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Livestock Traceability Systems: RFID and Blockchain for Farm-to-Market Tracking and Export Compliance

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Livestock traceability systems help track animals and their products from farm to market using technologies such as RFID, QR codes and blockchain. These systems maintain digital records of animal identification, vaccination, health status, movement and processing. By improving transparency and record management, they can support food safety, disease monitoring and export compliance. This article explores how digital traceability can strengthen livestock management and create more reliable supply chains.



Introduction

Livestock farming plays an important role in agriculture and food production. However, tracking animal health, movement and product origin across different stages of the supply chain can be challenging. Digital traceability systems offer a way to connect farm records with transportation, processing and market information. In India, initiatives such as the National Digital Livestock Mission and Bharat Pashudhan are advancing digital animal identification and livestock record management. These developments highlight the growing importance of traceability in animal health, product transparency and market access.

Role of RFID in Livestock Tracking

Radio Frequency Identification (RFID) uses electronic tags and readers to identify individual animals. Each tag is linked to a digital record containing relevant information such as breed, age, vaccination, treatment, breeding history and farm location. When an animal is scanned, authorised users can access its registered information. This reduces reliance on handwritten records and helps farmers, veterinarians and livestock businesses manage animal information more efficiently.



Blockchain for Farm-to-Market Traceability

Blockchain can provide a shared, tamper-evident record of important supply-chain events. When an animal moves from a farm to a trader, processing facility or exporter, the transfer

can be recorded with a timestamp and relevant identification details. RFID captures an animal's identity, while blockchain helps preserve the integrity of recorded transactions. QR codes can then link processed products to relevant traceability records, allowing authorised businesses and consumers to verify product information. However, blockchain cannot guarantee that the original data entered into the system is accurate; reliable verification is still essential.

Export Compliance and Food Safety

Export markets may require detailed records related to animal origin, veterinary inspection, disease status, processing and certification. A well-designed traceability system can help organise these records, support audits and make it easier to identify affected consignments when a food-safety issue arises. Exporters must still comply with the specific requirements of the destination country, including applicable veterinary, sanitary, residue-testing and certification rules. Digital traceability supports compliance but does not replace mandatory inspections or official approvals.



Challenges and Practical Applications

Implementing traceability systems involves costs for electronic tags, readers, software, staff training and data management. Connectivity limitations, inconsistent record entry and integration between different platforms can also create difficulties, particularly for small-scale farmers. A practical implementation can begin with RFID identification, a mobile application and a central livestock database. Blockchain can be added where multiple supply-chain partners need a shared, verifiable record. Starting with a pilot project allows the system to be tested before wider deployment.

Conclusion

RFID and blockchain offer useful tools for improving livestock identification, farm-to-market tracking and supply-chain transparency. When combined with reliable data collection and appropriate regulatory processes, these technologies can support animal health management, food safety and export readiness. The future of livestock farming will increasingly depend on connecting practical farm management with digital systems. Effective traceability can help build greater trust among farmers, processors, exporters and consumers while supporting a more transparent and accountable livestock industry.