MATHEWS

Editorial Article

Mathews Journal of Veterinary Science

Heifers: A Replacement Stock in Dairy Farms

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ABSTRACT

Replacement heifers play a crucial role in determining the productivity, profitability, and genetic progress of dairy herds. Optimal management aims for first calving at 22–24 months, which requires timely attainment of puberty, adequate nutrition, and proper reproductive management. Hormonal regulation involving leptin, kisspeptin, and gonadotropins governs the onset of puberty and estrous cyclicity. Body weight, rather than age alone, is a key determinant for breeding readiness, with heifers ideally bred at 55–60% of mature weight. Efficient heifer management integrates balanced nutrition, accurate estrus detection, timely breeding (preferably using artificial insemination), and proper post-breeding care. However, challenges such as delayed puberty, poor heat detection, low conception rates, dystocia, and resource limitations can hinder performance. Technological interventions like estrus synchronization and government initiatives such as the Holistic Agriculture Development Program (HADP) and Satellite Heifer Rearing Units in Jammu and Kashmir offer promising solutions. Overall, well-managed replacement heifer systems enhance herd sustainability, improve genetic quality, and support economic growth in the dairy sector.

Keywords: Heifers, Dairy Farm, Cow.

INTRODUCTION

Replacement heifers are the cornerstone of any dairy farm. They are the future of your herd and have the most direct long-term impact on the profitability and sustainability of your operation. The cows you cull must be replaced with new animals, which is where replacement heifers come in. A replacement heifer is a young female cow explicitly raised to replace older cows in your herd. She is selected based on her genetics, health, and potential for productivity to improve or maintain herd quality. Replacement heifers are the future milking cows of a dairy herd, so their management decides both herd productivity and genetic progress. Ideally, first-calving age in cattle is 22–24 months. Thus, heifers must reach puberty and conceive by 13–15 months [1]. The stimuli to higher centers in the brain, responsible for puberty, require a strong nutritional support in animals. The leptin hormone acting as metabolic regulator while kisspeptin as gate keeper in animal reproduction and puberty, stimulate GnRH pulsatile frequency and amplitude which triggers gonadotropin tonic and surge release. The kisspeptin neurons stimulate GnRH neurons in the hypothalamus which activate pituitary to release gonadotropins (FSH & LH), responsible for growth of ovarian

Vol No: 10, Issue: 02

Received Date: January 30, 2026

Published Date: April 03, 2026

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Citation: Bhat GR. (2026). Heifers: A Replacement Stock in Dairy Farms. Mathews J Vet Sci. 10(2):107.

follicles, final maturation and ovulation of dominant follicle which begins cyclicity and estrous behavior in animals [2]. The first cycle often being anovulatory and less overt estrous signs, owing to absence of progesterone priming from developing luteal structure. The fertile ovum released out from first ovulating follicle indicates sexual maturity which commences after few months of attaining puberty in heifers. An LH surge triggers ovulation, and progesterone from the corpus luteum maintains the luteal phase and pregnancy if conception occurs [3].

Late-calving heifers show subsequent delay in milk production, while early-calving heifers face health and performance problems. So reproductive management of heifers is central to dairy profitability, needing comprehensive understanding of heifer reproductive physiology, best management practices, challenges, and strategies [4]. Body weight gain matters more than age in attaining puberty. Heifers produce best when they calve at ~85% of mature weight (for Holsteins, roughly 545–570 kg post-calving). Undersized heifers give less milk, while over-fat heifers have more metabolic issues. This is why breeding is recommended at 55–60% of mature weight, not just at a fixed age [5].

Delaying age at first calving is expensive. Each extra month beyond 24 months adds about five thousand in rearing cost, and for this a farm must maintain more heifers to keep herd size steady [6]. Improving reproductive management in such animals can reduce the burden and can even produce surplus heifers for sale or expansion. The poor heat detection and nutritional deficiencies can drag performance down. Studies show that visual observation alone can miss over one-third of estruses, making structured detection or synchronization important. For obtaining results in a farm, heifers bred on time and at the right weight enter the milking herd earlier, give more milk in their first lactation, and stay productive longer [7]. Pubertal heifers show a regular 21-day estrous cycle (range 18–24 days). Estrus lasts 12–18 hours, with heifers showing stronger and longer heat signs than cows. Many heats occur at night, and ovulation happens ~24–32 hours after the start of standing heat.

In nutshell, an efficient system of replacement heifer stock production requires coordinated management of nutrition, heat detection, breeding, and post-breeding care.

Nutrition and Growth

Nutrients and energy are essential to support both maintenance and growth in calves and heifers, and clear associations have been demonstrated between body weight gain, age at puberty, and subsequent reproductive performance in these animals. Heifers must reach 60–65% of mature weight by breeding age (e.g., Holsteins bred at 380–420 kg). Consistent growth (about 0.7–0.8 kg/day) and balanced rations prevent undergrowth or over-fattening [8]. Farms track body weight/height and adjust diets when needed. Additives like monensin improve feed efficiency and help earlier puberty [9].

Estrus Detection and Synchronization

Heat detection is essential but easily missed. Visual signs include mounting, standing heat, restlessness, and mucus discharge. Tools like tail paint, activity monitors, and mounting patches improve detection [10]. Estrous synchronization refers to the deliberate control of the bovine estrous cycle so that most animals exhibit standing estrus within a defined, short time frame. This approach is highly effective in increasing the number of animals bred early in the breeding season. For a synchronization protocol to be effective, it must coordinate follicular wave development and/or induce luteal regression, ensuring that the majority of animals come into standing estrus at the onset of the breeding period. Synchronization using $PGF_2\alpha$, or protocols involving GnRH, progesterone (CIDR), and $PGF_2\alpha$, can group heats and allow timed AI, improving breeding efficiency [11].

BREEDING METHOD

During the breeding season, replacement heifers require management practices distinct from those of mature cows. Typically, heifers should be bred earlier than the main cow herd, providing them with additional time (at least three weeks) after their first calving to recover before entering the next breeding cycle with mature cows. Heifers that conceive early in their first breeding season tend to wean a greater number of calves, and heavier calves, over their productive lifetime [12]. Artificial insemination is preferred for better genetics and effective management. Heifers respond well to AI, particularly when bred using sexed semen (although lower conception rate but useful for producing replacement females).

Post-Breeding supervision

Pregnancy is confirmed by 30–60 days. During gestation, heifers must keep growing without becoming over-conditioned. Close-up groups 4–8 weeks before calving allow diet transition and reduce stress. Gestation is divided into three trimesters, with the final trimester being particularly critical as it is the stage when most fetal growth and colostrum production take place. However, the earlier trimesters are also essential, as recent studies show that key processes such as organ differentiation and development occur during early pregnancy. Therefore, replacement heifers should be provided with adequate nutrition and maintained at an appropriate growth rate throughout the

entire gestation period. Because heifers have higher dystocia risk, calving supervision and clean pens are critical. After calving, first-calf heifers need monitoring for injuries and metabolic problems as they adjust to lactation [13].

Challenges in Heifer Replacement stock generation

Delayed Puberty and Anestrus

Poor nutrition, mineral deficiencies, parasites, or overall stunted growth can delay puberty beyond 12–15 months. Underweight heifers may not cycle at all, while very thin or over-fat animals can show weak, irregular, or absent heats. Maintaining proper growth and body condition is a major challenge, especially on small or resource-limited farms.

Estrus Detection Problems

Heifers kept in remote paddocks or poorly observed areas often show heats that go unnoticed. Heat signs can be subtle or short, and casual observation misses a large portion of estruses. Limited labor or lack of detection aids (tail paint, activity monitors) means many heifers are bred late simply because heats are missed.

Breeding and Conception Issues

Even after detecting heat, conception may fail. Sexed semen lowers conception further, mistimed AI reduces success, and subfertile bulls in natural service systems can delay pregnancies unnoticed. Breeding too-small heifers leads to early embryonic loss. Infectious diseases like brucellosis, IBR, BVD, and leptospirosis can also cause abortion, and vaccination or biosecurity may be inconsistent on small farms [14].

Difficult Calving

Heifers have higher dystocia risk due to a narrow pelvis and large relative calf size. Poor sire selection, undergrown heifers, or over-conditioned animals increase the risk. Farms lacking round the clock monitoring may lose calves or the heifer. Dystocia also delays future fertility.

Resource and Knowledge Gaps

Small farms often lack AI access, skilled personnel, weighing facilities, and record-keeping. Decisions may be based on convenience rather than physiological readiness, leading to very late calving ages and wasted inputs.

Effective Estrus Detection and Synchronization

Daily checks with tail paint, teaser animals, or electronic activity monitors improve heat detection. For farms where observation is weak, synchronization protocols ($PGF_2\alpha$, CIDR + GnRH + $PGF_2\alpha$) allow timed AI with predictable success. These programs reduce missed heats, tighten breeding windows, and improve overall conception efficiency.

Health and Biosecurity

Vaccinate heifers before breeding (IBR, BVD, leptospirosis, brucellosis where required). Deworm regularly and monitor body condition. Conduct pregnancy diagnosis at 30–60 days and follow-up checks when possible. Record-keeping helps identify open or problem heifers early, preventing long delays and wasted feed.

HADP and Satellite Heifer Rearing Units

Quality dairy animals are lacking in Jammu and Kashmir. Based on the understandings, current sanctions in union territory of J&K, through Holistic Agriculture Development Program (HADP) and Satellite Heifer Rearing Units, aim to improve heifer development [15]. To build a self-reliant dairy sector, the government launched the HADP in 2022–23, which includes a major dairy development component focused on improving heifer rearing.

A key initiative under HADP is the creation of Satellite Heifer Rearing Units. These are decentralized, farmer-led mini heifer farms supported by subsidies and technical guidance. Small dairy farmers who cannot properly grow their calves can send them to these units, ensuring better nutrition, health care, and timely breeding.

In conclusion, establishment of heifer stock or units is important for dairy beneficiaries- entrepreneurs, as it could help to Improve herd genetic quality, by rearing calves from high-yielding local cows and using superior AI bulls or sexed semen. This has a potential to reduce the burden on small farmers, who often lack space, feed, or expertise to raise heifers themselves. It can ensure sustainable dairy farming and employment generation.

REFERENCES

1. Fantuz F, Fatica A, Salimei E, Marcantoni F, Todini L. (2024). Nutrition, Growth, and Age at Puberty in Heifers. Animals (Basel). 14(19):2801.
2. Scott CJ, Rose JL, Gunn AJ, McGrath BM. (2019). Kisspeptin and the regulation of the reproductive axis in domestic animals. J Endocrinol. 240(1):R1-R16.
3. Arroyo A, Kim B, Yeh J. (2020). Luteinizing Hormone Action in Human Oocyte Maturation and Quality: Signaling Pathways, Regulation, and Clinical Impact. Reprod Sci. 27(6):1223-1252.
4. Eastham NT, Coates A, Cripps P, Richardson H, Smith R, Oikonomou G. (2018). Associations between age at first calving and subsequent lactation performance in UK Holstein and Holstein-Friesian dairy cows. PLoS One. 13(6):e0197764.

5. Funston RN, Martin JL, Larson DM, Roberts AJ. (2012). Physiology and Endocrinology Symposium: Nutritional aspects of developing replacement heifers. J Anim Sci. 90(4):1166-1171.

6. Penev T, Vasilev N, Stankov K, Mitev J, Kirov V. (2014). Impact of heifers age at first breeding and first calving on some parameters of economic effectiveness at dairy cattle farms. Int J Curr Microbiol App Sci. 3(11):772-778.

7. Gaude I, Kempf A, Strüve KD, Hoedemaker M. (2021). Estrus signs in Holstein Friesian dairy cows and their reliability for ovulation detection in the context of visual estrus detection. Livestock Science. 245:104449.

8. Bailey E, Thomas J. (2021). Nutritional management of developing heifers: intensive versus extension systems. University of Missouri Extension, USA.

9. Thrift TA, Hersom MJ, Arthington JD. (2024). Application of Ionophores in Cattle Diets (Publication AN285). University of Florida IFAS Extension, USA.

10. Santos CAD, Landim NMD, Araújo HXD, Paim TDP. (2022). Automated systems for estrous and calving detection in dairy cattle. Agri Engineering. 4(2):475-482.

11. Fesseha H, Degu T. (2020). Estrus detection, Estrus synchronization in cattle and it's economic importance. Int J Vet Res. 3(1):1001.

12. Cappellozza BI. (2015). Nutritional strategies to improve the reproductive performance of beef females.

13. Wojewodzic D, Gołębiewski M, Grodkowski G. (2025). Methods of Observing the Signs of Approaching Calving in Cows—A Review. Animals. 15(7):1018.

14. Reichel MP, Wahl LC, Hill FI. (2018). Review of Diagnostic Procedures and Approaches to Infectious Causes of Reproductive Failures of Cattle in Australia and New Zealand. Front Vet Sci. 5:222.

15. Agriculture Production Department J&K. (2023). Dairy Development Project under Holistic Agriculture Development Program – Project Guidelines. Government of Jammu & Kashmir, India.