

PRODUCTION AND MANAGEMENT OF CATTLE

Selection of animals with good production potential and scientific management practices of feeding, breeding and disease control are the essential components of successful dairy farming.

COMMONLY USED TERMS IN DAIRYING

- Standard lactation milk yield Milk yield of 305 consecutive days
- Calving Act of giving birth
- Peak yield Highest daily yield in lactation period
- Intercalving period Interval between two successive calvings
- Service period Period from the date of calving to the date of next conception
- Lactation length The total number of days that the cow is in milk. Standard lactation length is 305 days from the date of calving.
- Dry period Number of days from the date of drying (Stoppage of milking) to the next calving
- Dam Mother
- Sire Father
- Heifer Female cattle above one year but not yet calved
- Sire index (Breeding value) An index of genetic potential of the bull

CATTLE BREEDS AVAILABLE IN NAGALAND

Cattle available in Nagaland can be classified as indigenous and crossbreds. The crossbred animals are having different level of exotic inheritance from Jersey or Holstein Friesian or a combination of these breeds; while the indigenous cattle are mostly of non-descript type. Jersey breed is known for its milk fat percent and Holstein Friesian for the high quantity of milk it produce. Experience of crossbreeding programmes across India revealed that animals with exotic inheritance of about 62.50 percent perform best due to several reasons. Further, Jersey breed is recommended for hilly and coastal areas where availability of resources is limited. On the other hand, certain level of native germplasm is helpful to retain the adaptability, disease resistance and tolerance to extremes of weather.

SELECTION OF DAIRY CATTLE

Proper selection is the first and the most important step to be adopted in dairying. Records are the basis of selection and hence proper identification of animals and records keeping are essential.

- **Heifers**

Heifers should be selected on the basis of the potential of the sire and milk production of the dam. It is this basic requirement that warrant proper maintenance of records. The heifers should have proper growth, good health and be free from genetic abnormalities. Heifers that conceive within 24 months of age alone may be retained in the herd.

- **Cow**

The most important economic trait to be looked into, while selecting a cow is milk production. For economic milk production a cow producing not less than 2500kg milk in 305 days lactation period is desirable. In general, selecting a newly calved cow yielding 10 litres per day may have 2000- 2500 kg lactation yield. A peak yield of 12 kg milk per day can be used as a criterion for this.

Age at first calving should be less than 3 years. The intercalving period should be 12 to 14 months. The cow should not have any physical deformity and should possess dairy conformation like well developed udder, prominent milk vein, squarely placed teats, ease in milking and good temperament.

- **Bulls**

Bulls contribute about 75 percent of the inheritance to the next generation and therefore, called as "*more than half the herd*". It is not very practicable to have intense selection of the females for breeding. Hence utmost care is to be given for bull selection. The bulls should be proven bulls or of high pedigree. The young bulls used for breeding should be from dams with lactation milk production not less than 4500kg and bulls with higher sire index. Other economic traits like milk fat and solid non fat (SNF), age at first calving, calving interval, calving ease, incidence of diseases etc., should be included in evaluation. Selection should be continuous and applied in all generations. Any slack in selection will not only result in the stoppage of genetic improvement but also in creating negative trends.

- **Indigenous cattle**

The indigenous cattle of Nagaland, recently named by National Bureau of Animal Genetic Resources, Karnal as '*Thotho*' are known for their heat tolerance, resistance to parasites and diseases, adaptability to atmospheric changes and high returns even under poor feeding condition. These cattle are considered to have low genetic potential for milk production. Nonetheless, the progressing global warming as well as limited landholding and

scarcity of roughage warrants conservation of animals which are heat tolerant and have the ability to thrive with relatively less feed.

HOUSING

Proper housing which is conducive to good health, comfort and protection from inclement weather is one of the important factors necessary for utilizing the genetic potential for optimum production.

Recommendation of Bureau of Indian Standards (B.I.S) for cattle housing in areas with heavy rainfall and high humidity for a farmer having two to three milch animals

The site selected should be dry, elevated and well drained with provision for enough space for future expansion. The shed has to be oriented across the prevailing wind direction in order to protect the roof from being blown off by high wind and at the same time to provide sufficient air movement in the shed. A lean-to-type layout of such a shed to accommodate five animals is given in figure 1.

Figure 1. A lean-to-type cattle shed

The standing space is provided in such a way that the animals face the manger which is adjacent to the wall. The length and width of standing space is kept variable from 1.5 to 1.7 metre and 1 to 1.2 metre, respectively. The floor should be non-slippery and can be brick laid on edge or stone slabs or concrete. The floor may be given a slope of 1 in 40 to 1 in 60 depending upon the type of flooring. The manger should be of continuous type and may be constructed using wooden plank, brick in lime or cement mortar. The surface of the manger should be smooth with all the corners rounded off. A two-way tethering arrangement may be provided. The dimensions of manger are as follows:

Height at forecurb	:	Maximum 30cm
Thickness of the forecurb	:	Minimum 4cm in wooden plank, 10cm in bricks
Inner width of the manger	:	Minimum 75cm
Depth of the manger	:	Minimum 20cm (For adults 40cm)

Drinking water should be available for the cow at all times. It is advisable to provide a water channel on the forecurb with overflow facility at one end of the shed. The material for roofing may be thatch, tiles, G.I. sheets, asbestos cement etc. The eaves of the roof should project out at least 75cm away from the pillars in order to afford protection to the animals from rain and high winds. The height of the eaves from the ground level should not be less than 1.75 metre and not more than 2.10 metres.

The drain will have to be laid just outside the shed. It can be built with bricks and cement mortar with rounded corners and should lead to a urine pit. The width of the drain should be 30cm and depth 6 to 7.5cm providing a slope towards outside.

In order to manage a herd of 20 animals a milk producer has to make provision for a calving box and a calf pen in addition to shed for cows.

FEEDING AND MANAGEMENT

The success of dairy industry depends to a large extent on rearing of calves to a breedable age at a fast rate and with minimum mortality. The higher the plane of nutrition, the earlier the onset of puberty and thus quicker the returns. In addition to the genetic influence, nutrition of the dam during gestation (pregnancy) is important for healthy and vigorous calves.

Feeding of colostrum to newborn calves

Colostrum is the first milk of the dam after birth and it contains large quantities of immune bodies which offer resistance against infections. Calves may be weaned (separate from dam) immediately after birth, wherever it is possible. They should be fed colostrums within half an hour or at the most within two to three hours after birth and continued for a minimum of 4 days at the rate of $1/10^{\text{th}}$ of their body weight. Colostrum should be fed fresh and should not be warmed as it clot if heated.

Feeding of orphan calves

In the absence of colostrum from the dam (due to death, injury etc) or from newly calved cows, a mixture can be prepared and fed as follows. Whip an egg in 300ml of warm water, add a teaspoonful of castor oil, one teaspoon of cod liver oil (equal to 10,000 I.U of vitamin A), 500 ml of warm whole milk, stir well and feed at body temperature. This is sufficient for one time feeding. The calf should be fed 3- 4 times a day.

Training of calf to drink colostrum or milk

Colostrum or milk is poured into a pail kept scrupulously clean. The calf may be brought to the pail and its nose made to come in contact with colostrum or milk. The attendant after thoroughly cleaning his/her hands may dip his/her forefinger in the colostrum/ milk and allow the calf to suck at his finger. He should then slowly his hand dipping it in the colostrum/ milk in the pail. When the calf takes one or two mouthfuls remove the fingers. This procedure may be repeated whenever the calf stops drinking and lifts its head. Patience is needed on the part of the trainer and under no circumstance the calf should be forced or punished. When labour is costly, the weaned calf may be fed from nipple-pail.

After four days, feed the calf on whole milk at body temperature, at the rate of $1/10^{\text{th}}$ of their body weight. The feeding may be 3 or 4 times for the first 7 days and gradually

reduced to twice a day by the second week. A highly nutritious concentrate mixture (calf starter) and good quality forage should be freely accessible to the calves in their pens as early as first to second week of age. Feeding of calf starter is continued up to 6 months.

Milk feeding schedule

1/10th for the first 6 weeks

1/15th for the next 2 weeks

1/20th for the next 4 weeks

Milk feeding can be stopped after 3 months.

In situations where weaning is not practiced the quantity of milk fed to calf can be regulated by allowing to suckle one quarter of the udder of cows yielding approximately 8 kg milk. This thumb rule, however, may not be applicable in the case of very high yielders and poor yielders.

For identification of the calf, tattoo the numbers inside of the earflap or apply ear-tags. For ease in handling and to avoid fighting between them, dehorn the calves, preferably before 7 days of age. After applying Vaseline around the horn buds rub with caustic potash sticks on the horn bud till slight bleeding occurs. Dehorning can also be done by hot iron or by electric dehorner.

Feeding of growing animals

For calves below one year of age it is always desirable to give sufficient concentrates in addition to good roughage so that they make optimum growth.

Feeding concentrate can be considerably reduced in the case of calves over one year of age fed on high quality roughage. In growing cattle, often inadequate supply of energy affects proper growth. Under- nutrition delays puberty. A judicious mixture of roughage and concentrate is essential for obtaining optimum growth without undue fat deposition.

From six month onwards, calves can be given the same type of concentrate mixture (14-16% Digestible Crude Protein and about 70% Total Digestible Nutrient) as used for adult cattle. Examples of concentrate mixtures are given separately.

Approximate feeding schedule of growing animals from six months onwards is given below:

Age (months)	Approximate body weight (kg)	Concentrate mixture (kg)	Grass (kg)
6-9	70-100	1.5-1.75	5-10
9-15	100-150	1.75-2.25	10-15
15-20	150-200	2.25-2.50	15-20
Above 20	200-300	2.50-2.75	15-20

Feeding of lactating cows

Proper feeding of dairy cattle should envisage minimum wastage of nutrients and maximum returns in respect of milk produced. The general principles of feeding are similar in cattle and buffaloes.

The ration is a 24-hour allowance of a feed for an animal. It includes maintenance and production allowances. The maintenance ration is based primarily on body weight of the animal.

The approximate body weight of a cow can be estimated from body measurement using the following equation.

$$1. \text{Body weight (kg)} = 3.3 (\text{chest girth in cm}) + \text{posterior girth in cm} + 0.7(\text{length in cm}) - 490$$

Chest girth is the circumference around the chest just behind the withers. Posterior girth is the circumference around the belly. Length is measured from point of shoulder to the pin bone.

$$2. \text{Body weight (lbs.)} = LG^2/300 \text{ where body length (L) and girth (G) are measured in inches. To convert into kg this may be divided by 2.2.}$$

The production ration is based on milk yield and its fat content and is dependent on whether the cows are pregnant and or still growing.

Feeding schedule for different classes of adult cows (Approximate body weight -250 kg)

	When green grass is plenty		When paddy straw is the major roughage		
	Concentrate mixture (kg)	Green grass (kg)	Concentrate mixture (kg)	Green grass (kg)	Paddy straw (kg)
Dry cows	-	25-30	1.25	5.0	5-6
Milking	1 kg for every 2.5-3.0 kg of milk	30	1.25+1 kg for every 2.5-3.0 kg of milk	5.0	5-6
Pregnant	Production allowance+ 1 to 1.5 kg from 6 th month of pregnancy	25-30	Maintenance + production+ 1 to 1.5 kg from 6 th month of pregnancy	5.0	5-6

Good quality roughage should form the basis for economic milk production. The amount and protein content of concentrate Mixture can be decided by the quality of roughage provided. Good quality grasses (Guinea, Napier etc) with a minimum of 6% crude protein on dry matter basis alone can form maintenance ration of a cow of average size. But it is possible to maintain milk production of up to 3-4 kg with grass-legume fodder

Even good quality roughage alone cannot entirely replace concentrates in the case of high yielders. Straw can form the roughage in the absence of grasses and in such cases concentrates should be given for maintenance. If straw forms the sole roughage, vitamin A

should be supplemented in the concentrate mixture at the rate of at least 5000 I.U. per kg of the mixture. Any vitamin A preparation available in the market can be used. If at least 5 kg of green grass is provided vitamin A supplemented is not necessary.

For lactating cows, 1 kg of concentrate mixture (compounded feed) (0.14-0.16 kg DCP and 0.70 kg TDN) may be required for every 2.5-3.0 kg milk over and above the maintenance allowance. After parturition, the cow should be given the same type of feed and the same quantity as before and the concentrate allowance should only gradually increased to avoid digestive troubles like acidosis, indigestion, etc.

In the case of young cross-breed cows below four years old age to meet the needs for growth, it is desirable to give additional concentrate allowance at the rate of 1 kg for animals in first lactation and 0.5 kg in the second lactation over and above the maintenance and production needs. Milking animals should always have free access to clean fresh drinking water.

Tips for feeding of dairy cattle

1. Concentrate must be fed individually according to the production requirements
2. Good quality roughage saves concentrates. Approximately 20 kg of grasses (Guinea, Napier, etc) or 6-8 kg legume fodder (cowpea, Lucerne) can replace 1 kg concentrate mixture (0.14-0.16 kg DCP) in terms of protein content.
3. 1 kg straw can replace 4-5 kg of grasses on dry matter basis. In this case the deficiency of protein and other nutrients should be compensated by a suitable concentrate mixture.
4. Regularity in feeding should be followed. Concentrate mixture can be fed at or preferably before milking- half in the morning and the other half in the evening- before the two milking. Half the roughage ration can be fed in the forenoon after watering and cleaning the animals. The other half is fed in the evening, after milking and watering. High yielding animals may be fed three times a day (both roughage and concentrate) increasing the frequency of concentrate feeding will help maintain normal rumen motility and optimum milk fat levels.
5. Over-feeding concentrates may result in off feed and indigestion.
6. Abrupt change in the feed should be avoided
7. Grains should be ground to medium degree of fineness before being fed to cattle.
8. Long and thick stemmed fodders such Napier may be chopped and fed.
9. Highly moist and tender grasses may be wilted or mixed with straw before feeding legume fodders may be mixed with straw or other grasses to prevent the occurrence of bloat and indigestion.
10. Silage and other feeds which may impart flavor to milk may be fed after milking.

11. Concentrate mixture in the form of mash maybe moistened with water and fed immediately. Pellets can be fed as such.
12. All feeds must be stored properly in well ventilated and dry places. Mouldy or otherwise damaged feed should not be fed.
13. For high yielding animals, the optimum concentrate roughage ratio on dry matter basis should be 60:40.

Urea in cattle feeds

Urea can replace $\frac{1}{4}$ th to $\frac{1}{3}$ rd of protein on nitrogen basis. For the cattle above 6 months of age, it can be used as a source of protein at 1% level in concentrate mixture. Care should be taken to:

1. Mix urea thoroughly and uniformly with the feed avoiding localized concentration.
2. Include readily available sources of energy such as cereals, tapioca chips or molasses
3. Introduce the urea containing feed only gradually.
4. Fed the concentrate mixtures containing urea in small quantities at frequent intervals.

Carelessness with urea feeding may cause death of animals.

Urea treatment of paddy straw

Treating paddy straw with urea at 4 per cent level (moisture level adjusted at about 50 per cent) is effective in improving its palatability and nutritive value. Ammonia liberated from urea improves the protein content of straw as well as its digestibility.

Procedure

4 kg of urea dissolved in about 100 litres of water is sufficient for treating 100 kg of dry paddy straw. Preservation can be done in cement masonry/metal/plastic container. Straw, either chopped or long is spread to a thickness of about 15 cm in the container and a proportionate quantity of urea solution is uniformly sprinkled over with a rose can. The process of filling and sprinkling is repeated until the level of straw is at least 30 cm above the container. Each layer should be properly trampled down to exclude as much air as possible, paying special attention to the corners of the container. The surface should be covered with a polythene sheet and at least 15 cm of soil should be put over it to keep the straw pressed and finally plastered and finally with mud. The straw will be ready for feeding after 2-3 weeks.

Alternatively Urea Molasses Mineral block may be provided for voluntary consumption for increasing the digestibility of straw.

Feeding of dry and pregnant cows

For dry cows maintenance allowances as per the feeding schedule alone need be given. The ration for pregnant animal should be adequate for development of the foetus as well as for providing nutrient reserves to maintain milk production.

Heavy milk production is a severe drain from the body and therefore the cow should be allowed a dry period of two months before the next calving. A good cow in good condition at the time of parturition will provide more milk and reach the peak production much earlier. Better feeding during the later stages of pregnancy is also important since the body condition at the time of calving influences the postpartum reproductive efficiency.

A pregnant animal should be given 1-1.5 kg of concentrate mixture over and above the maintenance and production allowance from the 6th month of pregnancy. A drastic reduction in the concentrate allowance of the pregnant animals may lead to metabolic disorders like ketosis during the next lactation period. Rations for pregnant cows should contain higher levels of Vitamin A. Excessive amounts of calcium should be avoided to reduce the incidence of milk fever in high yielding cows.

Laxative feeds may be included in the ration a few days before and after calving. Brans, green grasses etc. are good for this purpose.

Feeding of bulls

Male calves to be reared as future breeding bulls, should be fed on a higher plane of nutrition than female calves.

A bull in service should be given good quality roughage with sufficient concentrates. Too much roughage feeding should be avoided as it makes the bull paunchy and slow in service. A large concentrate allowance may make the bull too much fatty and less virile.

Feeding Schedule of bulls

Body weight (kg)	Concentrate mixture (kg)	Green grass(kg)
400-500	2.5-3	20-25

MILKING

Milk out the udder regularly from the day of calving. Milk can be used for usual human consumption from the 3rd or 4th day onwards. Animals producing more than 12 kg of milk per day can be milked 3 times a day. Keep the intervals between milking almost equal (>6-8 hours)

Take care to have clean practices during milking. Wash the udder properly and mop it with clean towel. Practice full hand milking. In organized farms machine milking can be used.

For proper disinfection and washing of udder iodophore (Polysan) 1:200 diluted or potassium permanganate in concentration of 1/1000 to 1/500 can be used. Use only properly cleaned utensils for milking and storage of milk. Keep the surrounding clean and free from dust. Take care that dung and urine do not splash into the milking pail. Milking process should be completed as fast as possible because the effect of letting down remains for about 5-6 minutes only. The udder should be completely milked out at each milking. The quantity

of milk at each milking should be recorded. It has been an established fact that milk drawn aseptically from the udder of even healthy cows contains a certain number of micro-organisms. Even this level of micro-organisms in milk can bring about spoilage on storage. After milking regular teat dipping with suitable antiseptic solutions may be practiced.

Source of contamination of milk and control measures

Source of contamination	Control measures
1. Exterior of udder	Wash and wipe udder. Clip the hair around udder and flank.
2. Interior of udder	Check for mastitis using strip cup Discard fore- milk
3. Air and dust in cattle shed	Avoid dusty environment at milking time Use small top milk pail Keep milk covered
4. Flies and other insects	Eliminate breeding places Control flies and insects with insecticidal sprays, repellents.
5. Milker	Practice clean habits, do not use lubricants on teat.
6. Utensils	Clean, sanitize and dry before use.

CARE OF MILK

Immediately after milking the milk should be transferred from the shed because milk is capable of absorbing odours from the atmosphere.

Straining through cloth, wire gauze, plastic sieve is done to remove large particles of foreign materials like straw, hair, insects, grass, dust, etc. after each use the strainer should be washed and sanitized. Improperly washed and unsatisfactorily sanitized strainer will only increase the bacterial population.

COOLING OF MILK

The scientific reason for cooling milk is to inhibit multiplication of bacteria. A temperature of about 5°C will maintain the milk in this state. Cooling is done by various methods in large dairy. Under farm conditions the milk cans are kept in a tank containing cool water, the level of water in the tank being above the level of the milk in the can. Milk should be transported to the collecting or selling point within four hours.

Various metals and their alloy are used for the manufacture of dairy utensils. Metals like Iron, Copper etc are not suitable because they are soluble (in traces) and produce undesirable chemical; changes resulting in odd flavor and bad taste. Heavily tinned copper, galvanized iron and 18:8 chrome nickel steel are quite satisfactory but they are very costly.

Aluminum and aluminum alloys are the best under our conditions. They can be easily cleaned and sanitized.

The most important aspect in the production of high quality milk is the cleaning and sanitation of dairy utensils. The dairy should be cleaned immediately after used and dried. This will avoid the accumulation of milk residues which result in bad odour, accumulation of milk stones, crypts, rust etc. on the can. The following procedure should be followed.

The utensils should be rinsed with clean cold water 2-3 times till the rinsed water is almost colourless. Alkaline detergents are used if hand washing is practiced. The concentration should be adjusted so that it will not affect the hand. Detergent powder available are mixture containing sodium carbonate and other cleaning agents like sodium hexametaphosphate, Trisodium phosphate, Sodium metasilicate etc. These ingredients should be selected depending upon the metal of the utensils.

The detergents are dissolved in warm water (45°C) and poured into the can and it should be cleaned using brush or hand. All the portion of the can, inside as well as outside, should be thoroughly cleaned. After cleaning with the detergent the can should be rinsed with warm water 2-3 times to remove all residues of detergent and finally with clean cold water. Cleaned can should be stored in racks in inverted position to drain the washed water.

REPRODUCTION

Puberty

Early onset of puberty is an economic factor in cattle rearing. It differs in different breeds of cattle. On attainment of puberty, the healthy animal will come into oestrus at regular intervals. The interval between two heat periods is called oestrous cycle. Duration of oestrous cycle varies from 18-21 days. Duration of heat or sexual receptivity ranges from 18-25 hours in different breeds.

Onset of puberty

Breeds	Age	Weight
Indigenous cattle	20-24 months	80-100 kg
Jersey cross	15-18 months	160-180 kg
Holstein Friesian cross	15-18 months	180-210 kg

Detection of oestrus in cows can be made from external manifestation including behavioural signs of oestrus, mucous discharge and turgidity or tone of the uterus

The external manifestation include excitement, loss of appetite, bellowing, reduction in milk yield, licking other animals, mounting other animals, standing still to be mounted, frequent urination, swollen vulva and pink and moist vaginal mucous membrane. The mucous discharge will be ropy, elastic and clear. On rectal palpation, cervix will be relaxed; uterus will have good tone and will be turgid. One ovary will have mature graafian follicle.

Gestation period

Gestation length is 275-285 days. Slight variation exists between breeds. Holstein Friesian and Brown Swiss crosses have a longer gestation length than other crosses. If gestation length exceeds 300 days, parturition will have to be induced. Few pregnant animals may exhibit oestrous symptoms.

Pregnant cows should be given atleast 2 months dry period. Transfers the pregnant cows to calving pen at least 2-3 weeks before the expected date of calving.

Parturition

Signs of approaching parturition

Extreme relaxation of sacrosciatic ligament, enlargement of udder and engorgement of teat, vulval tumefaction and flow of liquefied cervical seal are some of the prominent signs of approaching parturition. Colostrum is first noticed in the udder 96 hours before calving which increases towards parturition.

Care of new born

1. Immediately after birth, if the foetal membrane is found covering the nose and muzzle of the calf, it should be removed and the mucus should be removed from the nostrils
2. The body of the calf should be wiped clean.
3. If foetal respiration is delayed, alternate pressing and releasing of the chest is indicated. Respiration can also be initiated by opening the mouth and tickling the tongue/nostrils. Still if the calf is not breathing the mucous may be sucked out and expired air may be blown-in through the nostrils to stimulate respiration
4. If the umbilical cord is not broken at the time of the birth of the calf, tie it at two places at 5 cm apart from the umbilicus and cut it in between the knots. The cut end should be disinfected with tincture iodine (30%)
5. Colostrums should be fed to the calf soon after birth or within two to three hours.
6. Cows normally come to heat 30-45 days after parturition and there after it cycles regularly. The cow can be inseminated in the heat period after 4 days of parturition.
7. Service period of 90 to 120 days is considered optimum. This will result in an intercalving period of 13 to 14 months.

