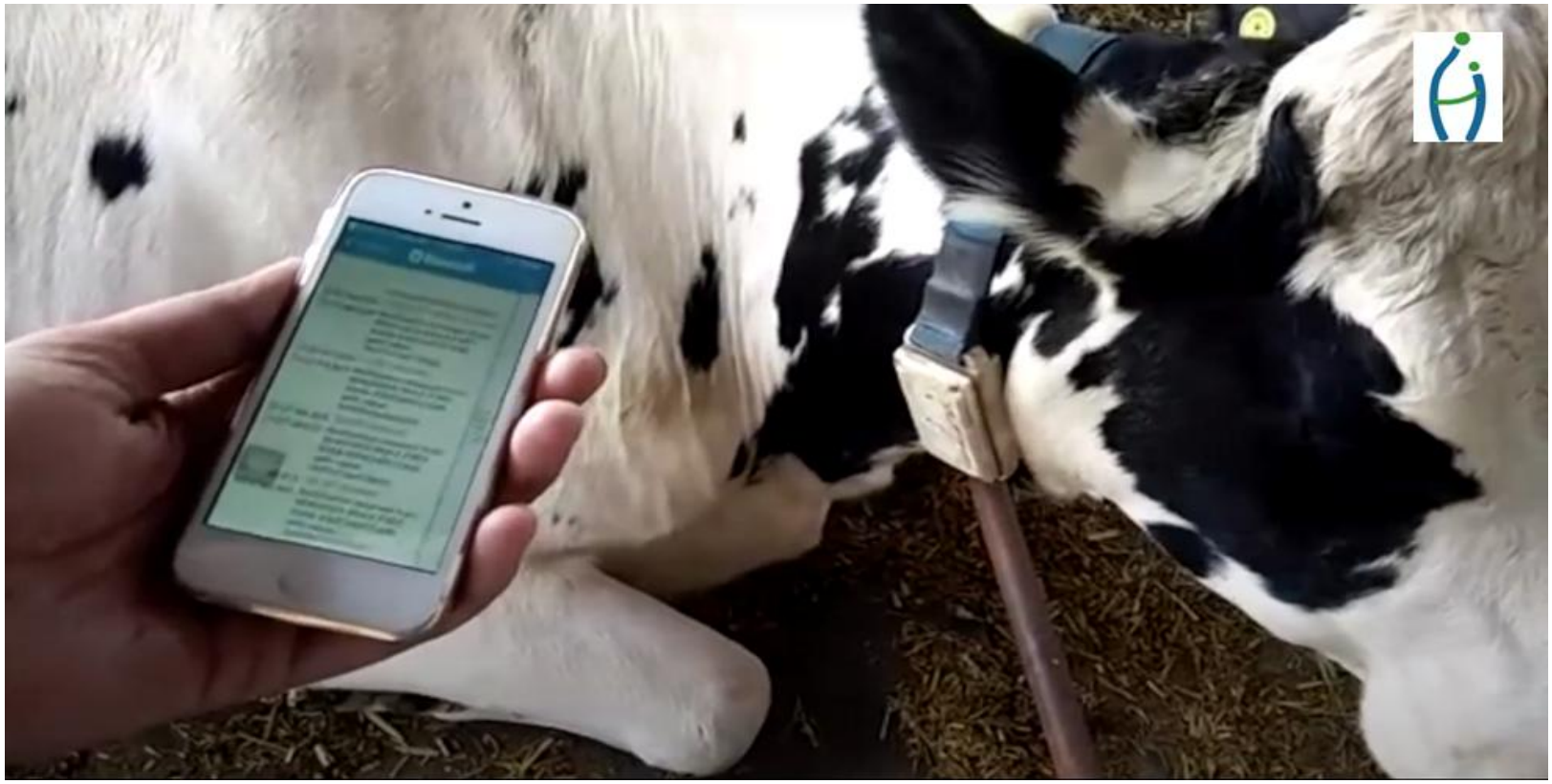
Case Study: Enhancing Agriculture & Dairy Loan Protection Through Hanumayamma Cow Necklace Sensors - A Digital Transformation Model for National Banks.



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Hanumayamma Innovations and Technologies, Inc.,
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A Note from CEO office:

"Our commitment goes beyond technology - we are building an ecosystem of trust, transparency, and empowerment for farmers, lenders, cooperatives, and national institutions. By integrating Hanumayamma Sensors into rural lending programs, development banks gain unprecedented insights into herd health, mortality risks, productivity trends, and income patterns, enabling them to make smarter, data-backed decisions.

This level of visibility fundamentally transforms agricultural financing. It shifts lending from a traditional, reactive model to a **proactive, preventive, and performance-driven framework**, where risk is mitigated before it becomes loss, and every stakeholder benefits.

As we continue expanding our partnerships with national banks, ministries, NGOs, and global agricultural agencies, we remain steadfast in our mission—to enable smallholder farmers to participate fully in the digital economy, strengthen food security, and accelerate socio-economic progress across regions.

Hanumayamma stands ready to support every institution that shares our vision for a more sustainable, resilient, and prosperous agricultural future."

Anitha Ilapakurti

Anitha Ilapakurti November 28, 2025

CEO,

Hanumayamma Innovations and Technologies, Inc.

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USA

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Executive Summary

The National Bank plays one of the most critical roles in financing dairy and agricultural development across countries, especially for developing countries. However, dairy loans face inherent risk-livestock mortality, disease outbreaks, low productivity, misreporting of cattle health, and inadequate visibility into on-ground conditions.

Hanumayamma Innovations & Technologies Inc., a global leader in Class-10 veterinary wearable sensors, offers the Hanumayamma Cow Necklace Sensor—a Artificial Intelligence (AI), IoT-driven livestock monitoring solution that enables real-time cattle health, productivity, and behavioral insights.

By deploying these sensors for livestock finance, the banks can:

- Ensure asset protection of cows and buffaloes.
- Reduce loan defaults caused by animal mortality.
- Improve insurance underwriting accuracy.
- Boost milk productivity, thereby increasing farmers' repayment capacity.
- Enable digital loan monitoring with Artificial Intelligence (AI) -driven analytics.

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SBI	NABARD
বাংলাদেশ কৃষি ব্যাংক Bangladesh Krishi Bank গ্রামবাংলার গণমানুষের ব্যাংক	RDB ප්‍රාදේශීය සංවර්ධන බැංකුව பிரதேச அபிவிருத்தி வங்கி Regional Development Bank
कृषि विकास बैंक लिमिटेड Agricultural Development Bank Ltd. ("A" Class Institution Liscensed from Nepal Rastra Bank)	

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Background: Agriculture & Dairy Lending Challenges

Small and marginal dairy farmers are a crucial part of the global farming community. There are approximately 570 million farms worldwide, with the majority being small farms, as per the Food and Agriculture Organization (FAO). The International Farm Comparison Network (IFCN) estimates that there are around 133 million dairy farms globally.

Country	Dairy Contribution to GDP	Notes
Pakistan	**≈ 11%**	One of world's largest dairy economies
India	**5–6%**	Largest global milk producer
Bangladesh	**2.5–3%**	Growing cooperative dairy model
Kenya	**4–5%**	Africa's strongest dairy sector
Ethiopia	**3–4%**	Large cattle population
Nepal	**4%**	Dairy is backbone of mountain agriculture
Sri Lanka	**1.5–2%**	Import substitution priority

Despite being a significant source of income for small dairy farmers, banks face serious challenges:

Challenge	Impact on Banks
Lack of visibility in cattle health	Difficult to validate the condition of financed livestock
Animal mortality or disease	Direct loss of financed asset
Farmers are unable to repay due to poor milk yields	Increases NPLs (Non-Performing Loans)
No reliable productivity documentation	Hard to justify loan underwriting
Insurance claims lacking verifiable data	Complex disputes between farmer, insurer, and bank

National Banks require a digital, real-time monitoring system to reduce risk and strengthen agricultural loan portfolios.

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Hanumayamma Cow Necklace Sensor – Overview

Hanumayamma Innovations and Technologies Inc. is a world-renowned company that prides itself on creating innovative products that serve the agricultural industry. Our groundbreaking solutions, including Agriculture Analytics, Dairy Analytics, Specialty Crops Analytics, and a Wearable Veterinary Sensor (CLASS 10) specifically designed for animal husbandry, have revolutionized the industry. Additionally, our Data Analytics (DnA) platform is exclusively built for farmers across the world, providing actionable recommendations on Yield Analytics, pricing models, economic sustainability, extreme weather recommendations, and food security. Our Sensors play a crucial role in ensuring productivity sand health of cattle that helps both Small Farmers and lending banks:

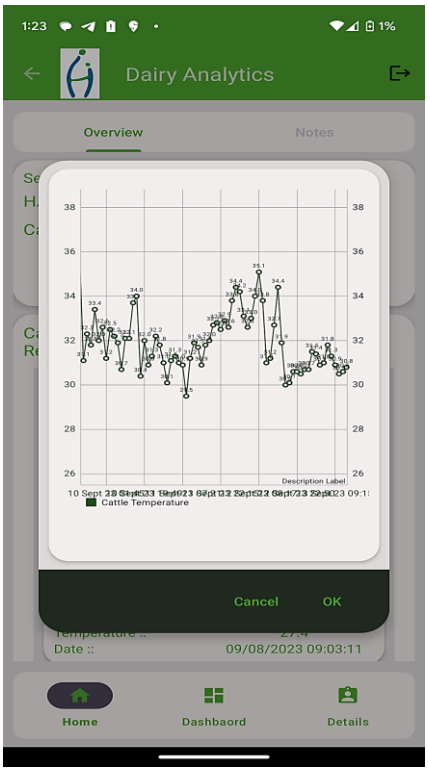

Figure 1: Hanumayamma Sensor Data

Key Parameters Measured with our Sensors and Data Science Platform:

- Body temperature (please see figure 1)
- Activity & motion patterns
- Heat stress indicators
- Rumination & feeding behavior
- Disease detection anomalies
- Milk-yield prediction signals
- Anti-theft monitoring

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Use Case for National Bank

Secured Dairy & Agriculture Loans

National Banks can tag every financed cow/buffalo with a Hanumayamma sensor, creating a digital livestock identity.

Benefits:

- Verified ownership & tagging of animals.
- Reduced fraud in livestock-based loan claims.
- Early disease detection prevents mortality of financed assets.
- Real-time monitoring helps identify high-risk customers.

AI-Driven Loan Repayment Prediction

Using data science, machine learning, and artificial intelligence, the sensors create a Milk Productivity Score (MPS) and Animal Health Score (AHS). National Banks can integrate this score into risk analysis:

- High MPS + High AHS ⇒ Low Loan Risk
- Low MPS or sudden health drop ⇒ High loan risk → Early intervention

Claim Verification for Insurance Partners

The sensors provide:

- Accurate mortality timestamps
- Last 30–60 days of animal activity (please see figure 2)
- Temperature logs
- Health anomaly patterns

This ensures **transparent insurance claims** and reduced disputes.

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Figure 2: Cattle Activity

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Operational Model for National Banks

To ensure full visibility and protection of financed livestock, each animal funded through a loan is first equipped with a Hanumayamma Cow Necklace Sensor, creating a secure digital identity and enabling continuous monitoring. Once the asset is tagged, farmers are onboarded through a simple mobile application, giving them real-time access to cattle wellness insights, health alerts, feeding behavior, and early warnings for disease or stress conditions. In parallel, the *National Bank designated loan officer* receives an integrated dashboard, where aggregated data from all sensor-equipped animals is presented as health trends, productivity indicators, and loan-risk signals, allowing loan officers to assess portfolio health at both individual and regional levels (please see figure 3). This system also seamlessly connects with insurance partners, automatically generating trusted data feeds and historical logs required for underwriting, mortality verification, and claim settlement, thereby reducing fraud and dispute cycles. Finally, advanced AI-driven periodic reports summarize monthly risk evaluations, highlight high-risk livestock or borrowers, and equip loan officers with actionable insights that improve decision-making, reduce defaults, and strengthen the overall agricultural loan portfolio.

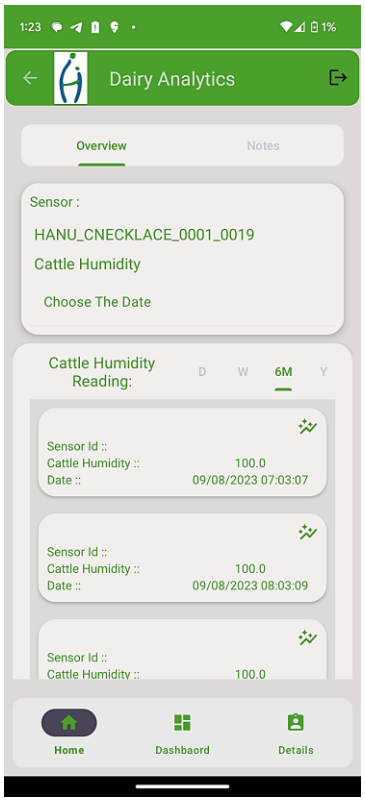

Figure 3: Humidity data

Step-by-Step Deployment Framework

Step	Description
1. Asset Tagging	Every financed animal is equipped with a Cow Necklace Sensor.
2. Farmer Onboarding	Farmers receive a mobile app for viewing alerts & wellness insights.
3. Bank Dashboard Integration	NBP receives aggregated dashboards on cattle health and risk trends.
4. Insurance Partner Integration	Automatic reporting for underwriting/claim verification.
5. Periodic Reporting	AI models generate monthly risk evaluations for loan officers.

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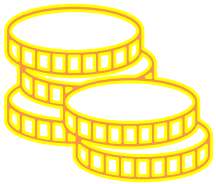
Quantifiable Impact for National Bank

The deployment of Hanumayamma Cow Necklace Sensors delivers measurable impact across key financial and operational metrics for dairy and livestock-backed lending. By enabling continuous health monitoring and early disease detection, National banks *can expect a 35–50% reduction in livestock mortality, directly safeguarding financed assets*. Transparent sensor-based evidence significantly lowers insurance claim *disputes by nearly 60%, while AI-driven wellness analytics improve early* disease detection accuracy by approximately 80%, allowing timely intervention. Healthier, better-managed cattle also lead to a 15–25% improvement in milk production, strengthening the farmer's income and repayment ability. Collectively, these enhancements drive a 20–35% increase in loan repayment reliability, ultimately translating into a substantial reduction of up to 40% in Non-Performing Loans (NPLs) within the dairy and agriculture loan portfolio.



Loan Portfolio Protection

Metric	Expected Improvement
Livestock mortality reduction	**35–50%**
Insurance claim disputes	**↓ 60%**
Early disease detection accuracy	**↑ 80%**
Milk production improvement	**15–25%**
Increase in repayment reliability	**20–35%**
Reduction in Non-Performing Loans (NPLs)**	**Up to 40%**

Farmer Benefits (NBP's Social Impact)

- Higher milk yield → More stable income.
- Early disease detection reduces veterinary costs.
- Prevents cattle theft or loss.
- Enables farmers to access more credit with strong repayment history.
- Strengthens national rural dairy economy.

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Alignment with National Government Goals

The Hanumayamma platform supports:

- National Vision (Agriculture Innovation)
- Digitization of rural credit
- Livestock productivity enhancement
- Financial inclusion for small farmers
- Climate-resilient agriculture (please see figure 4)

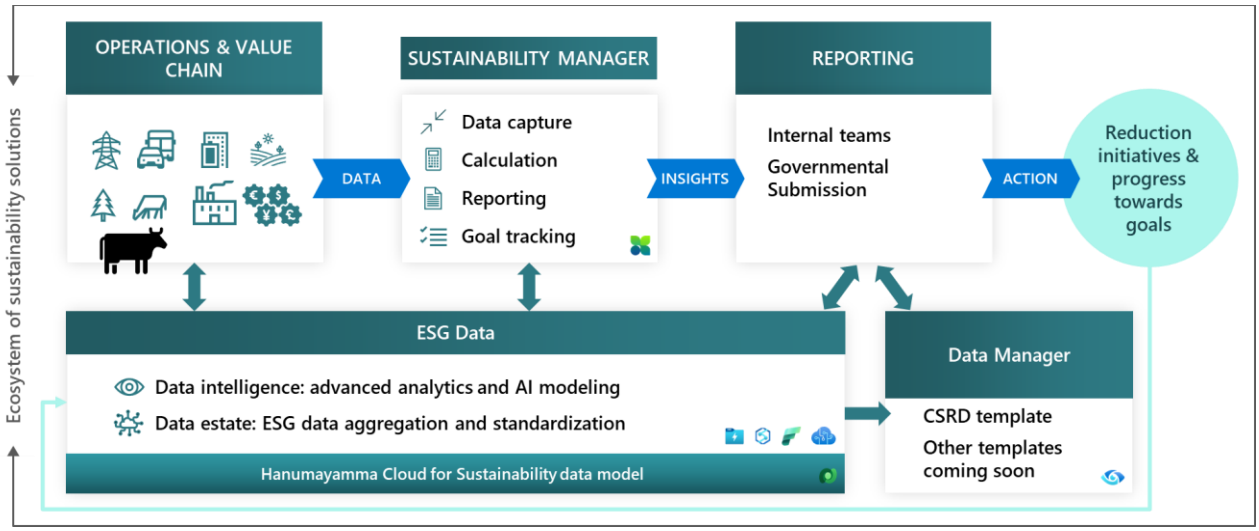

Figure 4: Hanumayamma ESG

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Why National Bank Should Adopt This Solution

The Hanumayamma Cow Necklace Sensor provides a **transformational leap** in how agricultural and dairy financing is managed in dairy agricultural economies. By integrating the technology with the National Bank's loan ecosystem, the entire gross root system can:

- Improve credit quality
- Protect financed livestock
- Empower farmers with actionable insights
- Unlock new opportunities in dairy innovation and rural fintech

This positions National Banks as a **pioneer in AgriTech-enabled banking**.

☑	Protects the bank's financed assets
☑	Reduces default risk
☑	Strengthens insurance partner relationships
☑	Provides AI-based decision support
☑	Create new digital lending models
☑	Enhances the bank's ESG and rural development profile

Some of the National Banks that're benefited through technological sensor deployments:

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National Bank For Agriculture and Rural Development, India.

Premier agricultural refinancing and development bank – worked with small & medium dairy farmers. https://www.nabard.org/EngDefault.aspx

State Bank of India (SBI): Largest dairy and livestock financing portfolio in India. Enabled Cattle tracking. https://sbi.bank.in/

Punjab National Bank (PNB): Strong rural and agriculture loan programs. Focus on Farmer enablement & deployed sensors in Punjab. https://pnb.bank.in/hi/

Bangladesh krishi bank

Bangladesh Krishi Bank (BKB): Main agriculture and livestock-focused bank. Highly motivated to provide digital banking through Sensors. https://ib.krishibank.org.bd/

Rajshahi Krishi Unnayan Bank (RAKUB): Strong presence in dairy and cattle financing. https://www.rakub.org.bd/

Regional Development Bank (RDB), Sri Lanka. Focuses heavily on dairy and livestock farming loans. https://www.rdb.lk/

कृषि विकास बैंक लिमिटेड
Agricultural Development Bank Ltd.
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Nepal's core agricultural and dairy financing institution. Used Sensor tracking and cattle health. https://adbl.gov.np/en

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Empowering Farmers Globally: 15 Years of Innovation and Dedication

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Appendix

Modelling Non-Performing Dairy & Cattle Loans

Base Financial & Sector Data (Actual Published Data) *(All values include INR and USD equivalents)*

Exchange rate to use for modelling:
1 USD = ₹83 (You can adjust this cell in Excel; all formulas update automatically.)

Metric / Year	**India Value**	**USD Equivalent**	**Notes**
Gross NPA Ratio[1] – All SCBs (2024)	2.6%	—	System-wide low NPAs
Gross NPA Ratio[2] – Agriculture & Allied (2024)[3],[4]	6.2%	—	Highest among major sectors
Gross NPA Ratio[5] – Public Sector Banks (Jun 2024)	3.32%	—	Includes SBI
NABARD Gross NPA Ratio (FY24)[6]	**0.26%**	—	Very low due to refinance model
NABARD Net NPA Ratio (FY24)	**0%**	—	Fully provided
Livestock share of Agri GVA (2023)	30.23%	—	Basis for modelling livestock share
Dairy share of livestock output[7]	60–70%	—	Basis for dairy modelling

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SBI Agriculture Loan Book (MODELLING)

SBI does NOT publicly publish "dairy-only" NPAs.
We create a modelling framework using known agriculture NPAs.

Assumptions (editable in Excel)

- Exchange rate: **₹83 = 1 USD**
- SBI Agriculture Loan Book (example for modelling): **₹3,00,000 crore**
  (This is a placeholder; SBI's exact agri portfolio must be inserted when available.)

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[1] National Bank for Agriculture and Rural Development - Audit Report – 2024 - https://www.nabard.org/pdf/financial-results-for-qtr-ended-31-mar-2024.pdf
[2] Net NPA - https://www.icra.in/Rating/GetRationalReportFilePdf?id=130031
[3] YEAR END REVIEW 2024: DEPARTMENT OF ANIMAL HUSBANDRY AND DAIRYING - https://www.pib.gov.in/PressReleasePage.aspx?PRID=2086052&reg=3&lang=2
[4] NPAs in agriculture sector stay high amid loan-saturation concerns - https://www.rediff.com/money/report/npas-in-agriculture-sector-stay-high-amid-loan-saturation-concerns/20250804.htm
[5] Ministry of Finance Year Ender 2024: Department of Financial Services - https://www.pib.gov.in/PressReleasePage.aspx?PRID=2088182&reg=3&lang=2
[6] NABARD - https://www.nabard.org/pdf/financial-results-for-qtr-ended-31-mar-2024.pdf
[7] THE GROWTH RATE OF LIVESTOCK SECTOR AND ITS CONTRIBUTION - https://dahd.gov.in/sites/default/files/2024-10/MlpGrowthRate202223.pdf

Step 1 — Convert Agriculture Loan Book to USD

Item	INR (₹ Crore)	USD (Million)
SBI Agriculture Book	₹3,00,000 crore	= 300,000 × 10 × (1/83) = **$361,445M** (~$361B)

(Formula: 1 crore = 10 million INR → (INR ÷ 83) for USD)

Step 2 — Agriculture GNPA Calculation

Agriculture GNPA Ratio = **6.2%**

Item	INR	USD
Agriculture NPA = 6.2% of ₹3,00,000 crore	₹18,600 crore	$2.24B

Step 3 — Livestock Share of Agriculture NPAs

(Using 3 scenario bands: 25%, 30%, 35%)

Scenario	Livestock %	INR (NPAs)	USD
Low	25%	₹4,650 crore	$560M
Mid	30%	₹5,580 crore	$673M
High	35%	₹6,510 crore	$785M

Step 4 — Dairy (Cattle + Buffalo) Share of Livestock NPAs

(Using dairy = 60–70% of livestock economy)

Scenario	Dairy %	INR	USD
Low-Low	60% of Low	₹2,790 crore	$336M
Mid-Mid	65% of Mid	₹3,627 crore	$437M
High-High	70% of High	₹4,557 crore	$549M

Final Modelled SBI Dairy/Cattle NPA Range (2024)
₹2,790 crore – ₹4,557 crore
≈ $336M – $549M USD

Note: This is a **modelled range**, NOT an official SBI number. SBI does **not** disclose dairy-specific NPA data.

NABARD (Refinance Model)

NABARD's own GNPA[8] = **0.26%** and **Net NPA = 0%**, so dairy NPA[9]s are **not for NABARD directly**, but for banks it refinances.

However, you can model NPAs of **RRBs and Coop Banks refinanced by NABARD** using the same approach.

[8] National Bank for Agriculture and Rural Development - Audit Report – 2024 - https://www.nabard.org/pdf/financial-results-for-qtr-ended-31-mar-2024.pdf
[9] Net NPA - https://www.icra.in/Rating/GetRationalReportFilePdf?id=130031

RRB Agriculture Loan Book (Modelled)

Assume RRB Agri Loan Book: **₹1,00,000 crore**
GNPA for RRBs (typical): **8–10%** (RRBs generally have higher NPAs)

RRB Agriculture NPAs

Item	INR	USD
GNPA at 8%	₹8,000 crore	$964M
GNPA at 10%	₹10,000 crore	$1.20B

Livestock Share (25–35%)

Scenario	INR	USD
Low	₹2,000 crore	$240M
Mid	₹2,700 crore	$325M
High	₹3,500 crore	$422M

Dairy Share (60–70%)

Scenario	INR	USD
Low	₹1,200 crore	$144M
Mid	₹1,755 crore	$212M
High	₹2,450 crore	$295M

Modelled Dairy/Cattle NPA Bands (With Currency)

Institution	Dairy/Cattle NPA Range	USD Equivalent
SBI (Hypothetical model)	₹2,790 – ₹4,557 crore	$336M – $549M
RRBs (NABARD-refinanced)	₹1,200 – ₹2,450 crore	$144M – $295M