



AI Keeps an Eye on the ‘Cattle of the Hills’ — and It Could Change How Farmers Watch Their Herds

At an ICAR farm in Nagaland, cameras and artificial intelligence are learning to read the everyday behaviour of Mithun. The technology could eventually help farmers with breeding, animal health and round-the-clock monitoring.

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In a significant step towards integrating artificial intelligence with livestock research and management, researchers at the ICAR-National Research Centre on Mithun (ICAR-NRC on Mithun), Nagaland, have developed an artificial intelligence-based system for real-time detection and tracking of Mithun behaviour in a natural farm environment. The research has the potential to support continuous monitoring of animal behaviour and provide valuable inputs for animal health, welfare, breeding and reproductive management.

The study, recently published in Engineering Research Express, presents an AI-based, real-time and non-contact framework for the automatic detection and tracking of Mithun (*Bos frontalis*) behaviour. Mithun, popularly known as the “Cattle of the Hills”, holds significant social, cultural and economic importance for tribal communities across Northeast India and contributes to livelihoods and food security in the region.

Monitoring livestock behaviour is an important component of animal management, as changes in feeding, standing, lying and reproductive behaviour can provide early indications regarding an animal's health, comfort, nutrition and physiological condition. However, conventional monitoring depends largely on manual observation, which is labour-intensive and difficult to sustain continuously, particularly during night hours.

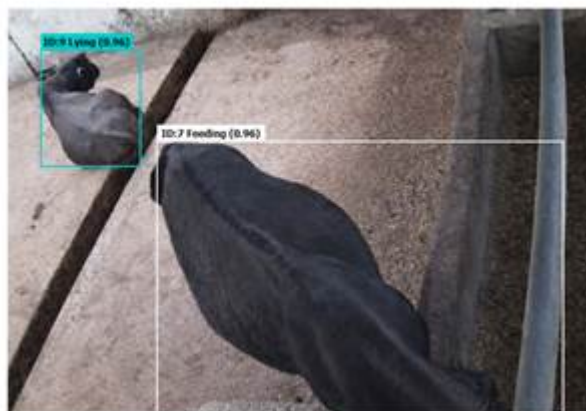
To address this challenge, researchers deployed 12 high-definition CCTV cameras across two sheds at the ICAR-NRC on Mithun farm in Nagaland. The cameras provided continuous day-and-night surveillance, including infrared coverage. Using the recorded footage, the research team developed a dataset comprising 3,000 manually annotated images representing four key Mithun behaviours—feeding, standing, lying and mounting.

The AI framework combines the YOLOv8n model for behaviour detection with DeepSORT technology for tracking individual animals across video frames and assigning persistent identities. The system is capable of identifying the behaviour being performed by an animal while simultaneously tracking individual Mithun in real time.

The YOLOv8n model achieved a mean average precision of 99.5 per cent at mAP@0.5, with a recall of 99.6 per cent. The system recorded a processing speed of approximately 31 frames per second on an NVIDIA RTX 3060 graphics processing unit, demonstrating its capability for real-time application. The

framework was also tested under challenging farm conditions, including partial occlusion, background clutter, uneven and wet ground, shadows, motion blur and nighttime infrared footage.

The technology has significant potential for improving livestock monitoring and management. Changes in feeding, standing and lying patterns can provide useful insights into an animal's health, comfort and physiological condition, while mounting behaviour can support reproductive and oestrus management. Continuous automated monitoring could enable farmers and livestock managers to access behavioural information without requiring constant physical observation of animals throughout the day and night.



Two behaviours, tracked with unique IDs — lying and feeding detected in one frame at 96% confidence.



Night vision: mounting behaviour caught in infrared at 97% confidence.

The researchers noted that the system has currently been evaluated at a single farm and requires further validation across different farms, geographical regions, seasons, stocking densities and camera arrangements. The present study focuses on four behaviours, while severe occlusion can affect detection and tracking performance. Further research is also required for quantitative evaluation of identity tracking using standard tracking metrics.

The researchers envisage expanding the AI framework to identify additional behaviours such as aggression, grooming and disease-related inactivity. Future work may also explore temporal AI models, edge-device deployment and the development of larger datasets covering different farms and seasons.

The study demonstrates the potential of combining livestock science with artificial intelligence and computer vision to develop technology-enabled solutions for livestock management. Such innovations could strengthen precision livestock farming and support farmers through continuous, data-driven monitoring of animal behaviour.

The research was published in Engineering Research Express, Volume 8 (2026), Article 175213. The study was conducted by researchers from ICAR-NRC on Mithun, Nagaland, in collaboration with NIT Nagaland, Nagaland University and CHRIST (Deemed to be University).

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