KVK Bulletin - 10

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# Contents

# INTRODUCTION

India is the top-most milk producing country in the world with an estimated 100 million tons of annual milk production from the dairy animals managed by nearly 70 million farmers. Smallholder dairying with cattle and buffalo has been an integral component of traditional agriculture of farmers since centuries on record and played a pivotal role in over all socio-economic development of rural poor. Cattle and buffalo form a part of the property, possession and profession of rural farmers. Not only that, they are an easily convertible currency and a reliable living bank to serve the immediate needs of the rural masses in several communities. They served and will continue to serve a valuable role in sustainable agricultural systems and are particularly useful in converting vast renewable resources from rangeland, pasture and crop residues or other byproducts from rural areas into milk, manure and draft power for human needs.

# CONTRIBUTION OF SMALLHOLDER DAIRYING TO THE LIVELIHOODS OF RESOURCE POOR FARMER

Dairying is an important option for increasing the income of marginal and small farmers and landless labourers due to uncertainties of crop production. The average annual growth is about 5.6%. It provides a major source of supplementary income for a huge majority of rural households (over 70%) and the sector is therefore, highly livelihood intensive. Dairy animal rearing in rural India takes place as a household activity and seldom employs hired labour. The sector is highly gender sensitive and over 90% of the household chores related to care and management of livestock are carried out by the family's women folk. The anticipated rise in demand for milk and milk products with the growing economy in the near future, will provide an avenue for resource-poor farmers to increase production, improve their livelihood, reduce malnutrition and thereby, contribute to the goal of overall poverty alleviation in rural areas. Distribution of dairy animal in particular appears to be far less unjust than distribution of land holding. For example, marginal producers and smallholders together owned over 67% of the milking animals and constituted the core milk production sector in the country. Dairy animal holding per household varies considerably with region, both in number and species held, but the average holding seldom

exceeds three animals per household. Landless labourers also own milch animals and earn substantial additional incomes from sale of milk, particularly in the dairy co-operative society (DSC) villages and other areas where milk-marketing infrastructure exists.

## SELECTION OF SUITABLE BREED

In Andhra Pradesh the milch animals are quite large a number but the productivity in terms of milk is very low, as majority of the animals are not in actual milking stage i.e. beyond 305 days of lactation due to malnutrition. Breed selection depends upon the available feeding resources (both quantity and quality of feed and fodder), purpose of dairying (fluid milk sale/product preparation), financial capacity of the farmer and local environmental conditions. It is better to have graded Murrah buffaloes, if the former is able to supplement some concentrate mixture to the animal in addition to the normal grazing. The non-descript cattle/buffaloes are the best choice for rearing only on grazing. Crossbred cattle are the best option for fluid milk sale if stall-feeding is being practiced and sufficient feed and fodder resources are available.

The common breeds of cattle found in Andhra Pradesh are Ongole, Malvi, Deoni, Hallikar and Krishna Valley. In Telangana and Rayalaseema most of the buffaloes are of non-descript type, whereas in coastal Andhra Pradesh population of graded Murrah buffalo is high. Local animals in Telangana and Rayalaseema regions can be improved by cross breeding with Jersey, where as by Holstein Friesian (HF) in coastal areas. All the non-descript buffaloes can be improved by crossing with Murrah breed.

**Holstein Friesian:** It is the best dairy breed among exotic cattle regarding milk yield and produces upto 50 litres of milk per day, whereas a crossbred H.F. cow gives 15 - 20 lts per day.

This breed can perform well in coastal and delta areas where fodder may not be a problem.

Holstein Fresion cow

**Jersey:** It gives upto 30 lts of milk per day, whereas crossbred Jersey cow gives 8-10 lts per day. This breed can better tolerate hot and humid environment compare to H.F.

Jersey cow

Murrah Buffalo

**Murrah:** Murrah buffalo produces milk upto 10-15 lts per day, whereas a graded Murrah buffalo gives 6-8 lts per day. This breed performs well in coastal and moderately cold climatic areas.

**Selection of dairy animals:** Selecting a dairy animal is an art and the farmer should select healthy animal known for high milk production and free from repeat breeding and post partum diseases. The following points should be considered for selection of a diary animal.

- Selection should be done based upon breed characteristics, fertility and milk producing ability
- History sheet or pedigree sheet which are generally maintained in organized forms reveals the complete history of animal, may be seen
- Whenever an animal is purchased from a cattle fair, it should be selected based upon its breed characters and milk producing ability
- The milk producing ability was maximum in dairy animals during the first five lactations. So select a cow / buffalo which is in I or II lactation and that too in early lactation (30-45 days of lactation after calving)
- The cow / buffalo should be milked for three consecutive days before selection and the average will give its milk production potential
- Select a cow/buffalo which is docile and allow anybody to milk it
- It is better to purchase the dairy animals during the months of October and November as maximum calvings takes place and price would be optimum during that period

### Characteristics of high yielding dairy animals

- Attractive individuality with feminity, vigour, harmonious blending of all parts, impressive style and carriage
- Animal should have wedge shaped appearance
- It should have bright eyes with lean neck
- The udder should be symmetrical, moderately long, wide and deep, strongly attached, soft, pliable and well collapsed after milking
- All four quarters of the udder should be well demarcated with well placed teats
- The mammary veins should be large, long, tortuous and branching

## SHELTER MANAGEMENT

The basic aim of housing is to protect from extreme climatic conditions in order to reduce the "environmental stress" on the animals. The cattle-shed need not be too expensive. When designing them consideration must be given to the comfort and health of animals, the economic use of labour in milking, feeding and cleaning, and maintenance of hygienic conditions for clean milk production. The level of lighting, natural or artificial, should be such that all the cattle can be seen clearly. The general layout of dairy farms should be planned depending on the number of animals to be housed, facilities to be provided for feeding the animals economically, collection of manure, and cleaning and washing. Generally, loose housing system is being followed in most parts of the state to provide shelter to the animals. In this system, cows are let loose in an open paddock or pasture throughout the day and night except at milking. The open paddock is provided with shelter along one side under which the animals can retire when it is hot or cold or during rains. A common watering tank is provided and fodder is fed in a common manger. Sufficient covered area (3.5 and 4.0 $m^2$ per cow and

Traditional housing and feeding system

buffalo, respectively) and open area (7.0 and 8.0 $m^2$ per cow and buffalo, respectively) should be provided for free movement of animals. Animals are milked in milking barn and fed with concentrates before milking.

### *Design considerations*

- Animal houses should be located in an elevated area with good drainage facility
- The long axis of the shed should be in East-West direction
- Sufficient green cover should be there around the sheds

### *Space requirements in milking barn/stall feeding*

- Each animal should be provided with standing space of 1.05-1.20 m width and 1.50 - 1.70 m length
- Should have a central passage of 1.50-1.80 m width with a slope from the center towards the drain
- A continuous manager is constructed using cement and brick or by cement concrete with 60, 50 and 40 cm height, depth and width, respectively for each animal
- The width and depth of the gutter should be 30 cm and 7.5 cm respectively

Feed manager in stall fed barns

- U-shaped drain with 0.20 m width on either side of the central passage should be provided

### *Floor*

- It should be hard, impervious to water, non-slippery, easy to clean and have proper slope
- The material of the floor should preferably of cement concrete/brick floor

### *Roof*

- The roofing materials should preferably be locally available thatch or bamboo or asbestos sheet or galvanized iron sheets
- The roof should be 8-10 ft high at sides and 12-15 ft high at center
- If iron sheets are used as roofing materials, cover it with grass during summer season with water sprinklers facility

### *Ventilation*

The objective of ventilation is to replace inside air by pure fresh air from outside. The air in buildings rendered impure by pulmonary or cutaneous exhalations, products of combustion, industrial processes, and effluents arising from fluid and solid excreta, refuse, etc., so that at no time the amount of carbon dioxide present exceeds six volumes per 10,000 volumes of air. Milk is a highly perishable substance, and its flavour and keeping qualities are readily destroyed if proper ventillation is not provided. Hence, great care should be exercised to prevent its pollution by dust and dirt, and its flavour being lost on account of the smell and taint from dung heaps, rubbish and filth surroundings.

## FEEDING MANAGEMENT

### The common feedstuffs

Livestock feeds are classified as concentrates and roughages. The concentrates have a low fibre (less than 18 percent) and possess a high total digestible nutrient value. They include cereals, oilseeds, oilcakes, and cereal and animal by-products. The feeds having a fibre content above 18 percent and a low total digestible nutrient value are classified as roughages, e.g. cultivated fodders, silages, hays and straws.

### Cereals, pulses and their by-products

The cereals are rich in starch, with a low percentage of crude fibre, and are greatly relished by livestock. Their protein content is low when compare to oil cakes and they lack in essential amino acids.

### Oilseeds and oilcakes

Oilseeds and oilcakes are protein-rich feeds. They are highly palatable, easily digested and are generally used to balance rations of dairy animals in respect of protein. They are rich in phosphorus but poor in calcium content.

## Legumes

Legumes are particularly important among the green forage crops. They are the richest in carotene, calcium and protein when compare to other roughages. They contain high-quality protein, which can be supplemented effectively the deficiencies of protein in cereal grains.

Fodder Sorghum

Stylo hamata

Lucerne

Fodder maize

Para grass

Buffaloes grazing on established pasture

## Straws

Of all the foodstuffs, straws are perhaps the poorest in protein and have the largest percentage of crude fibre. They are comparatively poor in phosphorus, in available calcium and also in trace elements.

## Hay

The nutritive value of hay depends upon the stage of maturity at which the herbage is harvested for conversion into hay. The early cuttings are more nutritious, late cuttings yield a larger weight and less nutritious.

Hay heap

### *Surplus Fodder preservation*

- Fodder should be harvested before maturity ensuring optimum availability of nutrients
- Fodder could be preserved either by sun drying or in artificial driers as hay or in airtight chambers/pits as silage

### Hay Making

- Good quality herbage at the flowering stage is cut early in the morning and left in the field
- After 4-5 hrs the cut, fodder is turned and repeated till the moisture content comes down to 10-15%
- The dried hay is stored as heap or bailed it
- Legume and non-legume forage crops can be used for hay making.

### Silage Making

- Silage is a fermented green forage product prepared under anaerobic conditions. Preservation of fodder without much loss of nutrients is the main aim of this method
- Jowar and maize are the best crops suitable for silage making
- Hybrid Napier, Sudan grass, Oats, millets can be used for silage making
- Legumes (Berseem, Cowpea) can also be made silage by addition of 8-12 kgs of molasses mixed in water for each one ton of green forage
- The crop is chaffed 2-4 cm in length and packed air tight in silo pit
- The air tight pit stacked with fodder would be ready in 90 days with a PH of 5.8
- Improper sealing of the silo pit leads to excess butyric acid formation and proteolysis and gives off flavor

- Best quality silage has a PH of 4.2, lactic acid 10.5% and Butyric acid 0%.
- Good silage is yellow-brown in color, with a characteristic acid fruity smell and just exudes moisture when squeezed

## Concentrate mixture

The following different combinations can be used to prepare concentrate mixture depending upon the locally available cheap feed ingredients

| Feed Ingredients (kg) | Concentrate mixture | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Cereal grains | 30 | 20 | 20 | 30 | 37 | 27 |
| Conventional bran (Wheat Bran / Rice Bran) | 32 | 50 | 37 | 47 | 10 | - |
| GNC / coconut cake | 25 | 20 | 20 | 20 | 20 | 25 |
| Unconventional bran (Bengal gram / green gram / black gram bran) | - | - | 20 | - | 30 | 25 |
| Cotton seed meal | - | - | - | - | - | 20 |
| Molasses | 10 | 7 | - | - | - | - |
| Mineral mixture | 2 | 2 | 2 | 2 | 2 | 2 |
| Salt | 1 | 1 | 1 | 1 | 1 | 1 |

## Thumb rules of feeding

- Milch animals are fed with *ad libitum* forages
- Animals in 1st and 2nd lactation will still be growing and need to provide 20 and 10% extra feed, respectively
- Concentrates are fed at the rate of 1kg for every 2.5 kg of cow milk or 2 kg of buffalo milk production
- An extra allowance of 1.5-2.0 kg of concentrates should be provided during first 30-45 days of calving
- When the animal is giving more than 10 kg of milk, 10% extra feed should be provided
- Animals giving more than 8 kg of milk should be fed with concentrate mixture containing ingredients rich in rumen protected protein like cotton seed cake etc.,
- Pregnant animals during last 2 months of pregnancy should be provided an extra allowance of 1-2 kg concentrate mixture

There are three types of dairy animal rearing systems, 1) Extensive (Grazing on natural pasture lands), 2) Intensive (Stall feeding with green and dry fodder and concentrate supplementation as per the requirements) and 3) Semi intensive system (Grazing on natural pasture and concentrate supplementation at evening). Generally, the available fodder from natural pastoral lands is of inferior quality as there is not much growth of pasture due to over grazing. The nutrient requirement of the grazing animals may not be met on such type of lands and leading to low production in milch animals and in severe cases anoestrus or silent heat problem in buffaloes. Hence, just before rainy season, the natural grazing/pasture lands should be sown with Cenchrus, Stylo, Rhodes etc grasses seed and the animals are not allowed to graze on this established grazing/pasture land for 2-3 months after sowing. The total grazing land should be divided into four equal paddocks and rotation grazing should be followed for 15 days. In addition to the fodder grasses, fodder trees like Subabul, Glyrecidium, Acacia etc., can also be planted in grazing lands as the leaf and pods of these trees are very much relished by the animals. In order to over come the fodder problem at village level, rainfed annual fodder crops like maize, Jowar, Lucerne etc can be cultivated in at least 10% area of the farmers fields. Guinea grass can be cultivated on watershed bunds, as it provides green fodder to the animal and also make the bunds stronger. Under intensive system, grass varieties like Co-1, Co-3, APBN-1, Para grass etc., can be grown on irrigated lands for feeding the milch animals by cut and carry system.

## HEALTH MANAGEMENT

Diseases affecting dairy animals cause total loss/impairment of production and reproduction and some times leading to death that cost farmers millions of rupees annually. Invariably, most of the diseases cause depressed dry matter intake, loss of body condition, decreased milk production, increased reproductive failure and susceptibility to mastitis often leading to expensive treatment or even culling. The other factors that hasten the health problems are stress due to weather or malnutrition. Hence, it is obligatory to keep the animals healthy to reduce production cost and maintenance of milk quality. All the animals should be examined at the time of feeding and milking both in the morning and evening. Proper diagnosis is very important and control measures should be taken immediately in order to prevent the spread of diseases. The following few points should be considered to keep the animals healthy

- Animal sheds and surroundings should be kept clean and hygienic
- Provide good quality nutritious feed to the animals
- Clean drinking water should always be made available to the animals
- Elimination of mosquitoes, ticks etc from the sheds and animals

### Signs of ill-health in dairy animals

- Animals separating from the herd and show weakness and lack of alertness
- Loss of appetite and stoppage of rumination
- Rise in body temperature
- Dryness of the muzzle
- Sunken eyes with redness and lacrimation
- Hairs are raised on the skin
- Change in quality and quantity of milk produced is an early indicator of disease
- Undigested feed particles in the dung indicate there is some disturbance in the digestive system functionality
- Change in colour of urine
- Pus containing discharges from vulva indicate septic conditions of the reproductive organs (metritis)
- Blood and clots in milk indicate mastitis

### Impaction

- Over feeding of dry fodder without water intake or intake of grain rich diet will lead to impaction of rumen
- Important symptoms include stoppage of rumination, dry and hard flakes of dung and severe abdominal pain
- Stop feeding the animal till the problem get subsides
- 250 ml of cooking oil can be given as a drench to ameliorate the problem
- It if is not subsided with in 24hrs then consult the local veterinarian

### Bloat

- Sole feeding of legumes like stylo / berseem / lucerne (containing froth forming agents) results in bloat

- Important symptoms include difficult in respiration, stoppage of rumination and severe abdominal pain
- A mixture of 50 ml camphor oil and 500 ml cooking oil should be drenched
- Stop feeding the animal till the bloat subsides
- Small quantities of rice gruel can be fed to the animal

### Anthrax

- The disease may occur in per acute form, where in the animal dies suddenly, without showing any symptoms
- In acute and sub-acute forms, there may be high-rise in body temperature and signs of intense pain
- Treatment with antibiotics like long acting broad spectrum antibiotics is of use in cases showing sub-acute form of the disease and can be controlled by prior vaccination

### Black-quarter (Black-leg)

- Young animals in the prime of condition and six months to three years old are affected more than others
- Buffaloes usually suffer from a milder form of the disease
- Outbreaks generally occur with the onset of rains
- Fever with redness of eye and hot painful swelling in the affected leg with crepitating sound on pressing the affected part of muscle are the some signs of the disease
- Death may occur in severe cases with in 1 or 2 days
- Administration of penicillin in repeated doses could be effective if injected before muscle damage has been caused
- Control by prior vaccination

### Foot and mouth disease

- The foot-and-mouth disease is a highly communicable disease and is characterized by fever, formation of vesicles and blisters in the mouth, udder, teats and on the skin between the toes and above the hoof
- Animals recovered from the disease have a characteristic rough coat and deformation of the hoof

- The disease spreads by direct contact or indirectly through infected water, manure, hay and pastures and cattle attendants also spread the disease
- Symptoms include fever with rise in body temperature to 104-105$^0$ F
- Profuse salivation ropes of stringy saliva hangs from mouth
- Vesicles appear in mouth and in the inter digital space
- Lameness due to damage of tissue between the toes and above the hoof

Foot & Mouth Disease symptoms

- Crossbred cattle are highly susceptible to this disease
- It can be cured by broad spectrum antibiotic therapy and topical application of ointments and finally with vaccination it can be prevented

## Haemorrhagic septicaemia

- This acute septicaemic disease of cattle and buffaloes is widely spread in the country
- Symptoms include redness of eye and lacrimation along with fever
- Severe dyspnoea, hot painful swelling at head, jowl region or brisket region

Haemorragic septecaemia affected cow

Drinking of stagnated water is a source of internal parasitic infestation

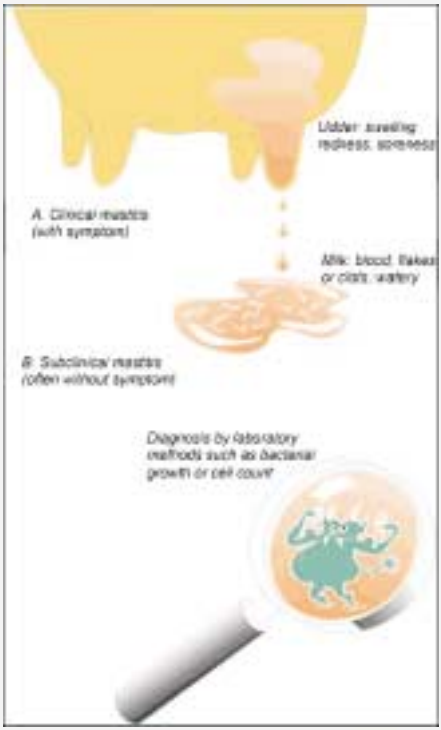
- In severe cases sudden death may occur due to high fever and severe dyspnoea
- Affected animals show a high rise in body temperature
- It can be cured by broad spectrum antibiotic therapy
- Prevention by timely vaccination

### Milk fever

- Milk fever is a disease which occurs immediately after calving especially in high yielders
- The clinical symptoms develop usually in one to three days after calving. They are characterized by loss of appetite, constipation and restlessness
- Cows are able to stand but show signs of hypersensitivity and excitability
- Muscle shivering in severe cases
- Sub normal temperature and cold extremities are also seen
- It can be cured by intravenous infusion of calcium gluconate salt

### Mastitis

- This disease is characterized by the inflammation of the udder, resulting in changes in the udder tissue and its secretion
- Symptoms include swollen teats with severe pain on touching the udder
- The milk contains blood and clots and the animal does not allow to milk it
- Affects both quality and quantity of milk production of the animal in long run
- Broad spectrum antibiotics with antihistamines will help in amelioration of the problem



Mastitis affected udder

**Metritis :** The symptoms include

- The discharge thrown by the animal in heat or 1 to 4 days after insemination is not clear
- It may be watery with white flakes like curdled milk or like thick pus or a mixture of both
- Treatment with Broad-spectrum antibiotics are indicated and the response is good when the ovary or ovaries are round, soft and smooth preferably with follicles

## Vaccination schedule

Proper vaccination should be done to the dairy animals at appropriate age in order to prevent the occurrence of diseases. The cattle and buffaloes are vaccinated as per the schedule shown in the following table

| Name of the disease | Age at 1st vaccination | Booster dose | Time of vaccination |
|---|---|---|---|
| Foot & Mouth Disease | 2M | Once in 6M | Mar – Apr<br>Aug – Sep |
| Haemorrhagic Septicaemia | 5M | Once in a year | May – June |
| Black-Quarter (Black-leg) | 7M | Once in a year | May – June |
| Anthrax | 6M | Once in a year | Aug – Sep |
| Brucellosis | 6M | Once in a life period | Aug |
| Theileriasis | After 4 M | Once in a year | Aug |

# REPRODUCTIVE MANAGEMENT

An important prerequisite for the sustainability of a dairy production is that cows must have efficient reproductive performance i.e timely onset of heat, conception to a fertile mating and normal delivery with viable calf at the end of gestation period in order to get milk continuously for 305 days from the animal. During the lifetime of a cow/shebuffalo, higher reproductive efficiency yields more lactations and therefore more milk as well as more calves for use as replacement stock or for sale. The main factors that contribute to economic losses are delayed puberty, long calving intervals, repeat breeding, short productive life and high calf mortality. Generally, cattle and buffalo heifers attain puberty when they reach 55-60% of their adult body weight. However, the age at which they attain puberty can be highly variable, ranging from 12-40 months in

Artificial insemination

cattle and 18-46 months in buffalo. Thus growth rate and body weight are more important determinants of puberty than age in animals that depends upon the feeding management.

- Animal regularly comes in heat for every 21 days if it is not pregnant and has regular cycle
- Animals in heat will have congested or pink, moist, shining vulval lips, the under surface of the tail pasted with mucus discharge
- Some times the discharge may be seen flowing out of the vulval lips when the animal mounts
- Animals in heat urinates repeatedly a small quantity of urine and swings its tail too many times
- Animals in heat accepts mounting or tries to mount on other animals
- Animal showing frequent oestrum will have Cysiic Ovaries problem

- Animals come in heat once in 3 to 4 days or once in 8 days in any case they will have long period of oestrum. Such cases should be suspected for cystic ovaries
- Animal not coming to heat due to malnutrition or deficiency of trace elements or due to summer stress especially in buffaloes needs to be treated accordingly
- Animals may be in silent or unobserved heat due to summer stress (common in buffaloes) needs to be observed regularly for insemination

Synchronization of oestrus is the best option to prevent silent heat problem in addition to get maximum conception rate and uniform calving throughout the year. Synchronization of oestrus is the act of making a number of cows come into heat at the same time. This allows better planning of breeding activities, wider use of AI and uniform production of milk throughout the year. The strategy is based on controlling the luteal phase of the oestrus cycle and can be achieved through two main approaches: (1) Extending the luteal phase by treatment with exogenous progesterone or progestagens, or (2) Terminating the luteal phase by treatment with prostaglandin's or its analogues. Animals usually come into heat 2-3 days after the treatment regime. Two inseminations are necessary per animal, at 48 and 72 hrs after withdrawal of the progesterone treatment or 72 and 96 hours after the end of prostaglandin's treatment.

### Management of pregnant animals

- Pregnancy diagnosis should be made within 60-90 days after service
- Give calcium injections one week prior to calving in order to prevent milk fever
- Antibiotics should be infused into the udder 15 days prior to calving in order to prevent mastitis
- Transfer the cows to clean sheds prior to calving
- During the last 2 months of gestation the animal should be dried off and it should be fed 1-2 kg of concentrate per day in addition to its maintenance rations
- It should be dewormed during 3 – 6 month of gestation
- The cow should not be frightened and it should not be taken for long distance walk grazing

### Care of animals at calving

- As the animal approaches parturition, it should be housed in a clean shed covered with paddy straw on the floor
- A period of 10-12 hr may elapse from the commencement of restlessness until the calf is born
- If some trouble is suspected it is better for the unskilled farmer to seek veterinary assistance
- The placenta is discharged within 8-12 hrs after calving, if it is delayed by 24 hrs then consult the veterinarian
- Give luke warm drinking water mixed with a little glucose after parturition
- Feed the animal with green pasture and concentrate mixture containing salt and minerals for 3-4 days after parturition

### Care of newborn calf

- Apply tincture of iodine to the naval cord immediately after birth
- Calf should be fed with sufficient amount of cholestrum with in 6hrs after birth
- Calf should be fed daily with sufficient amount of (2.5-3.0 kg per day) milk or milk replacer
- Start feeding green lush pasture from 15days onwards
- Feed concentrate mixture from 2$^{nd}$ month onwards 150-200 g / day, from 3$^{rd}$ month onwards 300-400 g/day, from 4$^{th}$ month onwards 500-600 g, from 5-6$^{th}$ month onwards 750-850 g and by 7$^{th}$ month it should be fed with 1 kg/day
- Start feeding dry roughages from 3 months onwards along with green fodder
- Deworm the calf first at 1week age and later on at monthly intervals till it attains 6 months

## CLEAN MILK PRODUCTION

Milking is very important operation and quality of milk determines its shelf life and price. Hence, milk with good quality can be stored more longer time without refrigeration and fetches more price in the market. So, farmers should keep an eye in this aspect for higher returns. Maintenance of clean and hygienic conditions in the milking barn results both in better udder health and production of quality milk that remains

Full hand milking

Machine milking

Clean milk can

wholesome for longer time. Hence, the milking barn should be thoroughly washed and sobbed after each milking so that the barn will be clean and dry, before the subsequent milking is commenced. The milk producers should strictly follow the following guidelines for clean milk production.

### Cleanliness of milch animals

- The hindquarters and thighs of cows/buffaloes should be brushed and washed before milking as lot of filth is accumulating on them
- Just before milking the udder should be washed with a warm sanitizing lotion and wiped with a cloth
- The foremilk should be drawn into a strip cup and tested for mastitis at least once in a week
- The teats should be dipped in a sanitizing lotion after each milking inorder to prevent mastitis
- The health condition of cows should be regularly examined and milking of healthy cows should be carried out first followed by mastitis or other disease infected ones
- The milch animals should be screened at regular intervals for tuberculosis
- Milk with abnormal colour, bitter or sour taste should be disposed off and not mixed with normal milk

### Cleanliness of milkers and milking pails

- The milkers should wear clean dress and cover their heads with caps inorder to prevent falling of loose hairs into milk
- Milkers' nails should be trimmed at regular intervals to prevent injury to the teats while milking
- Milkers should clean their hands with disinfectant detergent solution before milking

Milking in open space is a source of contamination

Cleaning and Sanitizing Equipment

- Milkers haring filthy habits like spitting, blowing nose etc. should not be allowed to milk the animals
- After each milking the milking pails should first be washed with warm water, scrubbed well using detergent sanitizer and then rinsed well with clean cold water

## Economics of milk production

The profitability of a dairy enterprise depends on the relationship between the cost of milk production and sale price of milk. The producer has no control over the sale price of milk but he has steady control on cost of milk production, hence measures should be taken to reduce the cost of production.

## Guidelines to reduce the cost of milk production

- Cultivation of green fodder in his own (at least 10%) land will reduce the cost of milk production to a great extent
- Utilization of family labour for various dairy operations and not depending upon outside labour
- Plan accordingly with synchronization technique so that maximum calvings take place in particular period of year which coincides with the natural green fodder availability
- Rear cows/buffaloes which are in $2^{nd}$ to $4^{th}$ lactation
- Preparation of concentrate mixture in his own by making use of locally available cheap ingredients
- Regular observation and timely insemination of animal
- Feeding the animal as per requirements
- Timely vaccination and treatment of diseased animals

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