

SAMPOORNA KRISHI - AN AI POWERED FINTECH PLATFORM FOR INDIAN FARMERS

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Keywords:

Agri-FinTech, AI Powered FinTech, Generative AI, Multimodal Intelligence, Structured Output, Crop Disease Diagnosis, Market Forecasting, Financial Inclusion, Multilingual Accessibility, Next.js, Zod.

Introduction:

Sampoorna Krishi (meaning "Complete Agriculture") is a comprehensive, AI-powered FinTech web application designed to empower Indian farmers. By integrating advanced generative AI with essential financial services, the platform provides critical financial tools, access to government schemes, and intelligent agricultural advisories through a user-friendly, multilingual interface. The goal is to bridge the technological and informational gap that has long persisted in the agricultural sector, providing farmers with the digital resources they need to improve their financial stability, increase farming efficiency, and make more informed decisions.

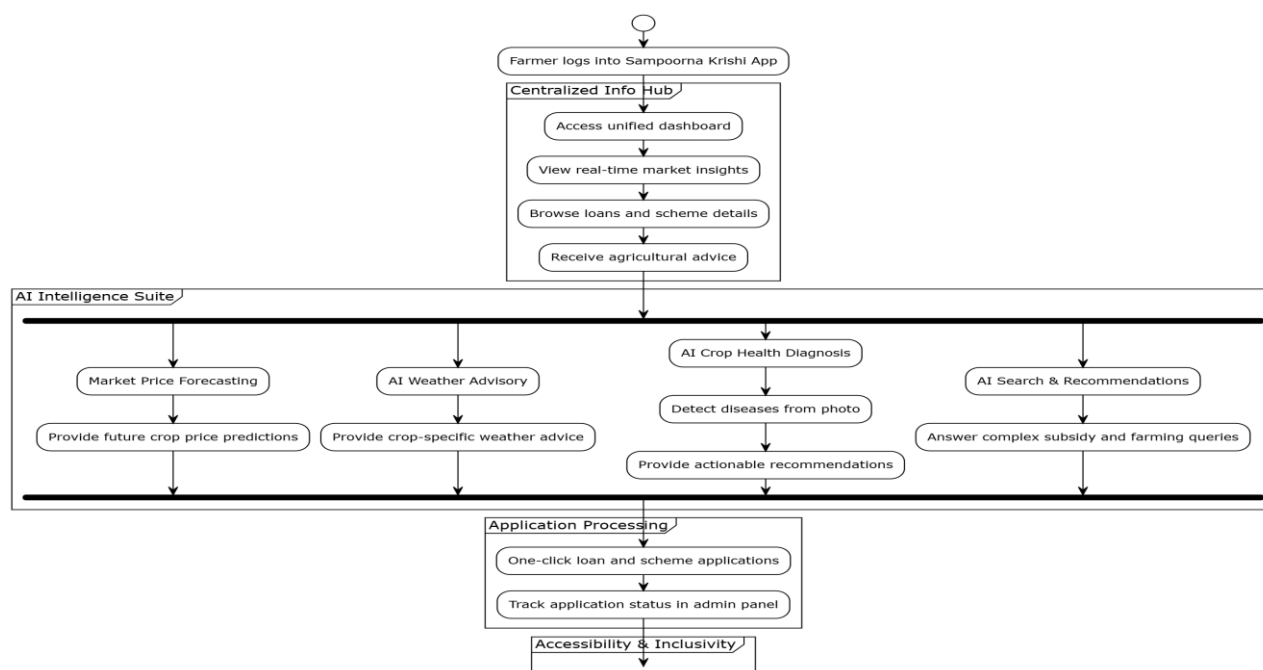


Figure 1: System Design Diagram of functional requirements

Objectives

1. **Empowerment & Information:** To bridge the information gap by providing a centralized platform for real-time market prices, government schemes, and financial services, reducing dependence on intermediaries.
2. **AI-Driven Intelligence:** To leverage Generative AI for hyper-localized weather advisories, predictive price forecasting, and real-time crop health diagnosis via image analysis.
3. **Inclusion & Productivity:** To boost farm yields and profitability through a multilingual, accessible interface that simplifies financial applications and promotes data-driven decision-making.
4. **AI-Driven Decision Support:** The project aims to leverage the transformative power of Generative AI to serve as a personal, on-demand agricultural expert.

Methodology:

The Sampoorna Krishi platform is developed using an Agile methodology, prioritizing iterative refinement of Generative AI outputs to ensure real-world reliability. The system architecture leverages the Next.js App Router and React Server Components (RSC) to deliver a lightweight, high-performance frontend optimized for low-end devices and unstable rural networks. System intelligence is powered by Google's Gemini 2.5 Pro, which utilizes native multimodal capabilities and sophisticated prompt engineering to assign specialized "expert" personas—such as agricultural pathologists or economists—within a unified Firebase Genkit pipeline. To ensure data integrity, the Zod library is employed for strict schema definition, forcing the AI to return structured, type-safe JSON responses and eliminating the risks associated with manual string parsing. State management is handled pragmatically through the React Context API and local state to minimize boilerplate, while the overall user experience is grounded in Universal Design, featuring multilingual support and AI-driven "Read Aloud" accessibility to bridge the digital and literacy divide among Indian farmers.

Result and Conclusion:

The **Sampoorna Krishi** project successfully realized its primary objectives by demonstrating that a centralized, AI-powered FinTech platform can effectively bridge the information gap for Indian farmers. Results indicate that the integration of **Gemini 1.5 Pro** provided highly reliable, multimodal decision support, ranging from accurate crop health diagnoses to context-aware market price forecasting. By utilizing **Zod-enforced structured outputs** and **Firebase Genkit**, the prototype overcame common LLM challenges such as hallucinations and formatting inconsistencies, ensuring a stable user experience. Furthermore, the platform proved the viability of a simplified, one-click financial application process and inclusive design through its multilingual, "Read Aloud" accessibility features. In conclusion, while currently a proof-of-concept using simulated data, the project serves as a robust blueprint for future digital agricultural services. By transitioning toward real-time banking and government API integrations, Sampoorna Krishi has the potential to transform from a diagnostic tool into a comprehensive, production-ready ecosystem that enhances the financial inclusion and operational productivity of millions of farmers across India.

Project Outcome & Industry Relevance

The immediate project outcome is a highly functional, responsive web application prototype that seamlessly intertwines specialized FinTech workflows with accessible generative AI. For the industry, this represents a scalable proof-of-concept demonstrating how modern agricultural solutions can successfully integrate directly with digital banking pipelines. It provides an operational template for financial institutions aiming to tap into rural markets, highlighting that complex digital adoption barriers can be overcome through native language support and multimodal interactions.

Working Model vs. Simulation/Study

This project constitutes a comprehensive Working Model web application prototype. It operates live application routing, functioning frontend interfaces, and makes live, real-time API calls to Google's Gemini multimodal AI backend. While the financial ledger systems and specific scheme application databases utilize mocked underlying data simulations to guarantee security during the prototype phase, the core artificial intelligence generation, logic structuring, and application workflows act as a fully functional model.

References:

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Future Scope:

The future scope of this project includes:

1. **Banking Integration:** Transition from mock to genuine loan processing using Open Banking APIs and the Account Aggregator framework.
2. **Government Connectivity:** Integrate with India Stack and official portals for real-time scheme data and pre-filled application forms.
3. **Live Market Analytics:** Incorporate real-time APMC mandi feeds to increase the accuracy and timeliness of AI price forecasting.