

Mali-Connect: The Digital Twin for Livestock Assets

Executive Summary

What if you could determine the value of any physical asset with just your phone?

We're starting with Africa's most important one: livestock. Mali-Connect is an AI platform that transforms a few simple photos into a 'holographic' 3D model of an animal, complete with a full health and value assessment—we call it the 'Mali-Score'. This score becomes a universal certificate for fair trade, insurance, and credit, empowering herders to build climate-resilient wealth.

Mali-Connect addresses the fundamental challenge that pastoralist communities face: their wealth is "invisible" to traditional financial systems. By creating digital twins of livestock through AI-powered 3D modeling and comprehensive health assessment, we transform physical animals into verifiable, bankable, and tradable digital assets.

The Problem & The Solution

The Problem

Pastoralist communities across Africa face a critical challenge: their primary wealth—livestock—exists in a "digital blind spot." This invisibility creates a cascade of problems:

- **Market Exclusion:** Without verifiable health and value data,

The Solution

Mali-Connect transforms livestock from invisible assets into verifiable digital twins through:

1. **AI-Powered 3D Modeling:** Convert simple smartphone photos into interactive "holographic" 3D models

herders cannot access fair market prices

- **Financial Exclusion:** Traditional banks cannot assess livestock as collateral, locking herders out of credit
- **Insurance Barriers:** Lack of standardized health assessment prevents access to livestock insurance
- **Climate Vulnerability:** No systematic tracking of animal health makes climate adaptation difficult
- **Wealth Inequality:** The inability to monetize livestock wealth perpetuates economic marginalization

2. Comprehensive Health

Assessment: Generate the "Mali-Score"—a standardized health and value metric

3. **Digital Asset Creation:** Transform physical animals into tradeable, insurable, and bankable digital assets
4. **Ecosystem Integration:** Connect herders to markets, insurance, and financial services

Core Feature: The "Holographic" Assessment Demo

Our hackathon demonstration showcases the core innovation through an intuitive user experience:

User Flow

1. **Case Selection:** Users choose from pre-loaded "case files" featuring real cattle images from different health conditions
2. **AI Analysis Simulation:** A compelling animation simulates the AI processing the photos, analyzing health indicators
3. **3D Model Generation:** The system renders an interactive, "holographic" 3D model of the animal
4. **Mali-Score Display:** The AI-generated assessment appears with diagnostic markers overlaid on the 3D model
5. **Ecosystem Preview:** Mock UI elements demonstrate how the score enables marketplace listing, insurance applications, and collateral usage

Technical Innovation

- **Mobile-First Design:** Optimized for smartphone use in field conditions
- **Responsive Layout:** Adapts to larger screens for presentation purposes
- **Real-Time Interaction:** Users can rotate, zoom, and explore the 3D model
- **Visual Storytelling:** "Scrollytelling" narrative guides users through the assessment process

The "Mali-Score": The AI at the Core

The Mali-Score is a composite AI-driven metric that standardizes livestock assessment across four key dimensions:

Scoring Algorithm

Body Condition

40%

Visual assessment of muscle mass, fat coverage, and overall physique. AI analysis of body proportions and condition indicators. Range: 0-100 points

Physical Health

25%

Detection of visible health issues, injuries, or abnormalities. Analysis of coat condition, eye clarity, and general vitality. Range: 0-100 points

Conformation

20%

Assessment of structural soundness and breed characteristics. Evaluation of posture, stance, and physical development. Range: 0-100 points

Age Estimation

15%

AI-powered age assessment based on physical characteristics. Integration with breed-specific growth patterns. Range: 0-100 points

Score Interpretation

- **90-100:** Excellent - Premium market value, optimal insurance rates

- **70-89:** Good - Strong market value, standard insurance eligibility
- **50-69:** Fair - Moderate value, basic insurance coverage
- **30-49:** Poor - Limited market access, high-risk insurance
- **0-29:** Critical - Emergency intervention required

The Broader Ecosystem

Our demo hints at the comprehensive platform through integrated ecosystem features:

Live Market Integration

- **Dynamic Pricing:** Real-time market value calculation based on Mali-Score
- **Marketplace Listing:** One-click listing with verified health data
- **Price Transparency:** Historical pricing data and market trends

Financial Services

- **Insurance Applications:** Streamlined process using Mali-Score as risk assessment
- **Credit Scoring:** Livestock as verifiable collateral for loans
- **Wealth Tracking:** Portfolio management for livestock assets

Resource Management

- **Forage Mapping:** GPS-enabled resource tracking and planning
- **Market Hubs:** Location-based market access and pricing
- **Climate Data:** Weather and environmental risk assessment

Technical Architecture & Stack

Project Type

Single-Page Responsive Demo Application designed for maximum visual impact and user engagement.

Layout Strategy

- **Mobile-First:** Primary experience optimized for smartphones

- **Adaptive Design:** Two-column layout for desktop presentations
- **Sticky 3D Viewer:** Right column remains fixed during content scrolling
- **Synchronized Experience:** Content scrolling drives 3D model interactions

Technology Stack

Frontend Framework

React 18 with TypeScript for type safety and modern development

Vite for fast development and optimized builds

Custom Hooks for state management and scroll synchronization

3D Graphics

Three.js via react-three-fiber for 3D rendering

@react-three/drei for utilities and helpers

Google Model Viewer for robust GLB model loading

CSS Fallback for reliable 3D visualization

Styling & UI

Tailwind CSS for utility-first styling

Custom Design System with Mali-Connect brand colors

Responsive Utilities for mobile-first design

Animation Libraries for smooth transitions

AI Simulation

Frontend Logic for Mali-Score calculation

Mock Data for realistic assessment scenarios

Lottie Animations for AI processing visualization

Hackathon Success Metrics

Innovation (25%)

First-of-its-kind "holographic" livestock assessment, seamless AI integration, intuitive mobile-first interface

Visual Impact (25%)

Professional interactive 3D visualization, flawless responsive design, smooth engaging animations

Problem-Solution Fit (25%)

Directly tackles pastoralist wealth invisibility, aligns with Agriculture whitepaper priorities, clear scalability path

Technical Execution (25%)

Clean maintainable code, fast performance, robust error handling, professional presentation polish

Implementation Roadmap





Phase 1: Core Demo COMPLETED

- ✔ Project setup and architecture
- ✔ 3D model integration and fallback systems
- ✔ Mali-Score calculation and display
- ✔ Responsive design implementation
- ✔ Ecosystem feature mockups

Phase 2: Enhancement IN PROGRESS

- 🔄 Real GLB model optimization
- 🔄 Advanced animation sequences
- 🔄 Enhanced mobile interactions
- 🔄 Performance optimization

Phase 3: Presentation PLANNED

-  Demo script and flow optimization
-  Visual polish and final touches
-  Documentation and deployment
-  Presentation preparation

Conclusion

Mali-Connect represents a paradigm shift in how we view and value livestock assets. By creating digital twins through AI-powered 3D modeling and comprehensive health assessment, we transform invisible wealth into verifiable, tradeable, and bankable digital assets.

Our hackathon demonstration showcases this vision through an engaging, mobile-first experience that combines cutting-edge 3D technology with practical solutions for pastoralist communities. The result is not just a technical achievement, but a pathway to financial inclusion and climate resilience for millions of herders across Africa.

The future of livestock assessment is here—and it fits in your pocket.

Project Team: Mali-Connect Development Team

Hackathon: CHAI Week 4 - Agriculture Innovation

Date: January 2025

Status: In Development