

# A Real-Time Agricultural Advisory System Using Edge-Guided Deep Video Analytics with Detection and Temporal Learning Pipelines

Introducing an innovative farming assistant app designed to revolutionize agriculture in Kerala, leveraging cutting-edge machine learning to support local farmers.



# Karshika Sakhi: Your Digital Farming Assistant

Karshika Sakhi is a digital advisor for Kerala's smallholders, providing **real-time agricultural guidance in Malayalam** through an intuitive AI interface. It uses on-device vision models and "sync-on-connect" technology to offer offline diagnostics for pests and diseases via video, while building a digital memory of farm history for personalized seasonal tracking.

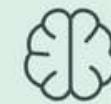
The platform functions on low-end smartphones by integrating lightweight vision architectures (EfficientNet, Tiny-ViT) with LLMs (LLaMA/Mistral) refined for local dialects. This bespoke pipeline delivers expert-level feedback in under two seconds, bridging the gap between advanced machine learning and practical, field-level needs.

# How It Works: Spotting Plant Diseases



## 1. Leaf Image Capture

Simply take a clear photo of your plant's affected leaf using the app.



## 3. AI Analysis (CNN Model)

Our advanced MobileNET or EfficientNET models analyze the image for disease patterns.

## 2. Image Preprocessing

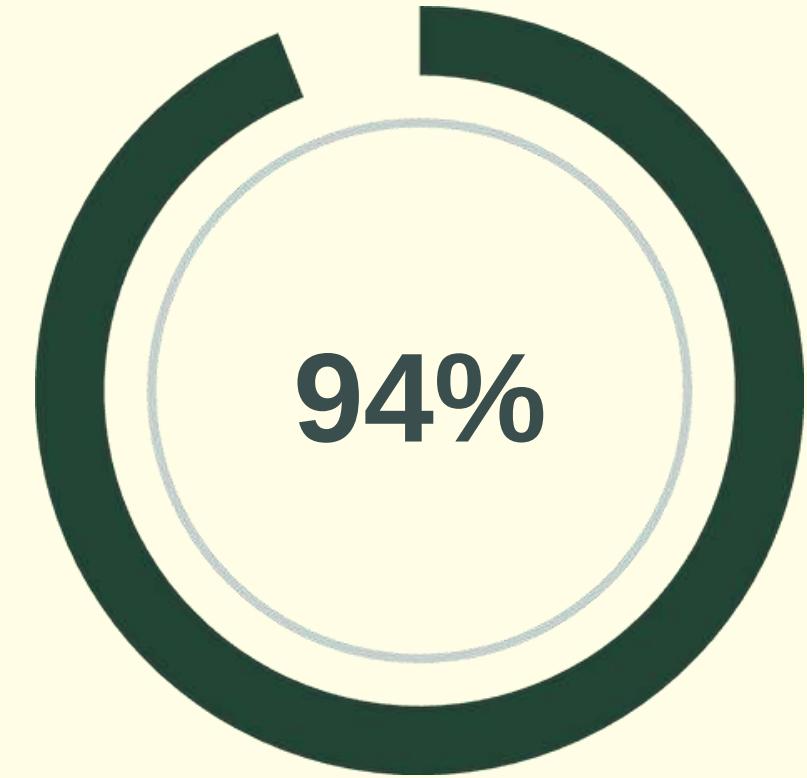
The app intelligently refines the image for optimal analysis, enhancing features.

## 4. Instant Diagnosis

Receive the probable disease name and confidence level in seconds.

# Unmatched Accuracy: 94% Success Rate

Karshika sakhi boasts an impressive 94% accuracy in identifying plant diseases, providing reliable results you can trust to protect your crops. This high precision ensures timely and effective interventions.



## Disease Detection Accuracy

Achieved through advanced CNN models trained on thousands of diverse crop disease images, this 94% accuracy minimizes false positives, fostering farmer trust. It's validated across Kerala's common crops like rice, coconut, and spices, ensuring reliable diagnoses that save time and money by preventing unnecessary pesticide use.

# Computer Vision: Seeing Your Farm Differently

Our app integrates a suite of powerful computer vision algorithms to give you a detailed understanding of your crops' health and growth.

## YOLOv8n: Object Detection

Accurately identifies and counts pests, fruits, and other objects in the field, helping you detect pest infestations early and quantify crop yield.

## MobileSAM: Precision Segmentation

Isolates specific plant parts or problematic areas, such as diseased leaf sections, for precise analysis and targeted intervention.

## EfficientNet-B0, MobileNetV3: Disease Classification

These models work together as the core of our disease identification system, providing rapid and accurate diagnoses to protect your crops.

# Advanced Crop Monitoring & Stress Detection

Beyond disease, Karshika Sakhi monitors growth and detects subtle signs of stress to prevent issues before they escalate.

1

## Tiny-ViT, Swin-Tiny

Identifies plant growth stages and precisely classifies pests.

2

## Optical-Flow + Color-Based Detection

Detects early signs of plant stress by analyzing visual changes.

3

## Temporal CNN

Tracks and predicts plant growth timelines for optimal management.



# Conversational AI: Your Personal Agri-Expert

Speak naturally to the app and get personalized advice and information, just like talking to a local agricultural expert.



## Dialogue Engine

Powered by LLaMA, Mistral, or Phi-3 for natural and intelligent conversations.



## Speech Recognition

Understands your queries in Malayalam using Coqui/Vosk.



## Neural TTS Models

Provides clear, natural-sounding responses in Malayalam.

# Intelligent Reasoning & Memory for Deeper Insights

Our app isn't just a tool; it's a learning companion for your farm. It continuously processes every piece of information you provide and learns from your interactions over time. This ongoing learning process enables the app to offer increasingly personalized, predictive, and relevant advice, transforming raw data into actionable insights for better decision-making and optimal yields.



## Knowledge Graph Engine

This powerful engine goes beyond simple data points, creating a rich network of interconnected information. It intelligently links diverse datasets such as crop types, soil analysis, historical weather patterns, common disease outbreaks, and even real-time market trends. By understanding these complex relationships, the app provides truly comprehensive and context-aware recommendations, helping you make informed decisions about everything from planting schedules to pest management.



## Event Extraction Model

Our advanced Event Extraction Model actively monitors and interprets your interactions and farm data. It pinpoints critical farming milestones like planting dates, fertilization schedules, pest sightings, irrigation events, and harvest times. By recognizing these patterns and significant events, the model continuously refines its understanding of your farm's operational rhythms, providing more accurate and timely advice that's deeply rooted in your farm's specific history and current situation.



## Farmer Genome (Embedding Model)

The Farmer Genome is a unique digital fingerprint of your farm. This embedding model compiles and processes all available data to create a detailed profile encompassing specific farm characteristics, such as soil composition, water sources, predominant crop varieties, local climate zone, and historical performance metrics. This living profile ensures that every piece of advice is precisely tailored to your farm's individual needs and evolving conditions, leading to increasingly personalized recommendations and predictive insights for optimal yield and resource management.

# Disease Detection: Identify Plant Health Issues

localhost:5173/#/detect

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**Krishi Sakhi**  
Your Digital Farming Companion

- Dashboard
- Farms
- Activities
- Reminders
- Officers
- Chat
- Detect**
- Weather
- Market
- Feedback
- Profile

**Disease Detection**

Upload a photo of your crop to detect diseases 🌱

**Upload Crop Photo**

Drag and drop your image here, or click to browse

Choose File

Supported formats: JPG, PNG • Max size: 5MB

Logout

Simply upload a photo of your affected crop and get instant disease identification powered by our AI models.

# Chat with Your AI Farming Expert

The screenshot shows a web-based AI farming companion named Krishi Sakhi. The interface includes a sidebar with navigation links like Dashboard, Farms, Activities, Reminders, Officers, Chat (which is selected), Detect, Weather, Market, Feedback, and Profile. The main area features a dark-themed chat window with a green header bar. The header bar displays the Krishi Sakhi logo, the text "Your Digital Farming Companion", and a language selection button for "English". The main chat area has a dark background with light-colored text bubbles. The first message is from the AI: "Namaste! I'm your Krishi Sakhi (farming companion). How can I help you today?". This was sent at 12:55. The user then asks, "What's the current pepper price?", which the AI replies to at 12:55. The AI also provides general advice about market prices and selling strategies. At the bottom of the screen, there is a footer bar with several quick question links: "What disease does my rice crop have?", "Will it rain today?", "When should I fertilize coconut trees?", and "What's the current pepper p". Below this is a large input field labeled "Ask your farming question..." with a microphone icon and a camera icon.

localhost:5173/#/chat

Krishi Sakhi  
Your Digital Farming Companion

English

Namaste! I'm your Krishi Sakhi (farming companion). How can I help you today?

12:55

What's the current pepper price?

12:55

- Prices change daily across markets.
- Visit the 'Market' page for current district-wise rates.
- Sell when trend shows a steady rise.
- Account for transport and commission costs.

12:55

What disease does my rice crop have?

Will it rain today?

When should I fertilize coconut trees?

What's the current pepper p

Ask your farming question...

# Personalized Farmer Profile

localhost:5173/#/profile

Krishi Sakhi Your Digital Farming Companion

rspahn Farmer • Ernakulam

English Kerala 0 yrs

Dashboard Farms Activities Reminders Officers Chat Detect Weather Market Feedback Profile Logout

Personal Information

Full Name: rspahn Email: Not provided Phone Number: —

Language: English Experience (years): 0 Number of farms: 0

State: Kerala District: Ernakulam

Farms

No farms added.

App Settings

Language: English Choose your preferred language

This screenshot shows the 'Personalized Farmer Profile' page from the Krishi Sakhi app. At the top, there's a navigation bar with back, forward, and search icons, and the URL 'localhost:5173/#/profile'. Below the header, the user's profile card is displayed with a green background. It shows the user's name 'rspahn', title 'Farmer • Ernakulam', and language 'English', location 'Kerala', and experience '0 yrs'. To the left of the profile card is a sidebar with various menu items: Dashboard, Farms, Activities, Reminders, Officers, Chat, Detect, Weather, Market, Feedback, and Profile. The 'Profile' item is highlighted with a green background. At the bottom of the page, there's a call-to-action message: 'Create your unique farmer profile to get personalized recommendations based on your farm's specific conditions and history.' A footer bar at the very bottom contains links for Logout and other app features.

Create your unique farmer profile to get personalized recommendations based on your farm's specific conditions and history.

# Real-Time Weather Forecasting

localhost:5173/#/weather

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## Krishi Sakhi

Your Digital Farming Companion

Dashboard Farms Activities Reminders Officers Chat Detect Weather Market Feedback Profile Logout

## Weather Forecast

7-day weather prediction with farming advisories

Select District: Thiruvananthapuram

### Current Weather - Thiruvananthapuram

30°C haze Feels like 35°C

Humidity	Wind Speed
70%	2.06 m/s
Pressure	Visibility
1010 hPa	4.5 km
Rain Chance	Updated
0%	12:46

### Farming Advisories

Watering Advisory - Current humidity is 70%. Regular watering recommended.

Harvesting Window - Good weather conditions for harvesting in the next few days.

### 7-Day Forecast

TODAY 30°C SUN 27°C SUN 23°C SUN 22°C MON 21°C MON 21°C

Get accurate weather predictions and farming advisories tailored to your district to plan your activities better.

# Live Market Price Tracking

localhost:5173/#/market

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## Krishi Sakhi

Your Digital Farming Companion

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### Market Prices

Live crop prices and market trends for better selling decisions

Select District: Ernakulam Select Market: Kochi Spices Market Select Crop: Rice Last Updated: 21/12/2025, 12:58:20 Refresh

Rice

3,500  
3,000  
2,500  
2,000  
1,500  
1,000  
500  
0

Mon Tue Wed Thu Fri Sat Sun

**Minimum Price** ₹2800 /quintal Lowest recorded price for Rice in Kochi Spices Market

**Modal Price** ₹N/A /quintal Most common price for Rice in Kochi Spices Market

**Maximum Price** ₹3200 /quintal Highest recorded price for Rice in Kochi Spices Market

Track real-time crop prices across different markets to make informed selling decisions and maximize your profits. Get direct access to certified agricultural experts and officers for personalized guidance on your farming challenges.

# Track Farm Activities & Progress

localhost:5173/#/activities

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## Activity Tracking

Log and track your farm's progress over time.

**Krishi Sakhi**  
Your Digital Farming Companion

**Dashboard** **Farms** **Activities** **Reminders** **Officers** **Chat** **Detect** **Weather** **Market** **Feedback** **Profile**

**Activity Summaries**

**Log New Activity**

**FARMER**

grp 2 (Ernakulam) All Farmers dd/mm/yyyy

**FARM (OPTIONAL)**

Select Farm dd/mm/yyyy

**DATE**

21/12/2025 Sep 22, 2025

**ACTIVITY DESCRIPTION**

Describe what you did... e.g., 'Irrigated 2 acres of rice field' or 'Applied fertilizer to coconut trees'

💡 Tip: Use natural language! The system will automatically categorize your activity.

**Log Activity** **Cancel**

Log all your farming activities, from planting to harvesting, and track your farm's progress over time with detailed records.

# Help Us Improve - Share Your Feedback

localhost:5173/#/feedback

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Krishi Sakhi  
Your Digital Farming Companion

Dashboard Farms Activities Reminders Officers Chat Detect Weather Market Feedback Profile

## Help Us Improve

Your feedback helps us make Ammachai AI better for farmers like you

### Why Your Feedback Matters

- ✓ Help us understand your farming needs better
- ✓ Improve features that matter most to you
- ✓ Make the app more user-friendly
- ✓ Add new features you'd like to see

### Recent Improvements

- Added smart activity tracking
- Connected with agricultural officers

### About You

NAME: **rspahn**

EMAIL: **your.email@example.com**

PHONE: **9101464166**

I AM A: **Farmer**

### Your Feedback

OVERALL RATING: **5/5**

Your feedback is invaluable in helping us improve Karshika Sakhi. Share your experience and help shape the future of farming technology.

# Karshika Sakhi: A Vision for Kerala's Agricultural Future

Karshika Sakhi is being developed to revolutionize traditional farming practices across Kerala. Our comprehensive platform is designed to empower countless farmers, driving unprecedented efficiency, knowledge, and prosperity, and helping cultivate success in every field.

## Advanced Features in Development: Pioneering the Agricultural Revolution

Our commitment to continuous innovation is unwavering. We are actively developing groundbreaking features that will further advance the livelihoods of smallholder farmers and solidify Kerala's position at the forefront of agricultural technology. Our roadmap ensures these innovations will be ready to transform farming.

1

### Video Pipeline

Real-time crop monitoring through advanced video analytics, utilizing entropy-based frame filtering for efficiency, motion detection for early alerts, and low-FPS WebRTC streaming for seamless data transfer, even in remote areas.

2

### Blockchain Integration

Ensuring transparency and trust in agricultural transactions with SHA-256 hashing and Merkle tree validation. Leveraging Hyperledger smart contracts for secure, verifiable farm records and direct market access.

3

### Offline Mode

Uninterrupted functionality, even without internet access. Our system incorporates quantized TFLite models for on-device AI and a local FAISS-Lite embedding store for critical data, ensuring farmers are always connected to vital insights.

These innovations underscore our dedication to advancing smallholder farmer livelihoods and building a resilient, prosperous agricultural future. Join us in this agricultural revolution! We invite you to be part of our early adoption program and beta testing phase. Contact us to learn how you can contribute to shaping the future of farming in Kerala.