THE "HALF THE HERD" PRINCIPLE: A COMPREHENSIVE GUIDE TO BULL MANAGEMENT

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Importance of the Bull in Herd Productivity

A bull is commonly regarded as "half the herd" because it contributes about 50 per cent to the herd's genetic and reproductive outcome. In the era of artificial insemination, the selection of genetically superior bulls has become even more critical, as most genetic progress within a population is achieved through the use of well-chosen sires. The use of a bull with sub-optimal fertility can disturb the regular calving cycle of many cows leading to delayed calving, lowered herd productivity and substantial financial losses for dairy farmers. Hence, breeding bulls should exhibit high fertility, sound physical and reproductive health, freedom from diseases, and should be maintained under optimal conditions through adequate nutrition, proper care and effective management practices.

Selection of Breeding Bulls

1. Breeding bulls should belong to recognized descriptive breeds and must be officially registered with an authentic and competent organization.
2. Bulls should be genetically evaluated using approved sire evaluation methods and their breeding value must be estimated before selection.
3. Semen from young bulls descended from proven parents may be used, provided they demonstrate acceptable fertility, ideally achieving about 50 per cent conception rate at first insemination within 60–90 days.
4. Bulls should be selected at a young age as early identification of superior bulls allows their use for a longer productive breeding period.
5. Pedigree performance should be considered during selection, with special emphasis on the dam's performance, particularly high milk yield and desirable dairy conformation.
6. Bulls must be free from hereditary defects, contagious diseases and major infectious diseases such as IBR/IPV, FMD, tuberculosis, bovine brucellosis, Johne's disease, and trichomoniasis additionally, the area within a 100 km radius of the AI center should be free from infectious diseases.
7. Selected bulls should exhibit good physical and reproductive soundness, including a masculine appearance, broad chest, well-developed body frame, large and healthy scrotum, alert temperament and active carriage.
8. Final selection of breeding bulls should be based on the performance of their progeny, as progeny testing provides the most reliable assessment of true genetic merit and fertility.

Housing Management of Bulls

Breeding bulls should be housed in individual pens constructed with concrete flooring and covered sheds having corrugated asbestos roofing, preferably oriented along the east–west axis to minimize heat stress. Each bull should be maintained in a spacious individual pen of about 30′ × 10′ with an adequate loafing area, separated by solid partitions to prevent direct physical and visual contact with neighbouring bulls. A sufficiently long rope should be provided to allow near-free movement of the bull within the pen. Strict hygienic practices must be followed to maintain cleanliness in and around

the bull housing area to ensure good health and disease prevention.

Bull calves should be reared along with female stock for at least six months after birth, as this practice helps in achieving early sexual maturity. After six months of age, young bulls should be shifted to separate stalls and maintained in small groups of two to three animals to facilitate better care and management until they reach about one and a half years of age. Thereafter, they should be transferred to individual pens. Young bulls should also be allowed daily exercise by keeping them together in an enclosure for at least one to two hours, which supports proper physical development and overall well-being.

Housing of Young Bulls

1. Bull calves should be housed in individual pens to ensure proper care and close monitoring.
2. Each pen should be equipped with feeding troughs and water bowls which must be cleaned daily to maintain hygiene.
3. Calf pens should have adequate bedding material to provide comfort and the bedding should be replaced regularly.
4. Pens should be cleaned and disinfected routinely to prevent disease occurrence.
5. Male and female calves should be separated before nine months of age to avoid unwanted breeding and facilitate proper management.

Housing of Adult Bulls

- Adult bulls may be housed either individually in loose housing systems or in groups under confinement housing such as single- or double-row stanchion barns.
- Individual loose houses should provide both a covered area (about 12 m^2) and a large open loafing area (around 120 m^2), while in group housing each bull should be allotted a standing space of approximately 2.5 × 1.5 m. The covered portion should be half-walled to allow free air circulation, and the loafing area should be securely railed and preferably shaded with trees.
- Bull sheds must be equipped with feeding mangers, water troughs, and proper dung and urine drainage channels. All corners of mangers, troughs, drains, and walls should be rounded to prevent injuries and to enable easy cleaning.
- During summer, especially for exotic cattle and buffalo bulls, cooling facilities such as fans and sprinklers should be provided to reduce heat stress and maintain normal body temperature. Adequate supply of cool drinking water should also be ensured during hot weather.
- Strict hygiene and sanitation should be maintained through daily cleaning of mangers and water troughs, removal of leftover feed to prevent mould growth and regular cleaning of sheds using pressurized water. Disinfection should be carried out routinely to control flies, ticks and other ectoparasites.
- Footbaths should be installed at the entry of bull sheds, and slurry tanks should be constructed near the sheds for proper collection of dung, urine and wash water which can later be utilized for pasture fertilization.
- Chemical disinfectants such as formalin and phenyl should be avoided in bull sheds; instead, safer alternatives like glutaraldehyde-based disinfectants should be used. Weekly floor sterilization using 4 per cent sodium bicarbonate solution is recommended to maintain hygienic conditions.

Feeding Management of Mature Bulls

- Mature bulls should be offered concentrate feed at the rate of about 2.0-2.5 kg per bull daily, preferably during morning hours.
- Seasonal green fodders such as maize, cowpea, berseem, and jowar should be fed according to availability, while a mixture of maize and oat silage may be provided ad libitum during the lean period.
- Bulls must have unrestricted access to clean and fresh drinking water throughout the day.
- Adequate energy intake is essential, as restricted feeding can slow growth rate, delay testicular development, increase age at puberty, and reduce sperm production.

- Feeding management should aim to maintain bulls in optimum body condition, avoiding both excessive leanness and obesity.
- Both underfeeding and overfeeding adversely affect libido and overall reproductive performance of bulls.

Training of Breeding Bulls for Semen Collection

Bulls should be introduced to handling and basic training at an early age preferably around one year to ensure better control and ease of management in later life. Training aids such as a nose ring, halter and bull staff are commonly used for leading and safe handling of bulls and disbudding should be carried out at an early age to minimize injuries and facilitate easier management. The actual training for semen donation usually begins at about 18 months of age. During the initial stages, bulls are accustomed to routine pre-collection practices such as regular exercise in a bull exerciser, cleaning, tying and general preparation prior to semen collection. Gradually, they are familiarized with sexual preparation procedures including mounting on a dummy, false mounting, application of the artificial vagina and the presence of attendants and semen collectors. With consistent and systematic training bulls adapt to the collection environment and progressively begin to donate semen efficiently.

Herd Health, Sanitation and Miscellaneous care

A comprehensive herd health programme should be strictly implemented as per the farm schedule to ensure optimum health and reproductive efficiency of breeding bulls. This programme should include regular vaccination, routine deworming, systematic treatment and control of ecto- and endoparasites, and periodic screening for infectious and contagious diseases. Bull calves should be dehorned at an early age to facilitate safe handling and management. Bulls must be provided with regular exercise, including weekly exercise in a rotatory exerciser, preferably one day prior to semen collection, to maintain normal sexual behaviour and ensure good-quality semen production. Proper grooming practices such as regular brushing should be followed to keep the coat clean, along with routine preputial washing using sterile saline water. Periodic clipping of preputial hair is essential, maintaining an optimal length of about 2 cm, as excessively short or long hair may increase the risk of contamination. In cases of soiling, the area around the penis should be thoroughly cleaned using soap or a mild detergent. Regular hoof examination and timely trimming are necessary to maintain sound hoof health and prevent lameness.

Continuous health monitoring should be ensured through timely screening, treatment, and isolation of sick animals, along with effective control of flies and ticks. Prophylactic measures should be undertaken through a well-planned vaccination schedule against major infectious diseases such as Foot and Mouth Disease, Haemorrhagic Septicaemia, Black Quarter, and Anthrax. In addition, breeding bulls should be routinely tested for important reproductive and zoonotic diseases including tuberculosis, Johne's disease, brucellosis, IBR-IPV (Infectious Bovine Rhinotracheitis–Infectious Pustular Vulvovaginitis), and trichomoniasis to ensure biosecurity and the safe use of bulls in breeding programmes.

Care and Management of Young Bulls

After young bulls are selected based on the performance of their pedigree and collateral relatives, they should be reared under intensive management with the provision of a balanced growing ration to support optimal growth and development. When the bull calf reaches about 9-12 months of age a lightweight nose ring should be inserted which can later be replaced with a stronger and larger ring as the bull matures. Early training for handling is essential to ensure docile behaviour and ease of management. Young bulls should also be housed near the semen collection shed during collection periods so that they become

familiar with the environment which helps in gradual training and preparation for semen donation.

Care and Management of Mature Bulls

Mature bulls should be handled carefully using a nose ring to ensure effective control without causing injury. Both young and adult bulls should be provided regular exercise at least two to three times a week to prevent excessive fat deposition, maintain physical fitness and support normal reproductive performance. Regular exercise also helps in preventing overgrown hooves and reduces the risk of swollen or inflamed joints. Body hair should be clipped routinely using scissors maintaining a length of about one centimetre to ensure cleanliness and reduce the chances of skin and reproductive tract contamination.

Nose Ringing and Control of Bulls

When a male calf reaches about 9-10 months of age, a lightweight nose ring measuring approximately 1.5-2 inches in diameter should be inserted to facilitate handling. The ring should be made of a non-rusting material such as copper or aluminium. As the bull matures, this ring should be replaced with a stronger and larger one of about 3 inches in diameter. Bulls should not be put into regular breeding or semen service before 15–16 months of age, and until this age, the number of services should be restricted to a maximum of two per week to avoid overuse. Young bulls should be brought regularly to the collection area to familiarize them with the environment and to provide training for semen donation. In adult bulls, it is common practice to limit semen collection to one or two times per week. Although frequent ejaculation may reduce semen volume and sperm concentration, collection frequencies of up to about 14 times per month generally do not adversely affect fertility in most bulls.

Maintenance of Sexual Libido in Breeding Bulls

Sexual excitement plays an important role in improving both the quantity and quality of semen. Libido in bulls is influenced by several factors including age, nutrition, level of exercise, overuse, unsuitable collection facilities, faulty feeding practices, obesity, inherent defects and chronic problems of the legs, back or genital organs. Sexual behaviour is markedly reduced during periods of physiological stress caused by diseases, climatic extremes or physical injuries and nutritional deficiencies such as low vitamin A or phosphorus further suppress libido. Certain conditioned stimuli, such as familiar sounds or routines associated with semen collection which helps in enhancing sexual response while management practices like false mounting or changing the teaser animal can increase ejaculatory stimulus.

Extreme climatic conditions particularly peak summer and winter adversely affect libido and semen quality. During summer, bulls should be housed in cool, well-ventilated, dry sheds with provisions for cold-water showering and protection from direct and reflected heat. In winter, soft bedding is essential to prevent cold stress and frostbite especially in northern regions. Buffalo bulls require additional protection including warm bedding during winter and showers or wallowing during summer to maintain optimal semen production. Semen volume generally ranges from 2-5 ml per ejaculate in young bulls and 5-15 ml in mature bulls with normal semen containing about 1-3 billion sperm per millilitre over 60 per cent of which should be live and actively motile. Semen quality can be assessed using various microscopic, biochemical and computer-assisted evaluation techniques.

Factors Affecting Sperm Output from Breeding Bulls

Sperm output from a bull is influenced by the frequency of ejaculation and the production targets set for the semen station.

- The total number of breeding bulls available in the herd also affects overall sperm output.
- Availability of adequate laboratory facilities, trained manpower, and storage capacity plays a key role in determining semen production efficiency.
- Market demand for semen largely governs the intensity and scheduling of semen collection.
- The level of sexual preparation provided to the bull significantly affects sperm output, including the use of false mounts, active restraint of the bull, or a combination of both to enhance sexual stimulation.

Measures to Maximise Sperm Output from Breeding Bulls

- Adoption of a fixed and well-planned semen collection schedule.
- Selection of suitable and responsive teaser animals.
- Ensuring adequate sexual stimulation and proper sexual preparation of bulls prior to collection.
- Use of sound and standardized semen collection techniques to minimize losses and ensure quality.

Semen Collection Regimes

1. **Single Ejaculation Regime:** In this system, the bull is presented for semen collection three times per week and only one ejaculate is collected on each collection day.
2. **Double Ejaculation Regime:** In this system, the bull is brought for collection twice pr week and two ejaculates are collected on each collection day.

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