**Proposal Title:**  
**AI Forecasting in Perishable Crops Logistics**

**Submitted To:** MSME Idea Hackathon 5.0  
**Host Institute:** TKR College of Engineering and Technology (TKRCET)

### 1. Executive Summary

This project proposes an AI-driven forecasting and planning tool to optimize the logistics of perishable crops like tomatoes, bananas, and leafy vegetables. These products often suffer high post-harvest losses due to uncoordinated supply chains, unpredictable demand, and inadequate storage decisions. The solution empowers agri-MSMEs, cold storage units, and farmer cooperatives by predicting market demand, estimating shelf life, and suggesting optimal transport timing using real-time weather, pricing, and storage data. By reducing spoilage and enhancing farmer returns, the tool contributes to sustainable agriculture and efficient rural logistics.

* **Theme:** Agriculture and Environment / Smart and Resilient Supply Chains
* **Objective:** Use AI to minimize perishables wastage, reduce transport costs, and stabilize market prices
* **Expected Outcomes:** 30% drop in spoilage, 15% increase in MSP realization for farmers
* **Funding Requested:** ₹14,90,000

### 2. Applicant Details

* **Institution:** TKR College of Engineering and Technology (TKRCET), Hyderabad
* **Student Status:** B.Tech (AI & Data Science)

### 3. Idea Overview

* **Problem Statement:** In India, 20–30% of perishable produce is wasted before reaching consumers due to delayed transport, lack of demand prediction, and improper storage decisions. MSMEs managing cold chains or mandis lack access to advanced forecasting tools to mitigate these risks.
* **Proposed Solution:**
  + Forecast regional demand using AI trained on market arrival + climate data
  + Predict shelf-life of produce in real time based on temperature and humidity
  + Advise MSMEs on when and where to move stock to prevent loss
  + Alert for glut/shortage situations in APMC or retail clusters
  + Visual dashboards and alerting tools for rapid decision-making
* **Target Users:** Agri-MSMEs, farmer producer companies (FPCs), mandi wholesalers, and logistics startups

### 4. Innovation and Novelty

* India’s first AI engine dedicated to perishables supply forecasting
* Combines market trend mining, weather-affected shelf-life modeling, and adaptive transport guidance
* Introduces proactive stock redirection and market matching instead of reactive liquidation
* **TKRCET’s Role:**
  + Forecast model development using real-time APIs and predictive learning models
  + Cold-chain optimization simulation lab using synthetic datasets and IoT emulators
  + Testing with local farmer networks, wholesalers, and mandi operators

### 5. Societal and Economic Impact

* **Economic:**
  + Up to ₹20,000 savings per truckload by preventing overstocking and spoilage
  + Improves shelf life estimation accuracy by 80%, improving vendor confidence
* **Social:**
  + Reduces food wastage and improves farmer profitability, leading to more resilient rural economies
  + Prevents distress selling during market gluts, improving negotiation power
* **Environmental:**
  + Optimizes cold chain usage (lower emissions from unnecessary transport)
  + Encourages local sale routing and minimizes food miles

### 6. Scalability and Sustainability

* **Scalable To:**
  + Cold storages, mandis, warehouse-linked MSMEs
  + Hyperlocal grocery supply chains and B2B marketplaces in Tier 2/3 cities
* **Sustainable:**
  + SaaS model for MSMEs and cooperatives ensures recurring revenue for maintenance and expansion
  + Potential integration with ONDC agri stack, agri APIs, and Kisan e-mandi systems
* **Adaptable:**
  + Modules can extend to dairy, floriculture, seafood, and meat logistics
  + API-based architecture allows easy plug-in to government and private agri-data stacks

### 7. Cost Reduction and Efficiency

* 25–30% reduction in spoilage through proactive inventory routing
* 10–15% improvement in cold storage utilization through dynamic scheduling
* Predictive routing reduces deadhead miles and underloaded trips, cutting logistics costs

### 8. Clean and Green Energy Focus

* **Indirect Contribution Through:**
  + Reduced energy usage in cold storage facilities via optimized scheduling
  + Lower emissions due to fewer unnecessary supply routes and optimized trucking
  + Efficient inventory rotation decreases organic waste accumulation

### 9. Implementation Plan

| Phase | Timeline | Key Activities |
| --- | --- | --- |
| 1 | 0–2 Months | Develop shelf-life estimation algorithm (fruit/veg) using real-time and lab data |
| 2 | 3–5 Months | Build demand prediction dashboard with map interface, alerts, and confidence metrics |
| 3 | 6–8 Months | Pilot with 5 MSMEs in Hyderabad, Warangal, Vijayawada including user feedback loops |
| 4 | 9–12 Months | Expand to 20+ MSMEs, integrate live IoT feeds from cold-chain sensors for validation |

### 10. Funding Requirements (₹14,90,000)

| Component | Cost (₹) | Purpose |
| --- | --- | --- |
| AI Model Training | ₹4,00,000 | Data sourcing, feature engineering, model training, and testing |
| Dashboard & App Development | ₹3,00,000 | Cross-platform MSME UI with interactive map, alerts, and tracking tools |
| Cold-Chain IoT Integration | ₹2,50,000 | Hardware interface development + software bridge for sensor input |
| Pilot Testing & Outreach | ₹2,00,000 | Farmer producer company (FPC) onboarding, vendor training, and field testing |
| Data Licensing | ₹1,00,000 | Daily mandi pricing, satellite weather data, IMD feeds licensing |
| Contingency & Maintenance | ₹2,40,000 | Cloud server hosting, analytics dashboard updates, model fine-tuning |

### 11. Expected Outcomes

* 10,000+ tonnes of produce tracked and optimized in pilot phase
* 30% reduction in spoilage across storage and transport layers
* Higher price realization for 500+ farmers per harvest season
* Establishment of AI-based forecasting baseline for national perishables logistics

### 12. Risk Analysis and Mitigation

| Risk | Mitigation Strategy |
| --- | --- |
| Prediction inaccuracy | Regular model retraining with anomaly detection modules |
| Farmer/mandi resistance to change | Onboarding through trusted FPCs, cooperatives, and digital literacy sessions |
| Data access gaps | Hybrid data approach using historical, crowd-sourced, and satellite inputs |
| Cold chain data variability | Manual override options with confidence scoring in dashboard UI |

### 13. Team & Expertise

* **Project Lead:** Final Year B.Tech (AI), TKRCET
* **Advisor:** AgriTech domain expert with experience in rural logistics systems
* **Mentor Faculty:** Senior Professor, Dept. of Data Science, TKRCET
* **Tech Support:** Student developers and researchers with Python, ML, and IoT expertise

### 14. Alignment with Viksit Bharat @2047

This project contributes to the Viksit Bharat vision by: - Doubling farmer income through efficient, data-led agri-logistics - Reducing national agri-wastage by 50% through predictive planning - Equipping MSMEs and FPOs with AI tools to modernize agricultural commerce - Supporting Atmanirbhar Bharat by enabling export readiness in perishable sectors