

Advanced Livestock Breeding Techniques and their Importance

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Introduction

India is an agrarian country. The majority of the population of India is engaged in agriculture and allied sectors for their livelihood. Agriculture and allied sectors play important roles in the nation's economy also. Livestock is an integrated part of the agriculture sector, which makes them more secure against the uncertainty in agriculture. The livestock industry has grown significantly in recent years, and managing cattle breeding operations is now a crucial aspect of the expanding sector. Breeding policy helps in the increase the production of livestock. These improved livestock breeding techniques encompass a range of practices, including artificial insemination, sex-sorted semen, embryo transfer, and in-vitro fertilization.

Artificial Insemination (AI)

Artificial insemination is the technique in which semen with living sperm is collected from the male and introduced into the female reproductive tract at the proper time with the help of instruments.

Advantages of AI

- ✓ There is no need of the maintenance of a breeding bull for a herd; hence the cost of maintenance of a breeding bull is saved.
- ✓ It prevents the spread of certain diseases and sterility due to genital diseases. eg: contagious abortion, vibriosis.
- ✓ Regular examination of semen after collection and frequent checking on fertility make early detection of inferior males and better breeding efficiency is ensured.
- ✓ The progeny testing can be done at an early age.

- ✓ The semen of a desired sire can be used even after the death of that particular sire.
- ✓ The semen collected can be taken to the urban areas or rural areas for insemination.
- ✓ It makes possible the mating of animals with great differences in size without injury to either of the animals.
- ✓ It is helpful to inseminate the animals that refuse to stand or accept the male at the time of oestrus.
- ✓ It helps in maintaining accurate breeding and calving records.
- ✓ It increases the rate of conception.
- ✓ Old, heavy, and injured sires can be used.

Disadvantages of AI

- ✓ Requires well-trained operations and special equipment.
- ✓ Requires more time than natural services.
- ✓ Necessitates the knowledge of the structure and function of reproduction on the part of the operator.
- ✓ Improper cleaning of instruments and sanitary conditions may lead to lower fertility.
- ✓ If the bull is not properly tested, the spreading of genital diseases will be increased.
- ✓ The market for bulls will be reduced, while that for superior bulls is increased.

Sex-sorted semen

Semen sexing or sperm sexing deals with the separation/sorting of X and Y-chromosome-bearing spermatozoa present in the semen before insemination. Semen having either X or Y bearing sperm to produce progenies of a desired sex i.e.

female or male is known as sexed semen. The technologies presently available are capable of producing sexed semen with 80-90 percent accuracy. By adopting this technology dairy farmers can produce progenies of desired sex and abate the menace of unwanted stray male animals. The full potential of this technology can be appreciated if combined with IVF for the production of sexed embryos as oocytes from multiple donors can be fertilized using single-sexed semen doses.

Advantages of Sex-sorted semen

- ✓ Determination of sex at the earliest stage can reduce the management cost through selective management of superior bulls or cows.
- ✓ Calves of desired sex can be produced.
- ✓ Dystocia can be reduced by preventing the production of male calves.
- ✓ It lowers the cost of progeny testing programs and embryo transfer and enhances the value of genetic makers.
- ✓ This also enables rapid herd expansion without the risk of introducing diseases that occur with purchased animals.

Disadvantages of Sex-sorted semen

- ✓ The main disadvantage is quality of semen is lowered in terms of motility, sperm count, and sperm viability.
- ✓ The conception rate is reduced.

Embryo Transfer Technology (ETT)

Also called Multiple Ovulation and Embryo Transfer (MOET) Technology, is used to increase the reproduction rate of superior female dairy animals. Normally, one can get one calf from superior female dairy animals in a year. But by using MOET technology, one can get 10-20 calves in a year from a cow/buffalo. An elite cow/buffalo is administered hormones with FSH-like activity to induce super-ovulation. Under the influence of the hormone, the female produces several eggs instead of one egg produced normally. The super-ovulated female is inseminated 2-3 times at 12-hour intervals during oestrus and then its uterus is flushed with a medium 7th-day post insemination to retrieve the developing embryos. Embryos are collected along with flushing medium in a specialized filter and the quality of the embryo is assessed under the microscope. Good quality embryos are either frozen and preserved for transfer in the future or transferred fresh into

recipient animals approximately seven days post-heat date. Thus, from an elite dairy animal several calves can be produced in a year.

Advantages of ETT

- ✓ Increase the number of offspring sired from superior females.
- ✓ Results in faster genetic progress.
- ✓ Increase the frequency of desired mating, capitalizing on the excellence of a mating.
- ✓ Obtain offspring from old or injured animals incapable of breeding or calving naturally.
- ✓ Increased farm income through embryo sales
- ✓ Exportation and/or importation of embryos are easier than with live animals.

Disadvantages of ETT

- ✓ Can be cost-prohibitive and success rates are less than AI.
- ✓ Cost and maintenance of recipient females.
- ✓ Requires a technician with the skills to flush embryos from the reproductive tract.
- ✓ Possible spread of disease through the recipient

In-Vitro Fertilization (IVF)

A procedure in which eggs(oocytes) are collected from a cattle's ovary and then fertilized with sperm outside the body (in the laboratory) to form embryos. The embryos are grown in the laboratory for several days and then either transferred into recipient cattle or cryopreserved for future use. Also called as Ovum Pick-up and In Vitro Embryo Production (OPU-IVEP) Technology, is an advanced reproductive technology for the multiplication of superior female germplasm at a much faster rate. Using MOET technology one can get 10-20 calves from superior female dairy animals in a year. But by using OPU-IVEP technology, one can get 20-40 calves in a year from a cow/buffalo.

Advantages of in vitro fertilization

- ✓ IVF allows for the selection of superior genetic traits by using eggs from high-quality cows and sperm from top-performing bulls, thereby enhancing the genetic pool of the herd.
- ✓ By producing multiple offspring from genetically superior animals within a short period, genetic improvement is accelerated compared to traditional breeding methods.

- ✓ IVF can be performed on cows that have reproductive issues or are at the end of their productive lifespan, thus extending their contribution to the herd's genetics.
- ✓ As IVF involves the handling of eggs and sperm in a controlled environment, it reduces the risk of transmitting diseases that could occur with natural mating or artificial insemination.

Disadvantages of in vitro fertilization

- ✓ The process of IVF is expensive.
- ✓ IVF requires specialized skills and expertise, including the handling of gametes and embryos, which may not be readily available in all regions or facilities.
- ✓ The success rate of IVF can be variable, with a proportion of embryos failing to develop properly or not surviving the transfer process.
- ✓ The procedures involved in IVF, including hormone treatments and invasive egg retrieval processes, raise concerns about the welfare and stress imposed on the animals.