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LifeTag – "A Digital Cattle Management Lifecycle Portal"

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ABSTRACT

India has one of the largest cattle populations in the world and plays a crucial role in the country's agriculture-based economy. Despite their economic and social importance, cattle management practices remain largely fragmented and inefficient. A significant issue is the abandonment of cows and buffaloes once they reach the end of their milk-producing cycle. This leads to road accidents, sanitation challenges, and serious animal welfare concerns. Existing digital systems such as INAPH and e-Gopala focus mainly on production and advisory services and do not provide complete lifecycle monitoring, ownership tracking, or end-of-life management.

Keywords: Research Paper, Technical Writing, Science, Engineering and Technology

I. INTRODUCTION

Cattle have been at the core of India's rural economy for centuries. Dairy farming is directly associated with food security, employment, and rural livelihoods. According to the 20th Livestock Census (2019), India hosts approximately 303 million bovines, including cows and buffaloes. However, the livestock sector faces numerous challenges due to inadequate documentation, weak health tracking, poor accountability, and the absence of a unified lifecycle management system.

A significant issue is the abandonment of cattle that stop producing milk. These unproductive or "dry" cattle are often released onto roads, which leads to traffic accidents, damage to crops, and conflicts within communities. The economic and social consequences are substantial, yet the root cause remains unaddressed—there is no proper digital identity or tracking system for cattle.

Existing digital solutions in the livestock domain, such as INAPH, focus mainly on productivity and breeding, not on full lifecycle management or end-of-life care. Farmers often lack access to modern tools and struggle with record-keeping. LifeTag aims to bridge this gap by providing a modern, accessible, and farmer-friendly system that promotes transparency and improved cattle welfare.

II. LITERATURE REVIEW

Livestock identification systems worldwide have demonstrated promising results in improving traceability and disease control. Countries like Brazil, Australia, and Japan have implemented RFID-based animal identification systems, which ensure compliance with food safety regulations and disease surveillance.

In India, the National Dairy Development Board (NDDB) introduced INAPH, an information network for animal productivity and health. While INAPH records essential data for dairy value chains, it does not emphasize ownership accountability or end-of-life management. Similarly, the e-Gopala app, launched under the National Digital Livestock Mission, provides digital management for breeding and health but lacks integration with shelters or abandonment prevention.

Studies on animal welfare indicate that absence of tracking contributes to unplanned cattle movement and disease outbreaks. Research further highlights that proper vaccination records and identity tagging significantly reduce mortality rates. Despite these findings, adoption among Indian farmers remains low because existing systems are complex and not well-tailared to grassroots-level needs.

Hence, there is a clear research and practical gap, which LifeTag aims to fill by offering a simple yet comprehensive lifecycle tracking solution.

III. Problem Statement

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3.1 Abandonment of Non-Productive Cattle
Once cows stop producing milk, they are often released due to financial burden and lack of awareness. This creates urban and rural safety concerns.

3.2 Absence of Unified Identity and Tracking
Cattle ownership records are manually maintained and often unreliable. Without digital identity, enforcing accountability becomes impossible.

3.3 Inefficient Health and Vaccination Records
Vaccination schedules are frequently missed. Lack of digital records results in disease outbreaks, reduced productivity, and increased medical costs.

3.4 Incomplete Data for Government and Shelters
Shelters and government bodies lack real-time data on cattle population, health status, and stray cattle statistics.

3.5 Poor Farmer Support and Digital Awareness
Farmers, especially small-scale ones, struggle with managing cattle data manually. This affects productivity and welfare.

IV. Proposed Solution — LifeTag System

LifeTag aims to create a complete digital ecosystem for cattle lifecycle management, ensuring transparency, traceability, and welfare.

5.1 QR/RFID-Based Identification
Cattle receive a unique ID through QR or RFID ear tags.
QR tags are low-cost and scannable using smartphones.
RFID tags support long-term durability and automated scanning.
Tagging ensures authenticity and prevents duplication of records.

5.2 Continuous Lifecycle Tracking
LifeTag records every key event:
Birth registration
Vaccination history
Medical treatments
Ownership transfers
Milk productivity
End-of-milk cycle assessment
This complete lifecycle data helps maintain accountability and supports better decision-making.

5.3 Shelter & NGO Integration
LifeTag provides a structured process for transferring non-productive cattle to registered shelters.
Farmers can request shelter transfer through the app.
Shelters receive details and approve intake.
Government receives reports for monitoring.

5.4 Role-Based Dashboards
Each stakeholder has a custom interface:
Farmers: Scan tags, update records, view productivity.
Vets: Log treatments and vaccinations.
Shelters: Manage incoming cattle and care records.
Government: Monitor population data and policy impact.

5.5 Data Validation & Security
Each update is timestamped and linked to user identity, ensuring transparency and reducing manipulation.

V. System Architecture

VI. Methodology

The methodology for the LifeTag project describes the step- by- step process used for designing, developing, and evaluating the cattle lifecycle management system. It ensures a structured and systematic approach to transforming the idea into a functional prototype.

7.1 Requirement Analysis
In this stage, the team identified major issues such as abandoned cattle, missing vaccination records, and lack of ownership accountability. Inputs were collected from farmers, veterinarians, and local cattle shelters to understand real- world challenges. Government reports like the Livestock Census and NDDB publications were also reviewed.

7.2 System Design
The system was designed to include:

- A QR/RFID-based cattle identification mechanism
- Farmer, veterinarian, shelter, and government dashboards
- A centralized database

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- User-friendly interfaces
  Flowcharts, wireframes, and architecture diagrams were prepared to visualize how data flows across the system.

7.3 Workflow of LifeTag (with flowchart)
This section explains **how the LifeTag system works step by step**.
This is where your workflow diagram will go.
Workflow Steps:

1. **Birth Registration**
   - Cow/buffalo is tagged with a QR/RFID code.
   - Basic details are entered (breed, age, owner).
2. **Ownership Tracking**
   - Whenever the animal is sold, the new owner updates the record by scanning the tag.
   - Creates transparent ownership history.
3. **Vaccination & Health Logging**
   - Vets scan the tag and update vaccination and treatment records.
   - Ensures medical history is digitally preserved.
4. **Milk Productivity Monitoring**
   - Farmers enter milk production details into the portal.
   - Helps identify productive vs. non-productive animals.
5. **End-of-Milk Cycle Detection**
   - When productivity drops, the system flags the animal as “non-productive.”
6. **Shelter Transfer**
   - Farmer requests nearby shelter through the app.
   - Shelter verifies and accepts the animal.
7. **Government Monitoring**
   - Dashboards show real-time data on cattle population, health, and shelter usage.

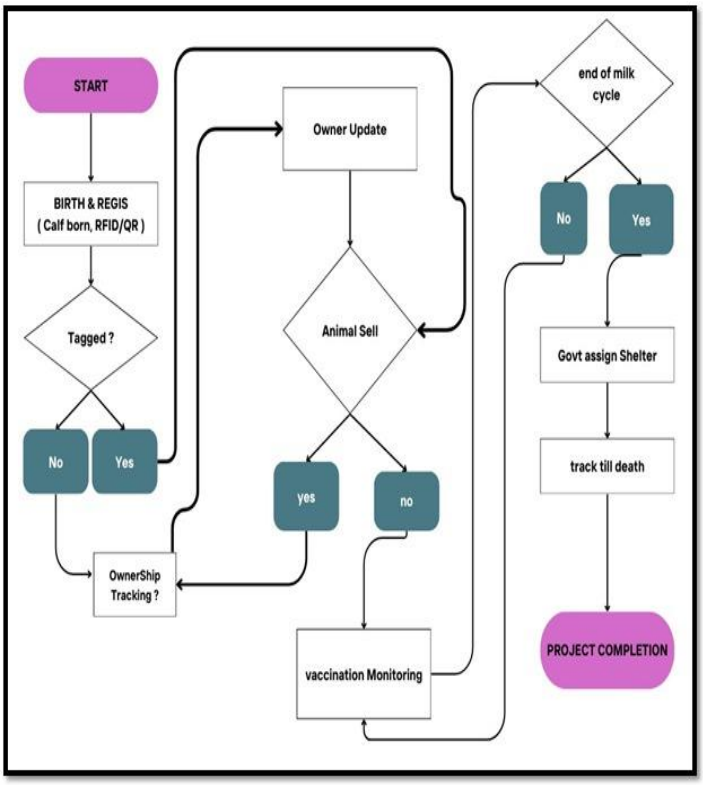

Fig - 7.1 (Flow Diagram Of the Project)

7.4 Prototype Development

A working website prototype was created with basic features such as tag scanning, profile creation, and health tracking. The aim was to demonstrate feasibility and user interface design.

7.5 Testing

The prototype was tested with sample data to check accuracy of records, ease of scanning, and dashboard functionality. Errors and missing features were identified and improved.

7.6 Evaluation
The system’s performance was evaluated based on:

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- Usability for farmers
- Accuracy of QR scans
- Clarity of dashboards
- Completeness of lifecycle records
  The results show that LifeTag can significantly improve cattle traceability and reduce abandonment when implemented at scale.

VII. Expected Outcomes

LifeTag is expected to produce measurable improvements:

- Reduction in stray cattle incidents.
- Better health management through timely vaccinations.
- Improved farmer accountability via ownership logs.
- Transparent end-of-life management.
- Stronger government planning using real-time data.
- Enhanced animal welfare at scale.

VIII. CONCLUSION

LifeTag provides a transformative approach to modern cattle management in India. By integrating identification, health tracking, ownership transparency, and shelter coordination, it addresses long-standing issues of abandonment, poor welfare, and inefficient data systems. The solution aligns with national digital initiatives and offers a scalable path for rural development. With further enhancements through IoT, AI, and blockchain, LifeTag has the potential to revolutionize livestock management and support millions of farmers across the country.

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