Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 06, Issue: 02 (MAR-APR, 2026)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

GPS Technology in Indian Livestock and Agriculture: A Game Changer for Farmers

*Sanchit Pal Singh and Shruti Gupta
ICAR-IVRI, Izatnagar, India
*Corresponding Author's email: sanchit000singhdr098@gmail.com

Agriculture and livestock rearing form the backbone of India's rural economy, yet farmers continue to face persistent challenges such as disease outbreaks, animal theft, poor resource management, and lack of real time information. The Global Positioning System (GPS) is a satellite-based navigation technology, has emerged as a transformative tool with wide ranging applications in this sector. This article explores the role of GPS in Indian livestock management and broader agricultural practices, encompassing animal tracking, disease surveillance, pasture monitoring, smart dairy operations, and disaster management. Drawing on both field applications and published research, the article demonstrates that GPS, often integrated with Geographic Information Systems (GIS) and Remote Sensing (RS) that enables precision farming, reduces losses, and strengthens veterinary surveillance. While challenges such as cost, infrastructure gaps, and inadequate training persist, the expanding adoption of GPS in India signals a promising future for technology-driven agriculture.

Keywords: GPS, GIS, Disaster-management, Remote-sensing, Smart Dairy.

Introduction

India is home to the world's largest livestock population contributing significantly to rural livelihoods, food security, and the national economy. Yet, livestock farmers particularly smallholders, struggle with animal theft, disease outbreaks, grazing mismanagement, and limited access to timely veterinary care. In crop farming too, inefficiencies in asset tracking, route planning, and resource allocation continue to drain productivity and profits.

Global Positioning System (GPS) is a satellite-based navigation technology that delivers accurate, real time information on the location, velocity, and movement of objects anywhere on Earth, at any time and in any weather (Narayanan, 2012). Originally developed by the U.S. Department of Defense, it was later made available for civilian use globally. Today, GPS does not stand alone, it functions as a key component of Geoinformatics, an integrated technology framework that also includes Geographic Information Systems (GIS) and Remote Sensing (RS) (Bhabhor and Vyas, 2018). Together, these tools are reshaping how India's farmers manage their animals, land, and resources.

This article highlights the practical applications of GPS in Indian agriculture and livestock management, discusses how this technology is helping farmers become smarter and more efficient, and examines the challenges that still need to be addressed for wider adoption.

GPS and Livestock Tracking in India

Animal Monitoring and Anti-Theft

One of the most immediate and visible applications of GPS in Indian livestock farming is animal tracking. Cattle, buffaloes, sheep, and goats, especially in semi-arid and forested regions often roam over vast areas, making them vulnerable to theft and straying. GPS-enabled collars allow farmers to monitor the real time location of their animals remotely, receive instant alerts when animals move beyond a defined area, and recover strayed or stolen

livestock quickly (The farming industry faces many challenges, 2023). Through geofencing the creation of virtual geographic boundaries on a digital map, farmers can set safe zones for their herds. If an animal crosses the boundary, the GPS system sends an automatic alert to the farmer's mobile device. This is particularly valuable in India's tribal and rural belts, where large grazing areas make physical supervision nearly impossible. For dairy farms, GPS collars also enable lameness detection, calving alerts, and identification of cows that are isolated in drains or difficult terrain (Bhabhor and Vyas, 2018).

Wildlife and Wild Animal Tracking

Beyond domestic animals, GPS has proven invaluable in tracking India's wild animal populations. GPS collar devices such as battery-operated, remotely programmable units with a lifespan of 18-24 months communicate via GSM and GPRS and function even in dense forest cover (Bhabhor and Vyas, 2018). These devices are used to study habitat usage, seasonal migration patterns, and species distribution. They also support anti-poaching initiatives by providing enhanced early warning systems, helping reduce human-wildlife conflict, and enabling the monitoring of relocated animals until they adapt to their new environments.

Disease Surveillance and Epidemiological Mapping

India's livestock sector is regularly challenged by outbreaks of diseases such as Foot and Mouth Disease (FMD), Brucellosis, and Lumpy Skin Disease. When GPS is integrated with GIS, it becomes a powerful tool for veterinary epidemiology. Disease spread can be mapped spatially, identifying which farms and areas are at risk during an outbreak. GIS allows veterinary authorities to produce maps of disease incidence, prevalence, mortality, and morbidity across farm regions (Amin et al., 2012). GPS enables precise identification of the location of an infected farm, and GIS's buffer zone function can then notify all farms within a specified radius of the outbreak often within minutes (Sanson et al., 1994). Simulation models integrating farm data such as animal numbers, type, population density, climate conditions, and source of outbreak can be overlaid on GIS maps to predict the direction and speed of disease spread (Dhama et al., 2013). Neighbourhood analysis further identifies adjacent farms at risk of transmission (Amin et al., 2012). For a country like India, where livestock diseases can cripple entire rural communities, this technology represents a major leap forward in veterinary public health.

Smart Dairy Operations: The GCMMF Example

The Gujarat Cooperative Milk Marketing Federation (GCMMF), the organisation behind India's iconic Amul brand is a leading example of GIS and GPS adoption in Indian dairy. GCMMF uses GIS at its head office and key marketing centres to map zone and depot boundaries, plot distributor locations, and superimpose product-wise sales data for distribution planning and review (Bowonder et al., 2005). At the milk collection centre level, the system incorporates animal census data and helps track average milk production, productivity trends of cows and buffaloes across Gujarat, and supports business planning. This integration of spatial technology in dairy cooperative management has set a model for the rest of India's dairy sector.

GPS in Broader Agricultural Applications

Farm Asset Tracking and Equipment Management

Indian farmers, particularly those with medium to large land holdings, rely heavily on tractors, harvesters, and irrigation equipment. GPS tracking systems allow farm managers to monitor the location and status of all assets in real time, receive alerts about fuel levels, engine diagnostics, and maintenance schedules, and trace stolen or misplaced equipment quickly (The farming industry faces many challenges, 2023). Route optimisation features help farm vehicles take the most efficient paths across fields and between farms, reducing fuel consumption, lowering operational costs, and extending the lifespan of machinery.

Pasture Management and Remote Sensing Integration

For livestock farmers dependent on open grazing, understanding pasture quality and availability is critical. When GPS is combined with Remote Sensing (RS) and GIS, it

provides a cost-effective and reliable method for surveying large tracts of grazing land. RS data can assess the quality and quantity of pastures, estimate the amount of natural forage available, and guide decisions on stocking density and rotational grazing, promoting sustainable land use (Price et al., 2001). In India, where grasslands and common grazing lands are under increasing pressure from encroachment and degradation, such tools offer vital planning support.

Disaster Management and Flood Risk Mapping

India is highly vulnerable to natural disasters such as floods, droughts, and cyclones regularly devastate farming communities. GIS combined with GPS data is now being used to identify flood-prone agricultural zones by overlaying geographic layers such as terrain, drainage patterns, and land use (Abbas and Srivastav, 2008). This allows disaster plan managers to target mitigation measures, pre-position veterinary and relief teams, and help farmers and livestock owners in at-risk zones evacuate in time. The rapid communication of spatially accurate information saves both human lives and livestock during emergencies (Suresh et al., 2005).

Challenges to Adoption in India

Despite its immense promise, the widespread adoption of GPS and Geoinformatics in Indian agriculture faces significant hurdles. The software and hardware required remain expensive, placing them out of reach for marginal and small-scale farmers who constitute the majority of India's agricultural workforce. Training and technical support for users of GIS and GPS tools remain inadequate, particularly in rural and remote areas (Bhabhor and Vyas, 2018). The need for constant data updating, geographic errors at larger scales, and an underdeveloped niche for GIS in health and agriculture applications further limit uptake. Government subsidy programmes, cooperative models such as demonstrated by GCMMF and mobile-based GPS applications tailored for low-literacy users are critical pathways to bridge this gap.

Conclusion

GPS technology, embedded within the broader Geoinformatics framework, is rapidly transforming Indian livestock farming and agriculture. From tracking cattle in remote pasturelands and mapping disease outbreaks in real time, to supporting dairy cooperative supply chains and enabling disaster preparedness, GPS is proving to be far more than a navigation device, it is a lifeline for Indian farmers. As connectivity improves and the costs of GPS devices decline, this technology has the potential to reach every Indian farm. Livestock disease reporting, epidemiological mapping, and animal safety are no longer aspirations, they are achievable realities. The future of Indian agriculture is smart, and GPS is at its heart.

References

1. Abbas, S.H. and Srivastav, R.K. (2008). GIS based disaster management. Management of Environment, 20, pp. 33–51.
2. Amin, A., Shah, K.A. and Andrabi, A. (2012). Use of geoinformatics in livestock disease management. Vetscan, 7(1), pp. 1–5.
3. Bhabhor, I.N. and Vyas, H.U. (2018). Role of Geoinformatics in Animal Husbandry. Gujarat Journal of Extension Education (Special Issue, National Seminar), pp. 113–116.
4. Bowonder, B., Gupta, V. and Singh, A. (2005). Developing a rural market e-hub: the case study of e-Choupal experience of ITC. Planning Commission of India.
5. Dhama, K., Verma, A.K., Tiwari, R., Chakraborty, S., Vora, K., Kapoor, S., Deb, R., Karthik, K., Singh, R., Munir, M. and Natesan, S. (2013). A perspective on application of geographic information system (GIS): an advance tracking tool for disease surveillance and monitoring in veterinary epidemiology. Advances in Animal and Veterinary Sciences, 1, pp. 14–24.
6. Hugh Jones, M. (1991). Applications of remote sensing to epidemiology and parasitology. Preventive Veterinary Medicine, 11, pp. 159–366.

7. Narayanan, N. (2012). Proceedings of 10th IAVPHS Conference and National Seminar on "One Health Initiative in Addressing Food Safety Challenges", pp. 240–248.
8. Price, K.P., Crooks, T.J. and Martinko, E.A. (2001). Grasslands across time and scale: a remote sensing perspective. Photogrammetric Engineering and Remote Sensing, 67, pp. 414–420.
9. Sanson, R.L., Ster, M.W. and Morris, R.S. (1994). Interspread—A spatial stochastic simulation model of epidemic foot-and-mouth disease. The Kenyan Veterinarian, 18(2), pp. 493–495.