.

### Fodder Maize

- ❖ It is grown on a variety of soils, but well drained fertile soils are best suited.
- ❖ Maize is mostly grown as KHARIF crop i.e. sowing in June - July. In South India it makes best growth in RABI and also in SUMMER.
- ❖ It can be grown throughout the year with irrigation facilities.
- ❖ African tall, Vijay composite, Moti composite, Ganga - 5 and Jawahar are some important fodder varieties.
- ❖ Staggered sowing is recommended for supply of green fodder for a long period.
- ❖ Harvest the crop when the cob is in the milky stage.



## Fodder Sorghum

- ❖ It is cultivated mainly for grain and also for fodder.
- ❖ Sorghum is a drought resistant crop.
- ❖ It thrives in a tropical climate with a temperature range of 25-35°C
- ❖ It is not suited to higher elevations (more than 1200 m).
- ❖ It can be grown under an annual rainfall of 300-350 mm.
- ❖ It can be grown on any soil except on very sandy soils.
- ❖ Suitable varieties for Irrigated land (Jan - Feb and Apr - May)
- ❖ Suitable varieties for Rainfed land (Jun - Jul) is Co.11, Co.27, Co.F.S.29
- ❖ Suitable varieties for Rainfed land (Sep - Oct) is K7, Co.27, Co.F.S. 29, K 10
- ❖ Sorghum can be harvested after flowering stage for green fodder.
- ❖ If it is a single cut, it should be harvested at 60-65 days (50% flowering) after sowing and if it is a multicut, the first cut is made 60 days after sowing and the second, 40 days after the first



## C) Grass Fodder

### Hybrid Napier / Cumbu Napier / Bajra Napier Hybrid

- ❖ It possesses more tillers and leaves than Napier and is more vigorous and higher in fodder yield and quality.
- ❖ It can be cultivated throughout the year under irrigated conditions.
- ❖ Pusa Giant, NB<sub>21</sub>, NB<sub>37</sub>, IGFRI<sub>5</sub>, IGFRI<sub>7</sub>, and IGFRI<sub>10</sub> (developed from Indian Grassland Research Institute, Jhansi) are superior hybrids developed in India.
- ❖ Co<sub>1</sub>, Co<sub>2</sub>, Co<sub>3</sub>, Co<sub>4</sub> & KKM<sub>1</sub> are also superior varieties released from Tamil Nadu Agricultural University. These varieties are suitable for growing throughout the year in all districts in Tamil Nadu.
- ❖ 40,000 slips are required to plant one hectare.
- ❖ First harvest is to be done after 75 to 80 days after planting and subsequent harvests at intervals of 45 days.



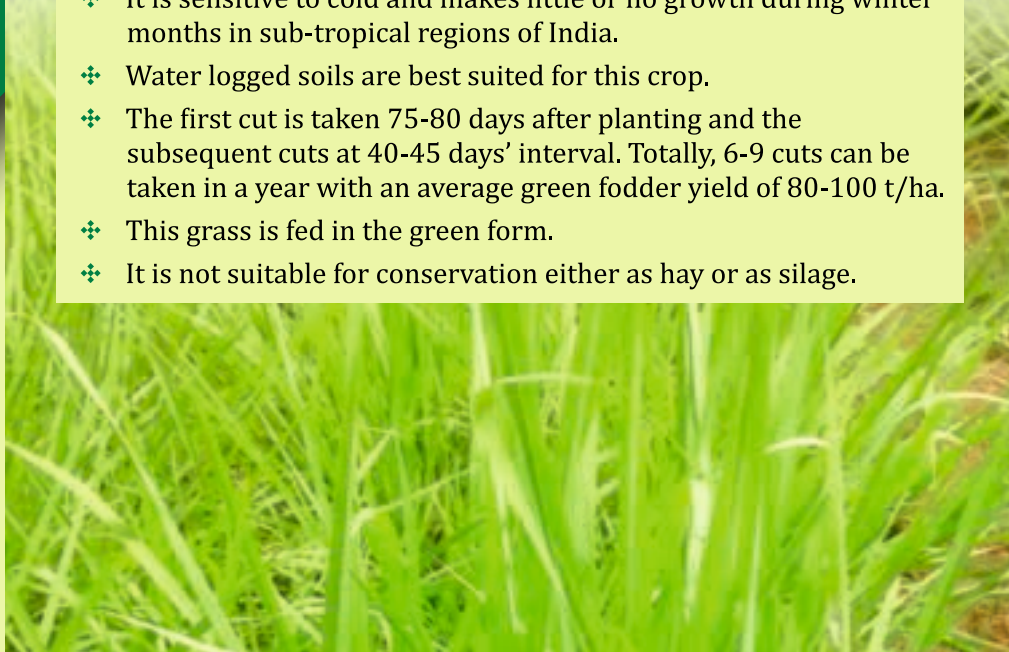


### Guinea Grass

- ❖ It is a tall (1-4.5 m), tufted and fast growing highly palatable perennial grass.
- ❖ It has a short creeping rhizome.
- ❖ Suitable for all types of soil with good drainage.
- ❖ Does not come up well on heavy clay soil or flooded or waterlogged conditions.
- ❖ Seed Rate: Seed 2.5 kg/ha , Slips 66,000 nos./ha
- ❖ Spacing: 50 x 30 cm.
- ❖ First cut 75- 80 days after germination or 45 days after planting of slips. Subsequent cuts at intervals of 45 days.

### Para Grass

- ❖ It is suitable for cultivation in humid areas.
- ❖ It is grown in seasonally flooded valleys and lowlands and can withstand water logging and long term flooding.
- ❖ It cannot grow on dry lands in arid or semi-arid areas.
- ❖ It is sensitive to cold and makes little or no growth during winter months in sub-tropical regions of India.
- ❖ Water logged soils are best suited for this crop.
- ❖ The first cut is taken 75-80 days after planting and the subsequent cuts at 40-45 days' interval. Totally, 6-9 cuts can be taken in a year with an average green fodder yield of 80-100 t/ha.
- ❖ This grass is fed in the green form.
- ❖ It is not suitable for conservation either as hay or as silage.



### **Blue Buffel Grass**

- ❖ Cenchrus is a promising green grass type which performs well in drylands cultivation under rainfed conditions.
- ❖ Grow well in dry land areas but superior than the other species.

## **D) Tree Fodders**

### **Subabul**

- ❖ It has seasonal varieties.
- ❖ Jun - Jul Hawaiian giant (Ivory coast), Co1.
- ❖ Rainfed (Sep - Oct) K 8, Giant Ipil - Ipil, Co1.
- ❖ In drought prone areas, allow the trees to grow for two years to ensure deep root penetration before commencing harvest.
- ❖ The trees can be cut at 90 to 100 cm height from ground level.
- ❖ As green fodder under irrigated conditions, a pure crop yields about 80 to 100 t/ha of green fodder.
- ❖ Under rainfed conditions 40 t/ha of green fodder is obtained after 2 years of initial growth and pruning to a height of 100 cm

### **Glyricidia**

- ❖ It is a small tree, semi-deciduous, with pale bark.
- ❖ *G. sepium* tolerates a wide range of climatic and edaphic conditions. Growth is most rapid in regions where annual rainfall exceeds 900 mm, but it will also grow where rainfall is as low as 400 mm per annum.
- ❖ It grows in soils ranging from heavy clays to sands and on rocky eroded sites; however, it is intolerant of water logging.

### **Sesbania**

- ❖ The leaves of *Sesbania* trees are highly palatable and mostly liked by goats.
- ❖ Grown throughout the year under irrigation

## Availability of Fodder Seasonality-wise

Sl No	Kharif (June to September)	Rabi (Oct to Jan)	Summer (April to June)
1	Cow Pea, Cluster bean, Field bean, Bajra, Sorghum, Maize	Berseem, Lucerne, Oats, Barley	Cow Pea, Cluster bean, Field bean, Bajra, Sorghum, Maize







## Moringa Cultivation for Green Fodder

### A useful nutritious green fodder crop for animals

Moringa green fodder is to be chaffed into small pieces of 2-3 cm size through manual or power chaff cutter for feeding to dairy animals. 15-20 kg chaffed green fodder of moringa can be fed daily to one animal after mixing it with dry or other cereal green fodder.

1

**Drought tolerant and source of perennial fodder.**

2

**Rich in nutrients like crude protein, minerals and vitamins.**

3

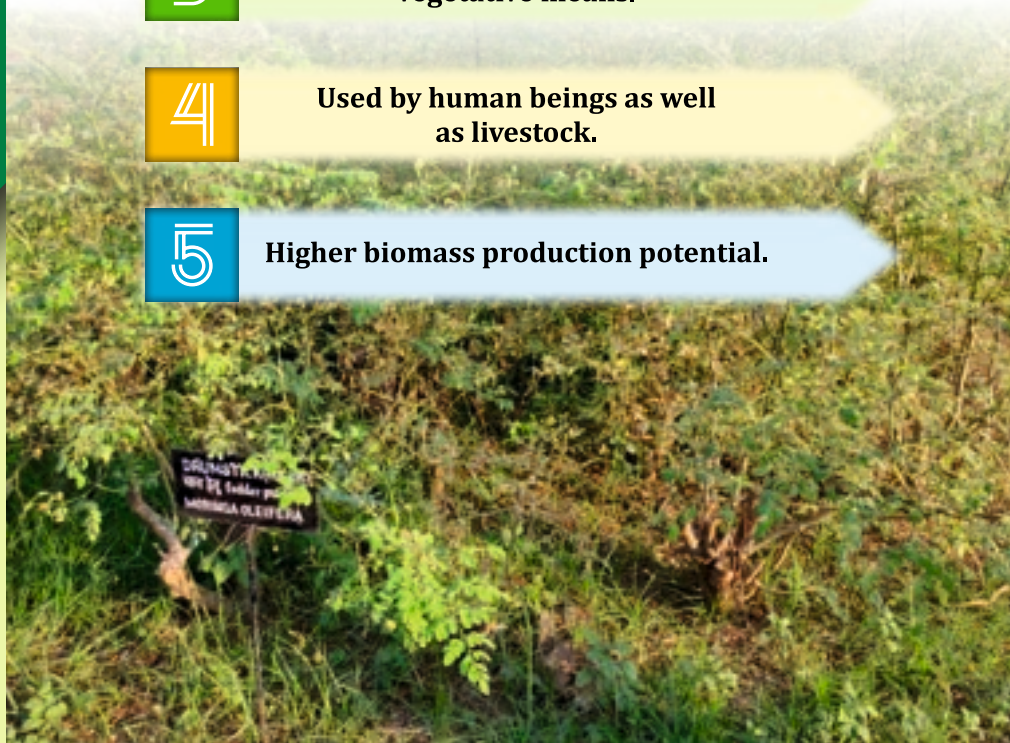
**Propagated through seeds and vegetative means.**

4

**Used by human beings as well as livestock.**

5

**Higher biomass production potential.**





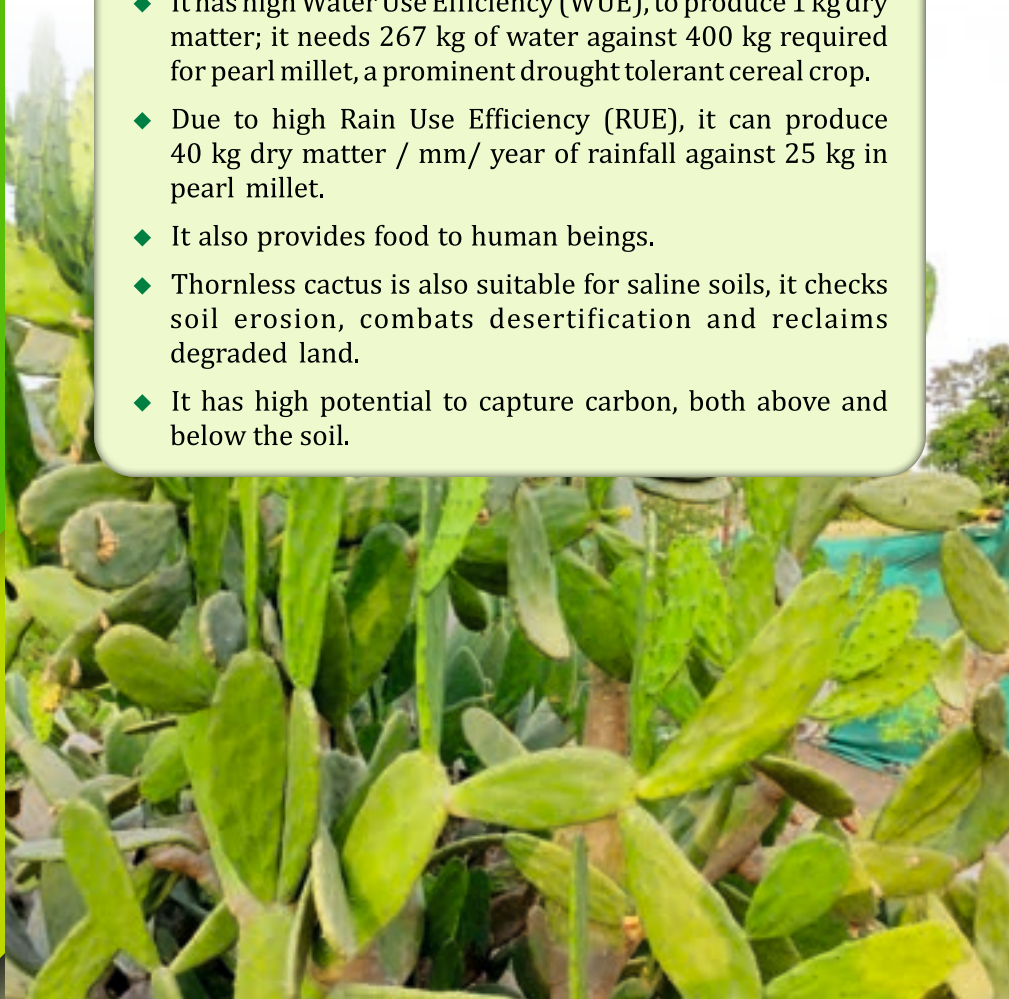
## Thornless Cactus (*Opuntia Ficus-Indica*)

- ◆ A source of green fodder for semi-arid and arid regions
- ◆ An alternate Fodder crop for water deficit areas

### Feeding of Thornless Cactus

- ◆ 10-15 kg chopped thornless cactus may be fed to animals per day.

- ◆ It is an excellent source of water, too for livestock as it contains 90 percent water.
- ◆ It has high Water Use Efficiency (WUE), to produce 1 kg dry matter; it needs 267 kg of water against 400 kg required for pearl millet, a prominent drought tolerant cereal crop.
- ◆ Due to high Rain Use Efficiency (RUE), it can produce 40 kg dry matter / mm/ year of rainfall against 25 kg in pearl millet.
- ◆ It also provides food to human beings.
- ◆ Thornless cactus is also suitable for saline soils, it checks soil erosion, combats desertification and reclaims degraded land.
- ◆ It has high potential to capture carbon, both above and below the soil.







## B. Processing, Improvement, and Preservation of Fodder

- ◆ Forage preservation measures of surplus fodder help in ensuring fodder availability to livestock throughout the year and also during lean seasons.
- ◆ Fodder needs to be stored properly so that its quality does not deteriorate.
- ◆ Establishment of fodder banks help in overcoming acute scarcity conditions such as unforeseen droughts, floods, earthquakes, and other natural calamities.

The proven methods of **forage preservation** are:

1. Silage-making
2. Hay making

Silage is the conserved green fodder having moisture content in the range of 65 to 70 per cent. Fodder crops rich in soluble carbohydrates are incubated after chaffing for 45-50 days under anaerobic conditions. Sugars present in the fodder are converted to lactic acid which acts as a preservative and a good source of readily fermentable sugars for the rumen microbes. Under proper storage condition, silage can be stored even up to two years. Good quality silage should not have any butyric acid, which gives off flavour to silage. If proper anaerobic conditions are not maintained, silage produced would have butyric acid content in it.





## Crops Suitable for Silage Making

Fodder crops, such as maize, sorghum, oats, pearl millet, and hybrid napier rich in soluble carbohydrates are most suitable for fodder ensiling. Quality of silage can be improved with the use of suitable additives such as molasses, urea, salt, formic acid etc.

### Infrastructure required

1. Silo-Surface or trench.
2. Farm machinery like tractor, trailer, fodder harvester and power chaff cutter

### Procedure of Silage making

- ❖ Construct a surface/trench silo (silage storage structure). One cubic meter space store 500-600 kg of green fodder.
- ❖ Harvest the crop at 30-35 per cent dry matter (DM) stage.
- ❖ Wilt the harvested fodder to bring down DM to 30-35 percent, if required.
- ❖ Chop the fodder into small pieces of 2-3 cm in size.
- ❖ Fill the chopped fodder into the silo.
- ❖ Press the chopped fodder in the silo, layer by layer of 30-45 cm
- ❖ Filling and pressing should be completed as fast as possible.
- ❖ Use additives during filling of fodder in the silo, if required.
- ❖ After filling and pressing, seal the silo with thick polyethylene sheet.
- ❖ Put weight through mud layer/ sand bags/ tyres on the sheet to prevent air flow beneath the sheet.
- ❖ Silo can be opened from one side as per need after 45 days and closed properly after taking out the silage.



## Feeding of Silage

- ◆ Initially, silage can be fed @ 5 kg/animal to adjust the animals on silage feeding.
- ◆ Silage is a substitute for green fodder and can be fed like green fodder.

## Characteristics of good quality Silage

**Bright, light green, yellow or green brown in colour.**

**Lactic acid odour with no butyric acid and ammonia odour.**

**Firm texture with softer material.**

**Moisture should be in range of 65-70 percent.**

**Lactic acid 3-14 percent.**

**Butyric acid less than 0.2 percent.**

**pH in the range of 4.0-4.2.**

## Hay Making

- ◆ Hay refers to any forage crop which is cut at an appropriate stage and dried in the sun for storage. The best materials for haymaking are thin-stemmed legumes and grasses cut at appropriate stage of growth
- ◆ Good quality hay is greenish, leafy and pliable, free from mold, weed and foreign material and has a pleasant aroma about it.
- ◆ Grass hays are made from grasses cut at flowering or pre-flowering stage. Legumes are cut much earlier for hay making so that they will have high levels of protein and minerals and less fibre. The common grass hays are dub, anjan, spear grass, timothy grass etc. Leguminous hays include lucerne, berseem, shaftal, pea, cluster bean, cow pea, horse gram etc.



## How to make Hay

Hay making operations should be done during the days of good sunshine.

The grass is initially cut manually or by mowers and brought to the place of drying. In a day or two, leaves dry up and stems begin to dry. At this time, rows of grass left for drying are pooled into heaps called cocks and allowed to dry further.

During this process, dry leaves absorb moisture from the stems and become soft and pliable.

When the whole material is sufficiently dried, the hay is removed to the place for storing where it is stacked and covered with straw.

**Good hay retains the original nutritive value** to a great extent, especially in terms of protein, carotene and overall palatability. Its **Vitamin D value** increases due to irradiation from the sun.





## C. Feeding

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. The following chapters are included in this section:

### 1. 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.



## General Recommendations

- ◆ To optimize milk production and to meet the nutrient requirement of animals, balanced feeding using user-friendly software developed by NDDDB 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.



# Ration Balancing Programme

## An effective tool to improve milk production at the least cost

Ration balancing is the process to balance the level of various nutrients of an animal, from the available feed resources, to meet its nutrient requirements for maintenance and production.

### Types of dietary feed ingredients

#### Compound Cattle Feed

This is considered to be a balanced source of nutrients for growth and milk production. However, only 10 to 12 per cent of the total feed ingredients are used to produce compound cattle feed. Compound cattle feed does not always complement the feed ingredients used by milk producers.

#### Other Feeds

Feed ingredients like rapeseed cake/meal, groundnut cake/meal, sunflower meal, cottonseed cake/meal, soya bean meal, guar meal, maize gluten, sesame cake, coconut cake, linseed cake, safflower meal, deoiled rice bran, rice polish, wheat bran, maize bran, maize grain, sorghum grain, wheat, broken rice, millets and chunnies are fed as such, depending on availability and cost.

#### Crops Residues & Grasses

Wheat straw, paddy straw, sorghum straw, maize stovers, straw of pearl millet and locally available grasses are fed as basal feed.

#### Green Fodder

Maize, sorghum, oats, hybrid napier bajra, lucerne, cow pea and berseem are available seasonally and fed in a limited quantity.

#### Mineral Mixture

This is a source of macro and micro minerals, usually lacking in the animal's ration.



Ration Balancing Programme 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 them adequate amounts of proteins, minerals, vitamins as well as energy.

### **Benefits of Ration Balancing Programme**

- ★ Uses locally available feed resources to balance the ration of animals at the least cost
- ★ Increases milk production with more fat and solids-not-fat
- ★ Helps increase the net daily income
- ★ Improves reproduction efficiency
- ★ Helps reduce inter-calving period, thereby increasing the productive life of animals
- ★ Improves the general health of animals
- ★ Improves the growth rate in calves leading to early maturity

## **2. 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.



### 3. 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 87% water, for every litre of milk produced, additional 2.5 to 3 litres water is required.





## Recommendations

- ◆ 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 ad libitum of water per day to manage heat.

## 4. Care 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 and half years of age.
- ◆ About 70% growth of foetus takes place during the 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 Mixture	50 gm
Compound Cattle Feed	2-3 Kg	Salt	30 gm

### 5. Nutritional Care after Calving

- ◆ 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.



# “Today’s Calf is tomorrow’s Milch Cow”

An optimum level of nutrition in early life favours faster growth and earlier onset of puberty. Calves should be reared carefully to obtain optimum gain in body weight, so that they attain about 70-75 percent of mature body weight at puberty.

Colostrum is the first secretion produced by the mammary gland of cows/buffaloes after calving, a rich source of protein, fat, minerals and antibodies.

## Importance of colostrum feeding

Newly born calves have very low resistance to diseases. Buffalo calves have an even lesser resistance to diseases as transfer of antibodies from the dam to calf through the placenta is very low.



Colostrum is an invaluable gift of nature to newly born calves. Compared to whole milk it contains 4-5 times protein, 10 times Vitamin A and plenty of minerals.

Colostrum acts as a mild laxative as it helps in removing digestive residue and meconium, from the intestines of newly born calves.





## Milk Replacer

Young calves need to be fed two litres of milk daily, at least for a period of two months, which should slowly be replaced with a good quality calf starter.

Milk replacer could be an economical alternative to milk for feeding young calves, comprising skim milk powder, soybean meal, groundnut meal, edible oils, grains, vitamins, mineral mixture, preservatives etc.

After colostrum feeding, about one litre reconstituted milk should be given with one litre of whole milk. Slowly, whole milk should be withdrawn and the reconstituted milk should be increased to about two litres a day, at one month of age and should be continued up to two months of age.

From the second week onwards, good quality hay and calf starter should also be introduced, which would help in early development of rumen and help achieve desirable growth rate.

## Calf Starter and Calf Growth Meal

Calf starter is a balanced concentrate mixture, comprising ground cereal grains, protein supplements, minerals and vitamins. Calves should be encouraged to consume maximum amount of calf starter as that would enhance growth rate. Feeding calf starter and good quality leguminous hay from early life, stimulates early development of rumen papillae (rumen wall), essential for rumen functions, which favours digestion of larger proportion of fodder at an early age. After about six months, calf starter should be replaced with calf growth meal, which is more economical for growing calves.



# Mineral Mixture

For Curing Deficiencies and improved productivity of Dairy Animal

## Functions of Different Minerals

### Calcium (Ca)

- Essential for milk production.
- Necessary for bone and teeth formation.
- Required for contraction of muscles.

### Phosphorus (P)

- Essential for milk production.
- Required in energy metabolism.
- Required for bone and teeth formation.

### Magnesium (Mg)

- Important for the integrity of bone and teeth.
- Involved in protein synthesis and metabolism of carbohydrates and lipids.

### Sulphur (S)

- Required for protein synthesis and metabolism of carbohydrates and lipids.
- Sulphur is a part of B-complex Vitamins, Thiamin and Biotin.

### Sodium (Na) & Potassium (K)

- Required for maintenance of osmotic balance.
- Required in acid-base equilibrium.

### Copper (Cu)

- Required for haemoglobin synthesis.
- Necessary for tissue pigmentation and a component of several metallo-enzymes.
- Required for normal reproduction functions.

### Zinc (Zn)

- Spermatogenesis and the development of primary and secondary sex organs.
- Required for normal functioning of epithelial tissue.
- Activates Vitamin A because its deficiency leads to night blindness.

### Manganese (Mn)

- Co-factor for many enzymes involved in carbohydrate metabolism.
- Activator in the synthesis of fatty acids.

### Iodine (I)

- Required for the synthesis of thyroid hormone ( $T_1$  &  $T_2$ ).
- Necessary for reproduction and growth of animals.

### Cobalt (Co)

- Required for the synthesis of Vitamin  $B_{12}$  by the rumen microbes.
- Essential for haemoglobin synthesis.

## Urea Molasses Mineral Block (UMMB) a Feed Supplement

- ◆ Ruminants have a special compartment in their stomach, which is called rumen. It contains a 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.



## Bypass Supplements

### ◆ Bypass Protein

Plant-based protein is an important source of amino acids for the dairy cow. During digestion, however, the majority of this valuable protein is broken down in the rumen of the cow, far too early in the digestive system for it to be fully utilised.

Bypass protein supplements overcome this problem by protecting the protein while in the rumen, but allowing it to be fully digested within the small intestine. Consequently, better utilisation of the essential amino acids occurs, resulting in improved milk production.

### ◆ Bypass Fat

In early lactation, most cows will actually lose a considerable amount of weight because energy intake is less than that needed to meet the nutrient demands of milk production. As a result, the cow mobilizes body nutrient reserves, particularly body fat, to meet the energy demand.

Feeding bypass fat supplement to high yielders during advance pregnancy and early lactation helps in minimizing this energy deficiency. This in turn would help in improving milk production and reproduction.

Use of the bypass fat should be in the ration of dairy animals for 10 days before and 90 days after calving.



## Recommended Daily Feeding Rate

- ◆ **Crossbred Cows:** 100-150 g
- ◆ **Buffaloes:** 150-200 g

Bypass fat can also be incorporated in the feed of growing calves and lactating animals @ 1.5-2%, for increasing energy density of the feed.

## Benefits of Feeding Bypass Fat

- ◆ Ideal energy dense supplement for early lactating and advanced pregnant animals to overcome negative energy balance.
- ◆ Enhances peak milk production and persistency of lactation.
- ◆ Fulfils the nutrient requirements of high yielding animals.
- ◆ Reproductive performance can be enhanced because the animal can return to positive energy balance sooner which can affect follicle size, ovum fertility and progesterone levels.
- ◆ Decreases metabolic disorders such as ketosis, acidosis and milk fever.
- ◆ Increases productivity and productive life of animals.



Cows are amazing !

They eat grass and make milk. They convert something that is indigestible into yoghurt, cheese, and ice cream !

But cows do not actually digest the grass; bacteria do that in the cow's rumen.

The rumen is the cow's first stomach chamber.

It resembles a very large wineskin.

It is warm and full of liquid, the perfect environment for bacteria. Every so often the cow will add some fuel -

**GRASS.**







## Tips for raising healthy calves

- Just after birth, clean the nostrils and mouth of the calf.
  - Massage the chest gently to help the calf breathe comfortably.
- Clean the entire body of the calf properly.
- Insert two fingers in the mouth and place them on the tongue, which will help the calf to start suckling.
  - Newly born calves should be kept in a protected environment.
- Naval cord should be tied with a thread at a distance of 2 inches. Cut the remaining cord with a clean pair of scissors and apply tincture iodine to avoid naval infection.
- Within half an hour of birth, feed colostrum to the calf.
  - Whole milk/milk replacer should be given to calves at least up to 2 months.
  - De-worming should be done during third week and then at the 3rd and 6th months of age.
  - From the 2nd week, calves should be fed good quality hay and calf starter.



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