

Unified Rural Ecosystem (URE): Proactive AI Intelligence for Bharat

Transforming rural livelihoods through intelligent multi-agent systems
powered by Amazon Bedrock & Strands Agents SDK



Our Journey Today

01

Rural Challenges

Understanding the intelligence gap facing 200 million farmers

02

URE Solution

Three-layer architecture with specialized AI agents

03

AWS Integration

Bedrock, Lambda, S3, and serverless orchestration

04

Real Impact

Use cases, metrics, and implementation roadmap



CHALLENGE

The Rural Intelligence Gap Holds Back India's Progress

Fragmented Information

Farmers juggle multiple apps for weather, schemes, and markets—creating friction and confusion at every step

Reactive Systems

Current solutions wait for queries instead of anticipating needs, missing critical intervention windows

Accessibility Barriers

40% digital literacy constraint combined with language limitations excludes millions from digital benefits

Disconnected Knowledge

Agriculture, policy, and resource data remain siloed, preventing holistic decision-making

URE: The 360° Rural Resilience Engine

A **Multi-Agent Operating System** that unifies agricultural intelligence, government policy navigation, and resource optimization into one seamless, local-language platform.

Core Capabilities

- Multimodal crop diagnostics combining images and sensor data
- Real-time Mandi price intelligence for market optimization
- Automated subsidy discovery with eligibility verification
- Predictive irrigation and energy optimization
- Proactive weather-based alerts in regional languages





ARCHITECTURE

Layer 1: Accessible Entry Points Connect Every Farmer



Web Application

Streamlit or AWS Amplify provides desktop access with rich visualizations and data management



WhatsApp & Voice Bot

12+ regional languages ensure inclusive access through familiar messaging and voice interfaces



API Gateway & Lambda

Central routing orchestrates requests to Strands Supervisor Agent with millisecond latency

Layer 2: The Intelligent Brain Orchestrates Everything

Claude 3.5 Sonnet on Bedrock

Industry-leading multimodal reasoning powers high-fidelity decision-making across text, images, and structured data

Intelligent Query Routing

Supervisor classifies farmer queries and delegates to specialist agents—Agri-Expert, Policy-Navigator, or Resource-Optimizer

DynamoDB State Memory

Remembers conversation context like "5 acres of wheat" to provide personalized, cumulative guidance

Contextual Synthesis

Merges outputs from multiple agents into unified recommendations that address interconnected needs

Layer 3: Specialist Workers Deliver Expert Knowledge

Agent	Purpose	Key Tools
Agri-Expert	Crop diagnostics, pest identification, and real-time market prices	image_analyzer, get_mandi_prices_api
Policy-Navigator	Government subsidies, scheme eligibility, and application guidance	bedrock_knowledge_base_search
Resource-Optimizer	Water conservation, energy efficiency, weather-based planning	s3_data_fetcher, weather_prediction_api

Each specialist agent operates autonomously while coordinating through the Supervisor to provide comprehensive, context-aware recommendations.

Amazon Bedrock Powers Unmatched Intelligence



Multimodal Vision

Industry-leading crop disease identification from images with 95%+ accuracy using Claude 3.5 Sonnet



Knowledge Base RAG

Retrieval-augmented generation on government scheme PDFs stored in S3 eliminates hallucinations



Bedrock Guardrails

Built-in safety prevents incorrect policy advice and ensures factually grounded responses



Serverless Scaling

No GPU management required—pay-per-use model scales from 10 to 10,000 concurrent users seamlessly



AWS Lambda Enables Event-Driven Intelligence

Serverless Processing at Scale

- **Image Upload Processing:** S3 events trigger PlantVillage vector search for instant disease identification
- **Weather Integration:** Automated IMD forecast retrieval and storage for predictive analytics
- **API Orchestration:** Real-time Agmarknet price data synchronized across regions
- **Auto-Scaling:** Dynamic resource allocation handles traffic spikes during harvest seasons



Amazon S3: The Unified Data Foundation

Crop Image Library

PlantVillage dataset with 54,000+ disease images optimized for visual RAG and multimodal analysis

Policy Documents

PM-Kisan, PKVY, and scheme PDFs enable hallucination-free government guidance

Sensor Logs

JSON time-series data from soil moisture and weather stations drive precision irrigation

Vector Indices

FAISS embeddings enable lightning-fast semantic search across agricultural knowledge

All data encrypted at rest and in transit, with role-based access controls ensuring farmer privacy and data sovereignty.

Agri-Expert: Multimodal Visual Intelligence in Action



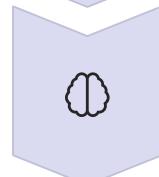
Image Ingestion

Farmer uploads leaf photo to S3 via WhatsApp or web interface



Vector Search

Lambda uses Titan Multimodal Embeddings for similarity matching



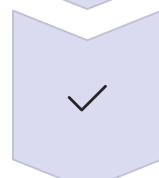
AI Grounding

Claude 3.5 compares query image with top PlantVillage references



Market Linkage

Real-time Mandi prices via Agmarknet API



Actionable Output

Disease ID + organic treatment + cost analysis

Policy-Navigator: Agentic RAG for Government Schemes



Source Data Ingestion

Data.gov.in PDFs and CSVs (PKVY, PM-Kisan) stored in S3 with metadata tagging



Vector Embedding

Bedrock Knowledge Base with Titan Text Embeddings creates semantic search layer



Reasoning Loop

Agent searches schemes AND validates infrastructure before providing final answer



Eligibility Verification

DynamoDB stores Census 2011 village amenities for location-specific validation

Resource-Optimizer: Predict-Then-Act for Sustainability

Component	Technology Implementation
Sensor Data Ingestion	JSON logs (soil_moisture, temperature, humidity) uploaded to S3 via IoT gateway
Weather Grounding	Lambda fetches IMD forecasts every 6 hours, stores predictions in S3 for temporal analysis
Predictive Engine	Strands Code Interpreter calculates evapotranspiration using Penman-Monteith equation
Cross-Agent Coordination	Consults Policy-Navigator for electricity subsidies to optimize pump timing recommendations

Knowledge Bases: Agriculture & Market Intelligence

Agmarknet Market Data

Daily wholesale prices for onion, tomato, potato, wheat, and rice across all districts.
Cleaned Kaggle dataset (2023-2025) enables real-time market arbitrage opportunities.

PlantVillage Disease Library

50,000+ images of healthy and diseased leaves covering 38+ disease classes including Potato Late Blight, Tomato Bacterial Spot, and more. Optimized for Claude 3.5 Sonnet's vision capabilities.



Knowledge Bases: Policy & Environmental Intelligence



Data.gov.in Portal

PDF and CSV summaries of PM-Kisan fund allocation, PKVY organic schemes, Village Amenities Census 2011 uploaded to Bedrock Knowledge Base



AgriFieldNet Geospatial Data

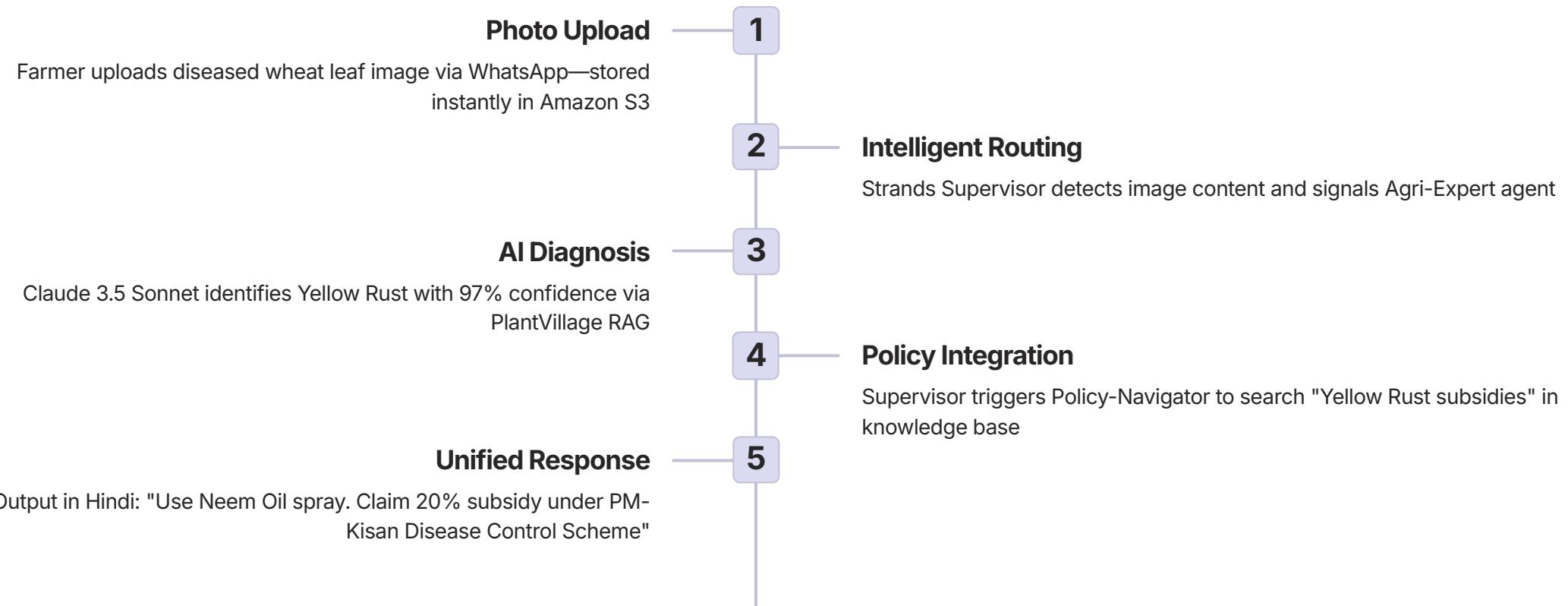
Crop type data for Bihar, Odisha, Rajasthan, and UP enables location-specific recommendations



IMD Agro-Met Data

Historical rainfall and temperature patterns power predictive analytics for seasonal planning

Real-World Impact: Solving the Yellow Rust Crisis



End-to-end response time: Under 8 seconds from upload to actionable recommendation

URE Delivers Unprecedented Competitive Advantages

Feature	Existing Players	URE Advantage
Agri-Intelligence	AgroStar, DeHaat (siloed single-purpose apps)	Contextual Cross-Talk: Pest diagnosis auto-triggers subsidy search and irrigation optimization
Policy Navigation	Kisan e-Mitra (reactive rule-based chatbot)	Agentic RAG: Village-specific eligibility validation with Census 2011 infrastructure data
Sustainability	Fasal, BharatAgri (IoT sensors only)	Proactive Alerts: S3 event triggers predict irrigation needs 48 hours in advance
Architecture	Monolithic platforms with vendor lock-in	Serverless & Modular: AWS-native with sovereign LLM migration path (BharatGen)

Projected Impact: Transforming Rural Livelihoods at Scale

20%

Yield Increase

Through early disease detection and precision agriculture practices

38%

Water Savings

Via predictive irrigation scheduling and soil moisture optimization

₹5K

Cost Reduction per Acre

Optimized fertilizer and pesticide use based on real-time crop health

20%

Income Uplift

Net farmer income improvement from combined interventions

