



Research Paper

Title: Solving Market Access and Price Exploitation Problems Faced by Indian Farmers Using AI and Data Science

❖ Research Contributors

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Batch: 2023 – 2026
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❖ Purpose of This Study

As students with a deep interest in using technology to solve real-life problems, we chose to work on an issue that directly affects millions of lives in India — the daily challenges faced by our farmers.

We noticed that even in 2025, many small and marginal farmers still struggle to sell their crops at fair prices. They are often forced to rely on middlemen, lack proper market information, and have no access to modern digital tools. This doesn't just lead to income loss in some heartbreaking cases, it pushes farmers into debt, stress, and even suicide.

Through this research, our aim is to understand why these problems still exist, even after years of technological growth. We explored how AI and data science can be used not just to predict crop prices, but to really support farmers in local languages, with offline features, smart financial advice, and simple interfaces they can actually use.

This project means more to us than just an academic requirement it's our small attempt to build something meaningful that could one day make a real difference in someone's life.

Market Access Challenges, Research Gaps, and Farmer Suicides in India: A Data-Driven Review

• Introduction: The Real Crisis Behind Agriculture in India

Agriculture is the backbone of the Indian economy, employing over **50% of the population**, yet a large portion of farmers, especially smallholders, struggle with **low income, unfair pricing, and market inaccessibility**. Despite digital revolutions and AI-based innovations, many farmers still sell their produce at throwaway prices due to **lack of real-time price transparency, dependence on middlemen, and poor infrastructural support**.

- ❖ According to the *Agricultural Census 2015-16*, **86% of Indian farmers** are categorized as small or marginal, making them highly vulnerable to market shocks and exploitation.

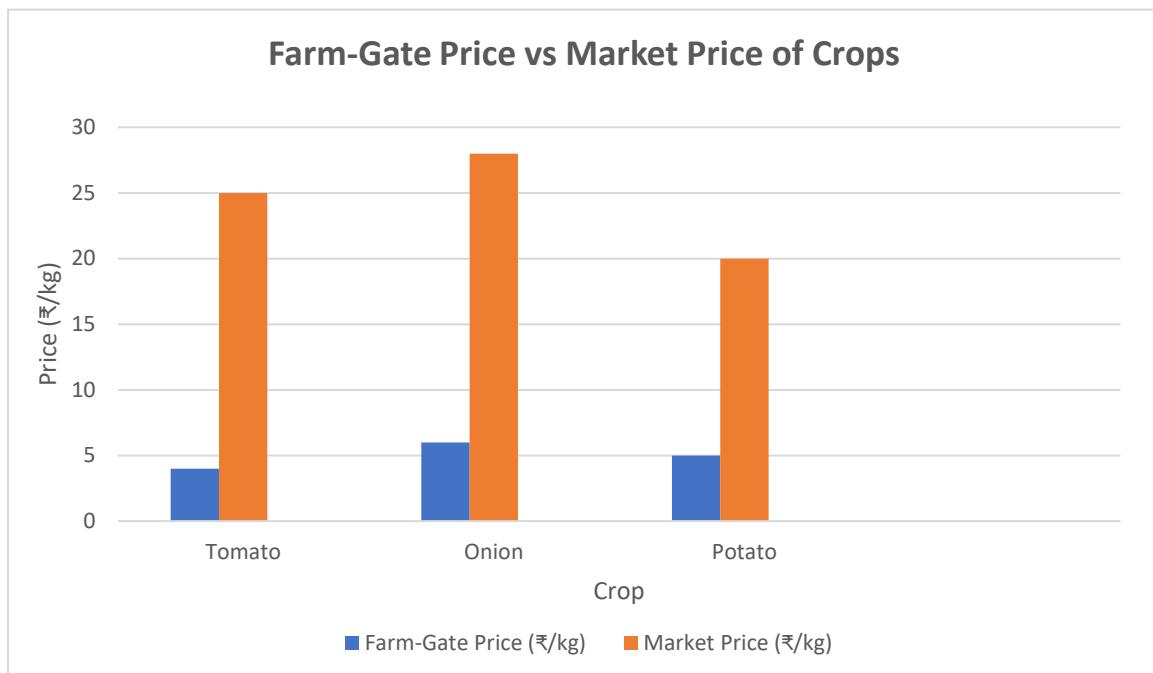
The Price Problem: Why Farmers Don't Earn What They Deserve

Even though produce may sell for ₹20–30/kg in urban markets, farmers often receive only ₹4–6/kg at the farm gate. The rest is lost in middle layers—traders, transporters, wholesalers, and retailers. Without proper **pricing information or direct access to buyers**, farmers have **no bargaining power**.

◆ Key Issues:

- Farmers lack **real-time access to mandi prices**
- **Middlemen manipulate prices** and delay payments
- No cold storage means **forced selling** after harvest
- Transport cost makes distant markets **inaccessible**
- Government e-market platforms (like **eNAM**) are underused due to poor digital literacy

- ❖ Source: NABARD All India Rural Financial Inclusion Survey, 2020 – only 10% of farmers use digital platforms for sales.



Gaps in Current AI/ML Solutions

Although many AI models have been proposed to predict crop prices, they rarely solve the core problems farmers face. Most of these models are developed in academic or tech environments without farmer participation, making them less usable or impactful.

What Researchers Are Doing:

1. **Wei Ma et al. (2018)** – Created a machine learning model using government mandi data to predict prices using random forests and decision trees.
2. **Bhardwaj et al. (2023)** – Used deep learning models like LSTM + Graph Neural Networks for improved prediction accuracy
3. **AGRICAf (2024)** – An explainable model to forecast prices of wheat, soy, maize at national scale.

❖ What They Don't Solve:

Gap	Reason It's Still Unsolved
Lack of voice-based/local-language tools	NLP in rural Indian languages is underdeveloped
No offline or low-internet support	Most apps need constant internet/data
Hyperlocal price prediction	Mandi data is often state- or district-level, not pincode/local level
No buyer connection	Forecast-only systems; farmers still don't know <i>who</i> to sell to
Lack of explainability	Complex models give results without reasons, leading to low trust
Financial & profit planning tools missing	Few models consider crop cost, loan burden, break-even
No field testing	Tools made without real farmer input or usability studies

NOTE: This highlights the need for **inclusive, explainable, low-data AI models** that speak the farmer's language, literally and technically.

Farmer Suicides in India (2025)

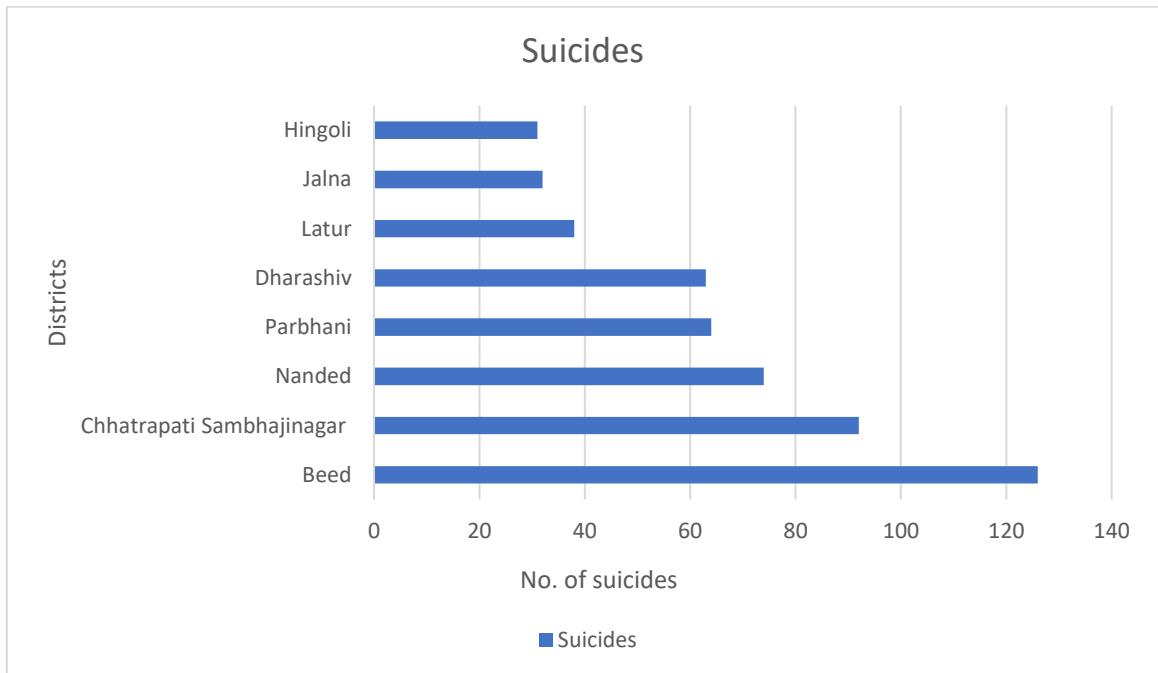
The result of continued market stress, debt, and hopelessness can be seen in rising farmer suicides, especially in drought-prone and economically backward regions.

❖ Case Study: Marathwada, Maharashtra (Jan–Jun 2025)

District	Suicides
Beed	126
Chhatrapati Sambhajinagar	92

Nanded	74
Parbhani	64
Dharashiv	63
Latur	38
Jalna	32
Hingoli	31
Total (Jan–Jun)	520

- ❖ **479 suicides** reported across Maharashtra in just **March and April 2025** alone.



Why Farmers End Their Lives:

Cause	Description
Debt burden	Loans from banks or moneylenders without repayment ability
Crop failure	Due to erratic rainfall, pests, or low yield
Market collapse	Low prices after harvest leave no income
Mental stress	No access to mental health care; social pressure
Lack of support	Delayed or rejected government compensation

❖ The Research Opportunity We Can Focus On

The project or research paper could propose an **AI-driven, explainable, voice-enabled agri-market support system** that includes:

- ❖ Real-time & hyperlocal price forecasting
- ❖ Voice-based interface in local languages
- ❖ Predictive analytics for profit margins
- ❖ P2P buyer-seller recommendations
- ❖ Offline SMS/USSD version for low-internet users
- ❖ Transparent explanations of price predictions
- ❖ Crop profitability calculator + financial planning module

Why This Matters for Research

- Highlighting these gaps in your literature review shows you're thinking holistically beyond models to real-world viability.
- By addressing voice delivery, offline use, interpretability, hyperlocal data, market access, and financial advisories, you can propose a comprehensive and socially responsible AI solution.
- Framing this against the backdrop of rising suicide rates and widespread trauma underlines the urgency and humanity of your work.

