

Feeding of Dairy animals (Cattle and buffaloes)

Feeding for dairy animals (cattle and buffaloes) is based on the use of poor quality crop residues like wheat straw, rice straw, sorghum and maize stovers, and natural grasses, supplemented with a little or no concentrates. The quantity and quality of fodder available from natural pasture shows seasonal fluctuation. There is an acute shortage of feed supply during off season and the available feed during this period is of very poor quality. Poor nutrition results in low production and reproductive performance, slow growth rate, loss of body condition and increased susceptibility to diseases and parasites. Thus, effective utilization of the available feed resources and appropriate supplementation of poor quality natural pasture and crop residue based diets appear to be the necessary steps to alleviate the nutritional problems of dairy animals.

Feeding of a well balance ration in proper proportions such as energy sources, protein, fibre, starch and sugars and vitamins and minerals for dairy animals improve the productive and reproductive performance, nutritional and health status of dairy animals as well as socioeconomic condition and welfare of farmers. This balance of nutrients can be estimated with a reasonable degree of accuracy at a group level, and requirements met through the careful selection of appropriate locally available feed ingredients.

Feed costs are about 60 to 70% of the total farm expenditure. Cows need to be fed balanced rations to give the most profitable level of production. Milk production of the individual cows is limited by heredity. Differences in milk production among cows of same breed are due to about 25% heredity and 75% environment. Feeding has the most influence on the milk yield and reproduction parameters. Proper feeding and care allows the cow to produce closer to her potential ability. Feeding programme should be revised periodically

keeping in view the local casts & availability of feed ingredients for different categories of dairy animal preferably under expert supervision.

Calf feeding

Feeding of Colostrum / Milk

Feeding of colostrum to newly born calf after birth within 1-2 hours to get maximum antibodies for developing immunity against diseases. Biological significance of the colostrum will be lost if feeding is delayed for more than 2 hours. Dairy animals in 2nd or later lactation's produce larger quantity of colostrum and have higher immunoglobulins concentrations than animals in first lactation. This is because old animals would have been exposed to a wider range of diseases than young animals and therefore have produced more immunoglobulins against them. The calf is capable of absorbing antibodies from the colostrum only for a short period of time. Maximum absorption of immunoglobulin as such occurs immediately after birth due to the process of pinocytosis and decrease with time because 24 hours after birth immunoglobulins degraded in the intestine.

The calves are to be fed with colostrums followed by milk at the rate of:

- 1/10th of body weight up to 4th wks of age including the colostrum feeding from 0–3 days,
- 1/15th of body weight during 5th and 6th wk. and
- 1/20th of body weight during 7 – 8th week.

Milk should be reduced slowly after 8th week and should be stopped completely by 10th week.

The calf starter should be started from 2nd week and increased @ 200 gm/wk. till it becomes 1.5 kg per calf per day. The green fodder should be started *ad libitum* starting from 2nd wk. of age.

Significance of colostrum Feeding

In cattle the antibodies (gamma globulins) are transferred from mother to the calf through colostrum. These gamma globulins will be absorbed as such by the calf and will enter its system forming a readymade antibody resistance system for the calf against all the disease producing agents and other antigens the mother has had, encountered during its lifetime. This will protect the calf against diseases in the early stages, until their own antibody manufacturing system takes over. Thus, if colostrum is not fed, the calves are denied antibody cover and, therefore, will remain susceptible to many diseases. Most likely, they will perish due to some disease or the other. Besides, colostrum is highly nutritious. It is slightly laxative and prevents constipation. In absence of colostrum and fostering by other mother cows, artificial colostrum can be prepared as follows (Table).

Composition of Artificial colostrum

Feed ingredients	Amount
Luke warm water	275 ml
Raw egg (55g)	One
Castor oil	3 ml
Vitamin A	10000 IU
Warm whole milk	525 ml
Antibiotics	About 80 mg

Feeding of Milk replacer

Milk can also be substituted with milk replacer to make calf raising economical. Milk replacer is a constituted feed through cheaper ingredients which resembles the biological and chemical composition of milk. It is usually fed in gruel form. Feeding of milk replacer helps

in reducing the calf mortality, better growth and development of calves and in economical raising of calves. The composition of milk replacer is given below:

Composition of Milk Replacer

Feed ingredients	Amount (kg)
Wheat	10
Fish meal	12
Linseed meal	40
Milk	13
Coconut oil	07
Linseed oil/cotton seed oil	03
Citric acid	1.5
Molasses	10
Mineral mixture	03
Butyric acid	0.3
Antibiotic mixture	0.3
Rovimix-A,B ₂ , D ₃	0.015

Calf Starter

Calf starter is a solid feed mixture of grains, protein feeds, minerals, vitamins and antibiotics. It has been evolved for use with limited whole milk. It is offered from 2nd week to 3 months of age with the main aim for an early development of rumen.

Composition of calf starter

Feed ingredients	Amount (kg)
Maize/Barley/Oats	45.00
Groundnut cake/Linseed/Til cake	35.00
Fish meal	7.00
Wheat bran/rice bran/chuni	10.00
Mineral mixture	3.00

Feeding of growing calves (Heifer)

Growing calves should have free access to fresh, clean water at all times, particularly when milk feeding is reduced. Heifer is growing animals and so the requirements for growth is of higher order than for more maintenance during early stage relatively more protein is required than energy. Most young heifers grow well if excellent hay is given as much as they eat. The amount of growth depends upon the quality of forage in unlimited amounts. No grains need to be fed after the calf is 9 months. Feed *adlib* of green fodder so that the animal gets enough carotene. If leguminous fodders are fed it gives enough calcium, and other minerals. When the heifers are fed with *adlib* roughages and concentrates and then check for their growth. If only poor quality crop residues are fed then they should be supplemented with multi nutrient blocks for obtaining proper body weight gain and early maturity in growing heifers.

Feeding of pregnant and lactating animals

If the pregnant and lactating animals are fed liberally with good quality green fodder, vitamin A supplementation should be stopped. Basal diet should not be restricted as a rule of thumb; 3 g of fermentable nitrogen per 100 g of fermentable organic matter are required to

meet the needs for efficient microbial growth. Feeding of 30-40 grams of mineral and vitamin supplements per animal per day may be beneficial in urea treated straw based diet. In pregnancy, feed intake is low (about 1.7- 2% of body weight). Pregnant dry animals (more than 5 month of pregnancy) should be fed with 20-30 Kg green fodder and 1-2 Kg concentrate mixture (20% CP and 70% TDN) and *ad libitum* wheat straw, respectively.

It has been shown that in last tri-master of pregnancy, pregnant heifers need an extra 0.5 kg balanced concentrate mixture per day, in addition to its maintenance requirements. During the last trimester of pregnancy, a further quantity of 1.25 and 1.75 kg balanced concentrate mixture is recommended for cattle and crossbred cattle/ buffaloes, respectively. During last tri-master (advance stage) of pregnancy an additional amount 90 to 130 g of DCP and 1-1.1 kg TDN have to be provided to cattle and buffaloes of 350 kg to 500 kg body weight. During the last 3 days prior to calving, the amount of concentrate mixture should be reduced and a little warm bran is fed to keep the animal in laxative condition before calving.

Feeding of dairy animals (cows and buffaloes) during the entire period of lactation is vital for harvesting the optimum milk production from the dairy animal. Proper management of the dairy animal during first few days after calving and during early lactation is of particular importance. The following management principles must be observed.

Soon after calving the animal must be fed laxative feed and warm gruel for first few days. The animal at this time must be managed separately. Special care may be taken regarding emptying the udder as frequent emptying may result in occurrence of milk fever especially in high yielding animals and those poorly managed during previous dry period. Feeding management during early postpartum must focus on attaining higher peak milk production and better persistency. This could be achieved by feeding the animal with higher energy diets and maximizing dry matter intake.

Monitor the body weight and condition regularly during early stages of lactation. It must be ensured that the animal does not lose excessive weight during this phase as this may result in fat infiltration of liver also called 'fatty liver syndrome'. Attempt must be made to return the animal in the positive energy balance soon as the long phase of negative energy balance results in poor persistency of milk production and lower reproductive efficiency. This can also be achieved by improving the quality as well as quantity of the feed. After the peak milk production has been achieved the feeding must be based on the level of milk production. The milk is most economically produced from fodders. All attempts must therefore be made to ensure supply of green fodders/silage/hay round the year. Concentrates should also be supplemented whenever necessary and depending on the level of production.

A combination of leguminous and non-leguminous fodders is best to meet the maintenance and production requirement of a cow weighing 400 g and yielding up to 8 litres of milk with only 1 kg concentrate supplementation. Non leguminous fodder feeding would necessitate additional 1/2 kg concentrate supplementation. Same cow if fed on hay would need proportionality higher quantities of concentrates 2.5 and 4.5 kg respectively.

In case of dairy cows producing higher quantities of milk (>20 litres/days), no suitable combination of concentrates and fodders (even at high intake levels) can sustain this level of production without the mobilization of body reserves. Moderate levels of milk can be sustained on a suitable combination of green and dry fodders supplemented with desired amounts of concentrates. While feeding a mixture of straw and green fodders, it will be desirable to mix 1 kg of straw with every 4-5 kg of chaffed green fodder for 100 kg body weight. If plenty of quality green fodder is not available and the ration is based on low quality straws/stovers then additional concentrate feeding is required. The feed intake of moderate yielding lactating dairy cows in dry matter equivalent is about 2.5 kg dry matter (DM) per 100 kg body weight. The dry matter intake in high yielding animals could go up to 3.5 % or

higher. In case of non-producing adult cows, dry matter requirement is about 2.0 % of their body weight.

Leguminous fodder (like Berseem, Lucerne) contain about 12-14 % crude protein, whereas non-leguminous fodder (like maize, sorghum, oats and grasses etc) contain about 7-8 % protein. Straws like wheat and paddy straws contain only 3-4 % crude protein. The crude protein content of the concentrate mixture should be so adjusted to provide about 13-14 % crude protein in total ration.

Roughage must be chaffed, but it should not be chaffed very fine, as it affects regurgitation process adversely. Grain portion of concentrates should be crushed else part of it may pass off undigested in the faeces. It is desirable to moisten the concentrate mixture and mix it with straws before feeding. Ample availability of clean drinking water must be ensured to the milch cows.

Due care should also be taken to feed the advanced pregnant cows and buffaloes as the feeding management at these critical stages will determine the age at maturity and ensure adequate built up of body reserves for use during early stages of lactation when the energy intake of the animal often fails to keep pace with the level of milk production.

A suitable combination of Berseem along with oats, maize, wheat/paddy straw and concentrates (based on the level of production) is most practical strategy of feeding dairy cows and buffaloes during winters. The total dry matter content of such ration should be about 22 % and the crude protein content should be about 14 %. The respective dry matter and crude protein contents of the above feeds are (Berseem (12 and 14%), Oats (15 and 10 %), Maize (16 and 10%), Straws (90 and 4%) and Concentrates (90 and 20%) respectively. If enough green fodders are not available and we have to depend on straws, we can improve the quality of these straws by treating them with urea under expert guidance.

Bypass protein supplement as a top feed

As the availability of protein meals in the country is limited, therefore, treatment of proteinaceous substances can help increase their efficiency of utilization. The treatment of high protein feedstuffs may be carried out by 3 methods i.e. heat (dry heat or moist heat) treatment, chemical (formaldehyde) treatment and tannic acid (condensed tannins) treatment. When these meals are fed as such to ruminants, about 70% of the protein is broken to ammonia in the rumen and a significant portion of it is excreted in the form of urea through urine.

However, if these meals are subjected to suitable treatments- termed as “bypass protein technology”, then their efficiency of utilization can be significantly improved. While the cost of treatment of protein meals is less than a rupee per kg, feeding one kg of treated meal can help increase milk production by more than a litre as compared to untreated meal. As almost all types of meals are suitable for bypass protein technology, locally available meals could be used in different regions.

Treated protein meals can be fed to animals, either as top feeds or by incorporating them in high milk yielder (cattle or buffaloes) feed @ 25%. In all the feeding trials, feeding 1 kg of bypass protein supplement increased daily milk yield, fat and protein per cent by 0.8-1.2 litre, 0.2-0.5% and 0.2-0.3%, respectively, as compared to untreated meal. If animals are supplemented with a source of bypass protein during drought then they are able to maintain milk production and there is minimum damage to future productivity. Replacement heifers and growing calves could be fed limited quantity of bypass protein supplement, to exploit their genetic potential for milk production.

Benefits of bypass protein feeding

- Higher availability of amino acids per unit of feed.
- Better utilization of protein meals having higher rumen protein degradability.

- Judicious utilization of protein meals, available in limited quantity.
- Improves growth & milk production (0.8-1.2 litre/day).
- Improves protein % (0.1-0.3%) in milk, hence, improves SNF content of milk.
- Improves fat % (0.2-0.8%) in milk.
- Better economic returns, for same input cost.
- Useful for low and high yielding animals, relevant to Indian conditions of feeding and management.

Important tips for feeding of high milk yielders

- Include optimum proportion of forage and concentrates in the ration. Good results are obtained by feeding a ration that derives 30 – 40% of the feed units from grains and 60-70% from forages.
- The forage should be of excellent quality, at optimum stage. A short delay to cut the fodder can adversely affect its quality.
- The feeding schedule should be such that it will maintain a continuous fermentation in the rumen. The cows should be fed minimum of four times a day at 6 hours intervals. Each feeding should comprise both grain and forage.
- When high levels of grains are fed, feed it by mixing with roughages or feed it after the animal has consumed some roughage.
- From 7th month to end of gestation cows may be fed 1 to 2 kg concentrate feed in addition to their nutrient requirement. The cows may be made to gain 20-25 kg body weight during this period.

In order to simplify feeding of dairy cows complete diet system have been introduced. Complete diet is an intimate mixture of concentrate and roughages in a desired proportion processed in such a way as to preclude selective eating. It forms the sole source of food for the cow. It reduces labour requirement and keeps a tighter control on the cow's

nutrition. Feeding of complete diet ad libitum to dairy cow has been found to be advantageous in that it increases feed intake, preserve milk quality as result in better utilization of nitrogen.

Feeding of dairy animals during transition period and stress conditions

Feeding of transition animals with forage and concentrate, as a TMR should be encouraged to ensure forage to grain ratio remains constant. Maximizing feed intake during the transition period must be a priority. Provide high quality forages and avoid sudden changes in diet ingredients. Avoid unnecessary stress near the time of calving. Feeding extra concentrate during the final 2 to 3 weeks prior to calving would benefit animal by adopting rumen to high starch diets and providing additional energy during a period when feed intake normally declines. Energy is one of the most important limiting factors in the synthesis of milk process by the mammary gland. Inadequate availability of feeds during adverse climate affects the production performance of animals.

Heat stress reduces feed intake and increases water intake, causing a rapid decline in milk yield. Heat stress not only reduce feed intake, milk yield, but also results in decline of milk fat and solid not fat. An ambient temperature of above 40⁰C depresses feed intake leading to mobilization of body reserves and high losses in body weight. In summer, the feed should be offered in the early morning and late evening so that animals feed intake and their milk production would be maintained. Both heat and cold stress increases the animals' maintenance requirement. However, cold stress increases feed intake, which prevents a decline in milk yield until temperature go below -5⁰C. In hot-dry and hot-humid season feeding of total mixed ration (TMR) and/or densified complete feed blocks should be practiced to stop the decline in feed intake which helps in sustainment of milk production.

Good quality and sufficient quantity of feed and fodders and appropriate feeding is the cardinal feature in dairy animal production as the feed costs account for over half of the total

milk production, increasing self sufficiency in feed production will be an important factor in future development programs. It is fundamental approach to provide good quality feed and fodders and/or balanced complete feed to dairy animals in sufficient amount to maximize production. The quality and quantity of feed that is utilized for milk production should be optimum to increase the profitability of dairy farmers. As the utilization of dietary protein in the ruminant animals is lower than simple stomach animals because the digestion in ruminant animals depends essentially upon a fermentative process in rumen before the enzymatic digestion. The condition becomes more complex when the availability of feeds is scarce.