Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 05, Issue: 04 (JULY-AUG, 2025)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Revolutionizing the Dairy Sector Using IoT Based Technologies

*Anees Ahmad Shah, Rameez Ali Dar, Syed Mohmad Shah, Manzoor Ahmad Yatoo, Gowhar Gull Sheikh, Arif Ahmad Pandit and Syed Ansarul Haq
Mountain Livestock Research Institute, Manasbal, SKUAST-K, India
*Corresponding Author's email: aneesvet5@gmail.com

Dairy farming is a cornerstone of rural economies globally, particularly in countries like India. As per a latest report (2023-2024) of department of Animal husbandry, dairying and fisheries Govt. of India, the country ranks first in world with an annual milk production of 239.2 million metric tonnes. Dairy sector in India contributes more than 26% to agricultural GDP in the country (Chandrashekhar, 2025). The sector assumes further significance in terms of its potential to generate huge quantum of employment and contribute significantly to food security. However, traditional dairy farming practices are often characterized by low productivity, disease vulnerability, and inefficiencies in management. To counter these challenges effectively, the data based revolution, driven by IoT and Artificial Intelligence (AI), offers a game-changing opportunity to modernize the dairy sector. Many such technologies have been developed and are in operation in advanced dairy farming systems and are taking the sector to next level. Since the dairy farmers remain the very basic pillar of dairy development, no development in sector can succeed unless the later are benefitted. This article present a brief review of the concept of IoT in dairy sector, benefits and bottlenecks.

The concept of IoT in context to dairying

The Internet of Things (IoT) represents a network of interconnected devices that collect and exchange data through the internet. In context to dairying, the data pertains to various aspects of production like breeding, nutrition, milking etc. Such data, when analyzed through software/machine learning tools provides actionable alerts to the farmers through computers or even mobile applications. Some of the most commonly used IoT based devices/technologies in dairy farming are:

- **Sensors**: Many types of sensors like activity monitors are available for wearing animals in the form of collars, ear tags, leg bands etc. Such sensors collect real time data pertaining to various animal parameters like activity, rumination etc.
- **Environmental sensors: Data loggers capable of recording** for temperature, humidity and ammonia level inside animal shelters can be helpful and pave way for timely adjustments to improve animal comfort.
- **Automated milking systems, Smart feeders and drinkers:** These technologies are available and go beyond traditional automation systems by incorporating data driven programmable systems in all these operations.
- **Cloud based platforms:** Such platforms function in collaboration with various sensing modules for anywhere access to the data generated

Benefits of using IoT based technologies in dairy farming

Animal health monitoring: Real time monitoring of animal's basic parameters like rumination, temperature, activity can provide an insight into overall animal health (Dineva and Atanasova, 2023). IoT-enabled sensors monitor such vital parameters and the real time

data so generated is sent to cloud based storage systems returned back to the farmer in the form of actionable alerts. The system use machine learning algorithms to sense any deviation in the recorded parameters suggestive of changes in animal health.

Early heat/calving detection systems: Timely heat detection in dairy animals is the foundation of efficient breeding. Late detection, missed heat may compromise the success of breeding, increase calving interval and reduce profitability. Similarly timely detection of expected calving time can alert the farmer in advance so as to remain ready for timely interventions at the time of calving in advance, if required. Timely detection of calving time is particularly important in primiparous cows as there are more chances of complications and trauma to cows as well as calf (Johansen & Berger, 2003).

Automation and precision in animal milking: Use of IoT based technologies have the potential of optimizing the milking process in comparison to conventional systems. IoT based technologies when integrated with Automatic milking systems (AMS) facilitate monitoring of AMS and offer automatic, fast and efficient means of assistance in the event of machine failure (Tangorra *et al.*, 2024).

Automation and precision in animal feeding: Automatic feeding systems are being used in dairy farming since long. Use of IoT based technologies in these feeding systems can further improve the efficiency of feeding system. IoT-based smart feeders measure intake per animal and optimize rations. Water meters track individual cow consumption and alert for any anomalies.

Environment and Barn Monitoring: Various sensors fitted within barns provide real time data on various parameters like ambient temperature, relative humidity, ammonia level. These, when integrated into machine learning tools can provide a helpful insight into timely assessment of animal comfort level and need for any interventions.

Bottlenecks in adoption of IoT based technologies in dairy farming

Though the IoT based technologies have the capacity to revolutionize dairy sector, a multitude of factors may pose significant challenges towards adopting such technologies from farmers point of view:

- **Poor knowledge and technical know-how:** Though the educated farmers may find it easy to adopt such technologies, a large chunk of illiterate farmers may not be even aware about the benefits.
- **Confusion about which technology to use:** While a large number of technologies are available, each and every technology may not be feasible/required for every farm. A dairy farm with very efficient breeding management may not benefit much from investing in a technology meant for optimizing breeding efficiency but may benefit more in investing in technologies wherein the existing system needs more improvement.
- **Cost factor:** Certain technologies may be too costly for a farmer to adopt**.**
- **Computer illiteracy:** Most of the IoT based technologies require some level of computer knowledge on part of the farmer. An average illiterate farmer may be reluctant to invest because of lack of such computer knowledge.
- **Availability:** While a farmer may be aware about and ready to invest in an IoT based technology, the doorstep availability may be bottleneck.
- **Technical support and maintenance:** Every technology needs regular maintenance. Such facilities may not be available everywhere which may hamper the adoption of such technologies.

Conclusion

IoT based technologies have the potential to revolutionize dairy sector as these ensure real time animal monitoring and data based management. However, many challenges exist towards adoption of such technologies. Extension based farmer awareness programmes, doorstep availability of technologies, better cash credit/subsidy options etc. are some of the steps which can improve adoption rates.

References

1. Neethirajan, S. 2017. Recent advances in wearable sensors for animal health management. *Sensors and Biosensors Research*, 12, 15-29.
2. Tangorra, F. M., Buoio, E., Calcante, A., Bassi, A., & Costa, A. 2024. *Internet of Things (IoT): Sensors application in dairy cattle farming. Animals, 14*(21), 3071
3. Chandrashekhar, R. 2025. Trends and performance of India's dairy sector: Opportunities and challenges. *Indian Journal of Agricultural Economics*, 80(1), 15–27
4. Dineva, K; Atanasova, T. 2023. Health status classification for cows using machine learning and data management on AWS cloud. *Animals*.13, 3254
5. Johanson, J.M and Berger, P.J. 2003. Birth weight as a predictor of calving ease and perinatal mortality in Holstein cattle. *Journal of Dairy Science.* **86**: 3745–3755