AGRICULTURE COSTING AND PROFITABILITY COMPUTATION USING DATA SCIENCE MODELS AND DEVELOPMENT OF PREDICTIVE MODEL FOR COST REDUCTION AND PROFITABILITY MAXIMIZATION

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Keywords:

Agriculture Costing, Profitability Prediction, Data Science Models, Decision Support Dashboard, Machine Learning.

Introduction:

Many farmers across India are quitting farming because they feel it is no longer profitable or worth the effort. The main problem is that most farmers do not calculate their total costs and expected profits properly. They still use the old “pen and book” method and have no modern tools to predict how much money they will actually make.

A quick survey we did showed that 92% of farmers are very interested in a simple costing and profitability prediction tool. Thanks to today’s technology, it is now easy to use data science to build models that can reduce costs and increase profits.

This project will create a practical, data-driven platform specially for small-scale farmers. It will track every expense — from seeds and labour in the field right up to harvest and sale — so farmers can clearly see the exact selling price they need to make the profit they want.

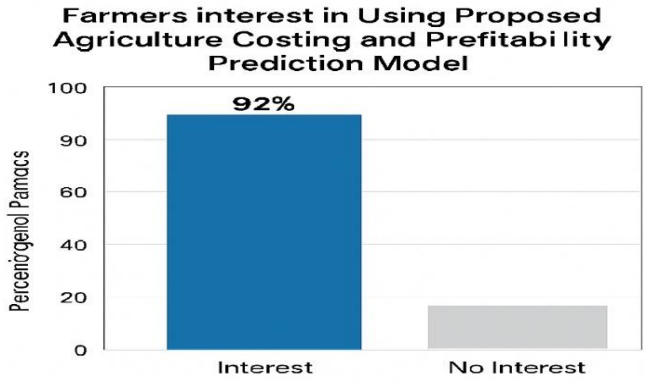

Figure 1: Farmer interest in using proposed agriculture costing and profitability prediction model

Objectives:

1. Build strong predictive models for crop yield, input costs and overall profitability under different situations.
2. Create an easy-to-understand decision-support system that suggests practical ways to save money (for example, best mix and timing of inputs) and shows expected profit.
3. Develop a simple mobile/web dashboard and test it with 10 real farms to measure actual cost reduction and profit increase.
4. Prepare complete documentation and a clear plan to scale up and commercialise the tool.

Methodology:

The project will follow these simple, step-by-step stages:

1. Data Collection & Cleaning – We will gather information through farmer surveys, daily farm diaries, weather records, soil data and market prices using easy mobile apps. All farmers will give consent, and their data will be kept completely private.
2. Feature Engineering– We will create useful new measurements such as fertiliser used per hectare, timing of activities, water used, labour days, previous market prices and weather effects.
3. Modelling – We will train several machine-learning models (starting with simple linear regression, then Random Forest and XGBoost for predictions, and ARIMA/LSTM for price forecasting). We will test the models carefully and use explainable tools so farmers can understand why the system gives a particular suggestion.
4. Scenario Simulation Module – Farmers will be able to try “what-if” situations (e.g., what if fertiliser price rises or there is less water?) and immediately see how profit changes.
5. Pilot Deployment & Evaluation – The dashboard will be given to 10 farms with simple explanations and action suggestions. We will measure model accuracy, actual cost savings or profit gain, and ask farmers for feedback through surveys.

Result and Conclusion:

The project is expected to deliver a fully working predictive system and a simple farmer-friendly dashboard. The tool will analyse real farm data and give clear, actionable advice on how to reduce costs. In the pilot with 10 farms, we expect to see measurable savings in costs or higher profits.

In conclusion, easy-to-understand models that show local profitability scenarios will build trust among farmers and give them a practical decision-support tool. This will also create a clear roadmap to expand the platform and link it with government market information and agricultural extension services.

Project Outcome & Industry Relevance

This project will help agri-tech companies, farm advisors and input suppliers by giving them accurate demand forecasts. For small farmers it will increase financial stability and reduce income ups and downs. For Garden City University it will strengthen applied data-science research and create useful community extension programmes for agriculture.

Working Model vs. Simulation/Study

This project involves the development of a functional working model a real mobile/web dashboard backed by a machine-learning pipeline and scenario simulation engine. It will be tested live with 10 actual farms.

Project Outcomes and Learnings

The main outcome will be a system that gives clear, practical recommendations on input choices, timing and crop selection. We will learn how much real impact the tool has on farm costs and profits, and what challenges traditional farmers face while using new technology.

References:

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[3] Prity, “ML-based crop recommendation system incorporating environmental and economic features,” 2024.
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Future Scope:

1. Scale the successful pilot for large-scale deployment and commercialisation.
2. Integrate the system with national market information systems and government agri-extension programmes to benefit a larger number of farmers.
3. Incorporate real-time data from low-cost soil sensors and automatic weather updates in later versions to improve prediction accuracy.
4. Expand the models to cover additional crops and diverse climatic conditions across India.