

Agro Advisor for farmers using ML

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Abstract—This study introduces Agro Advisor, a web-based platform aimed at assisting farmers by utilizing machine learning (ML) for predictive insights and real-time data access. Farmers frequently encounter difficulties due to a lack of timely information on crop selection, weather updates, government programs, and market rates. To address this, Agro Advisor features a crop prediction model that recommends the most suitable crops based on user-provided environmental conditions. Additionally, the platform delivers updated details on minimum support prices and daily mandi rates. A dedicated weather module is also integrated, allowing farmers to check forecasts for specific locations.

Index Terms—Crop prediction model, Machine Learning, Weather forecast, Government Schemes, Minimum Support Price, Daily Mandi Price.

I. LITERATURE REVIEW

The application of machine learning (ML) in agriculture has gained considerable traction over the past decade, addressing key challenges in crop management. This study examines the impact of data-driven approaches on modern farming, emphasizing their role in aiding farmers with informed decision-making to enhance productivity. Agriculture remains a crucial sector, fulfilling essential human needs while serving as a major source of employment globally. In countries like India, where agriculture forms the backbone of the economy, it contributes approximately 15.4% to the GDP. Research by Meshram et al. (2021) highlights the advantages of ML in agriculture, particularly in reducing farming losses by offering data-driven recommendations. Their comprehensive survey on recent ML applications in the field underscores its potential in enhancing productivity. Several ML techniques, such as Decision Trees, Support Vector Machines (SVMs), and Neural Networks, have been applied in various agricultural domains, including soil classification, crop yield prediction, and plant health monitoring.

II. INTRODUCTION

The agricultural sector has experienced a significant transformation due to rapid advancements in technology and digital innovations. The integration of Machine Learning (ML) into farming, commonly referred to as "Agro-Tech," is revolutionizing traditional agricultural methods. It helps farmers increase crop yields, optimize resource utilization, and make informed decisions. This paper introduces "Agro Advisor," an ML-driven tool designed to support farmers by providing insights on crop selection, weather forecasting, and irrigation planning. The primary aim of Agro Advisor is to offer data-driven recommendations that enhance agricultural productivity and sustainability while addressing crucial challenges like food security and climate resilience.

2.1. General overview - Agriculture is fundamental to the global economy and sustains billions of people worldwide. Conventional farming techniques often fall short in efficiency and sustainability, leading to decreased production and environmental harm. The adoption of ML presents a transformative approach to addressing these issues. Agro Advisor bridges the gap between complex data analysis and the practical needs of farmers, making advanced technology more accessible and applicable for various farming practices.

2.2. Modules Description:

2.2.1. Crop Management:

ML algorithms assist in determining the best planting periods, irrigation schedules, and nutrient requirements. By considering local conditions and crop-specific needs, farmers can enhance their agricultural strategies.

2.2.2 Yield Production: Accurate yield predictions are essential for supply chain efficiency and market

planning. By leveraging historical data, weather trends, and soil conditions, ML models offer precise forecasts that help farmers make strategic decisions.

2.2.3 Home Page: The home page provides two key features: "Predict Your Crop" and "Government Data Access." The "Predict Your Crop" function helps identify the most suitable crops based on environmental parameters provided by the user. The "Government Data Access" feature delivers information on minimum support prices (MSP), daily mandi prices, and other agricultural benefits.

2.2.4 Contact Page: This section includes fields for first name, last name, email, phone number, and a message box. Users can submit inquiries, concerns, or suggestions to enhance their engagement with the platform.

2.2.5 FAQ Page: The FAQ module is designed to provide quick and accessible answers to common questions from farmers and stakeholders. It improves user experience by addressing frequently asked concerns efficiently.

2.2.6 Weather Page: A crucial tool within Agro Advisor, the weather page delivers real-time meteorological insights. It includes information on temperature, humidity levels, and date and time, helping farmers plan agricultural activities effectively.

2.2.7 About page: This section provides an overview of the Agro Advisor platform. It highlights the platform's focus on delivering personalized crop predictions, real-time updates on government policies, and essential agricultural data to optimize decision-making and productivity.

2.2.8 Example Page: This page categorizes different seasons and provides recommended crop options for each, helping farmers choose suitable crops based on seasonal variations.

III. METHODOLOGY

3.1. Proposed Methodology - The Agro Advisor platform leverages machine learning (ML) to provide farmers with valuable insights aimed at enhancing their efficiency and profitability. By integrating ML

into agricultural processes, this system offers a significant opportunity to improve productivity and sustainability. The tool applies data-driven techniques to analyze farming conditions and suggest actionable strategies for optimal results.

3.2. General architecture - Agro Advisor is structured to assist farmers in making informed decisions by offering crucial data on crop selection, market trends, and government policies. A predictive model is developed to suggest suitable crops based on prevailing environmental conditions. The platform also provides real-time information on Minimum Support Prices (MSP) and daily mandi prices, enabling farmers to determine the best time to sell their produce. Data is gathered from multiple sources, including government repositories and agricultural marketplaces. Essential inputs for the system include soil characteristics, weather conditions, historical crop performance, and pricing trends.

3.3. The algorithm used - Utilizes machine learning algorithms (such as Random Forest, Decision Trees, or Neural Networks) to predict the best crop for a given set of environmental parameters. Provides a bridge between the frontend and backend, enabling real-time data updates. Fetches current MSP and daily mandi prices from government or external API sources. Provides crop recommendations based on user-input conditions.

IV. ABOUT ALGORITHM

The Random Forest Classifier is a smart machine learning technique used in the Agro Advisor project to help farmers choose the best crops based on soil and environmental conditions. Instead of relying on a single decision tree, this method creates multiple decision trees and combines their results to make more accurate predictions and avoid common errors.

4.1 Why Random Forest for Crop Prediction?

4.1.1 Handles Complex Data Easily: Farming involves many factors like soil type, temperature, and rainfall. Random Forest can understand these complex relationships better than simple models.

4.1.2 Reduces Errors: A single decision tree can sometimes give misleading results, but by averaging multiple trees, Random Forest ensures more reliable predictions.

4.1.3 Works Well with Missing Data: Real-world farm data often has gaps or inconsistencies, but this algorithm can still function effectively.

4.1.4 Highlights Important Factors: It helps identify key factors that influence crop growth, such as soil pH, temperature, and rainfall.

4.2 How Agro Advisor Uses Random Forest

4.2.1 Step 1: Gathering and Preparing Data

- The model learns from past agricultural records, including soil properties, climate conditions, and previous crop yields.
- Key factors like temperature, humidity, soil pH, and rainfall are selected as inputs.

4.2.2 Step 2: Training the Model

- The data is split into two sets—one for training the model and another for testing it.
- The Random Forest algorithm creates multiple decision trees (e.g., 100 trees).

- Each tree is trained on a different random sample of the data.
- The trees make independent predictions, and the most common prediction is chosen as the final result.

4.2.3 Step 3: Making Predictions & Recommendations

- Farmers enter details about their land, and the model suggests the best crop based on similar conditions from past data.
- The model also provides a confidence score, showing how reliable the prediction is.

4.2.4 Step 4: Integrating with the Agro Advisor Platform

- The model is built into the Agro Advisor website.
- Farmers can input their land details to get instant crop recommendations.
- The system can update predictions dynamically using real-time weather and soil data.

V. GRAPHICAL REPRESENTATION

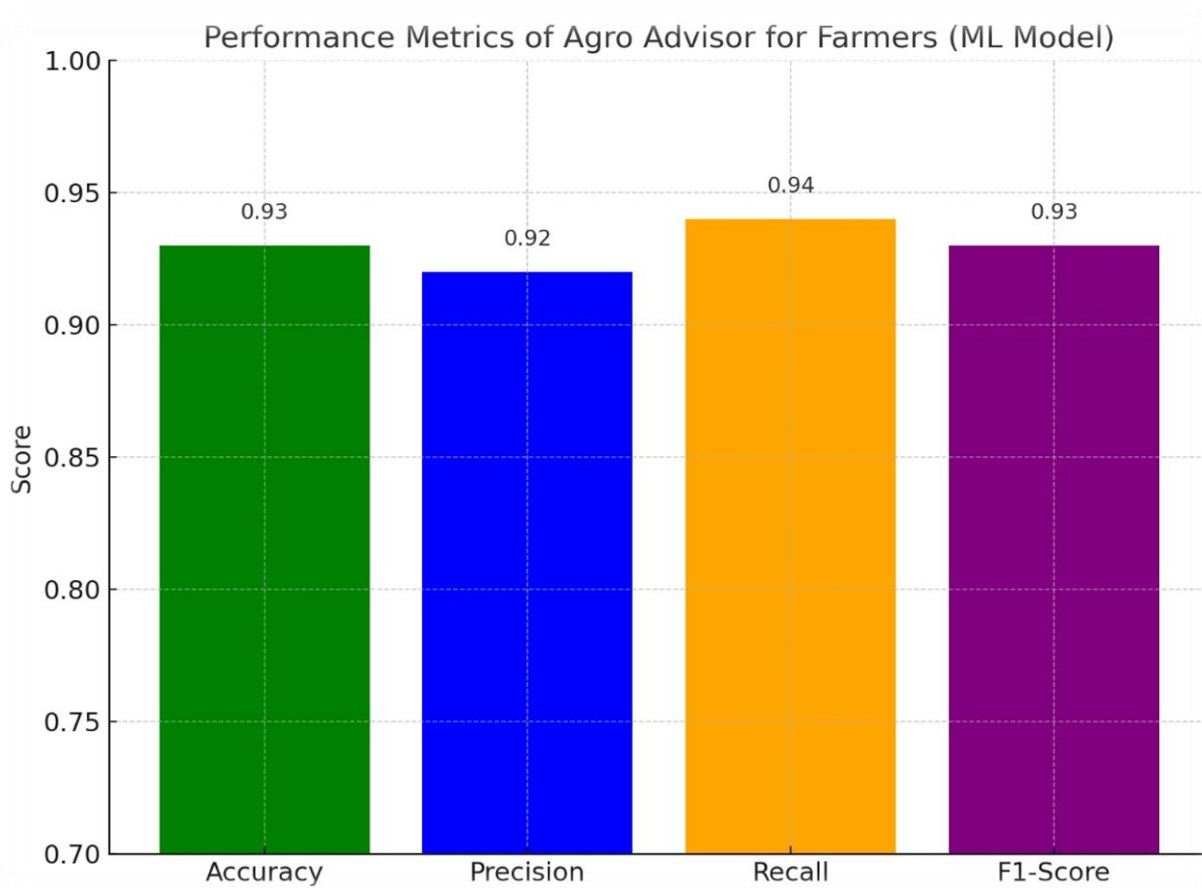


Figure 5.1 Performance Metrics graph

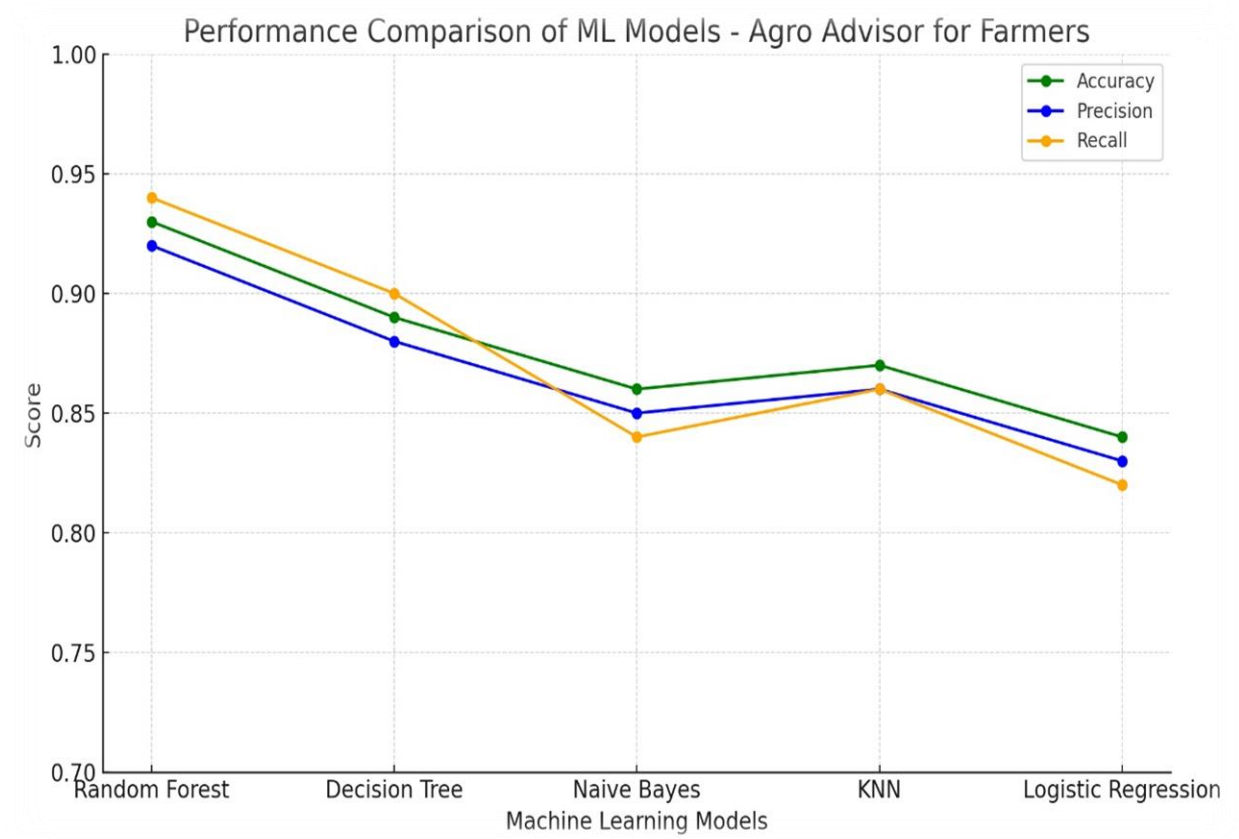


Figure 5.2 Performance comparison of ML Models

VI. OUTPUT SCREENS

Agro Advisor

Agro Advisor using Machine Learning

Get crops recommendation based on your soil and weather conditions using Machine Learning. Fill in the given form and get recommendations now.

Nitrogen in parts per million (ppm)
 Phosphorus in parts per million (ppm)
 Potassium in parts per million (ppm)
 Temperature in Celsius (°C)
 Humidity in percentage (%)
 Ph (0-14)
 Rainfall in millimeters (mm)

Recommend Crop

Figure 6.1 Crop Recommendation

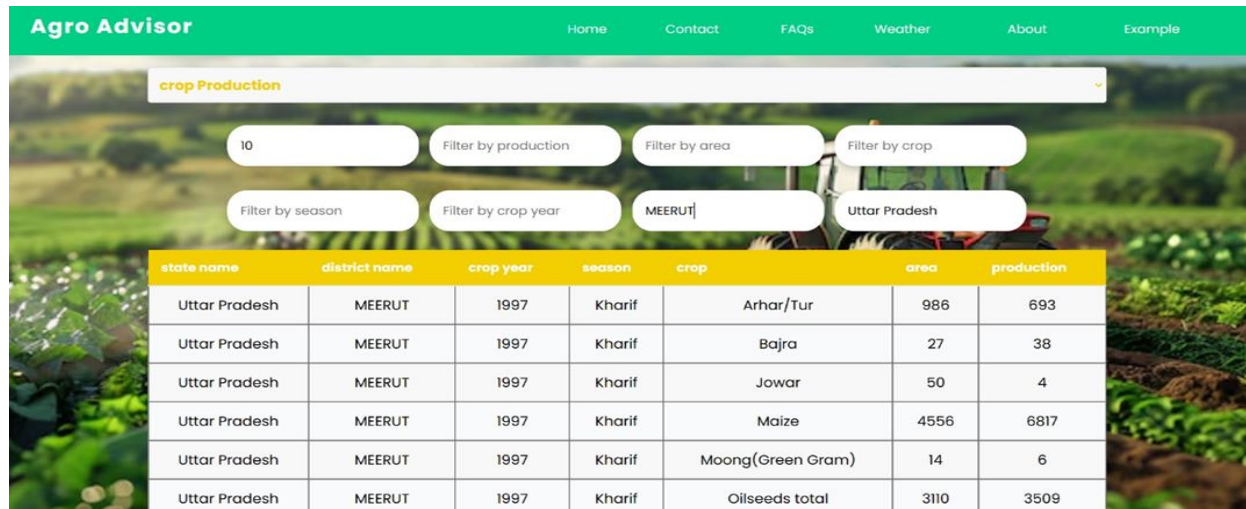


Figure 6.2 Crop Production

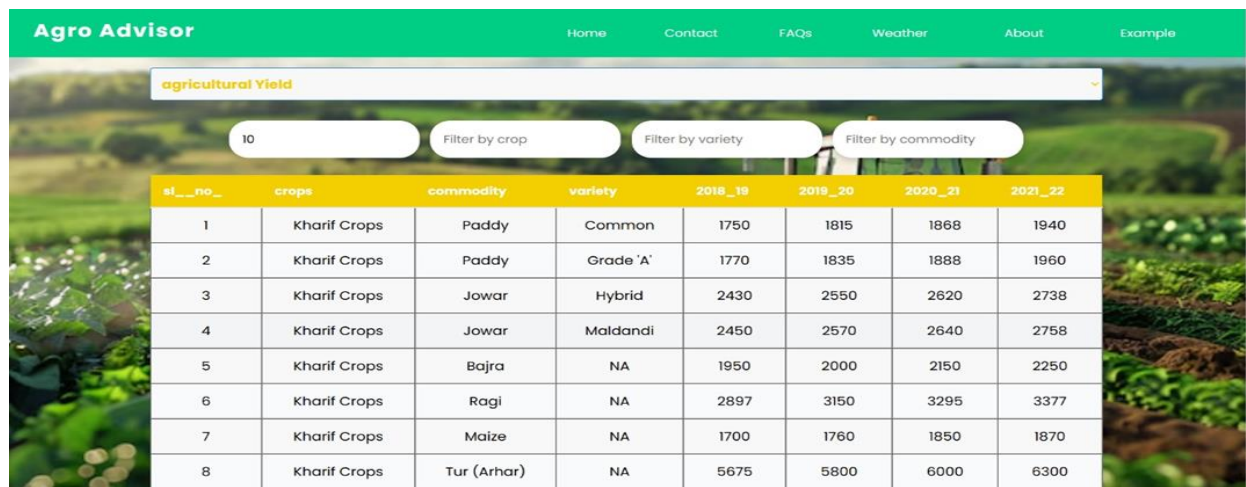


Figure 6.3 Agricultural Yield

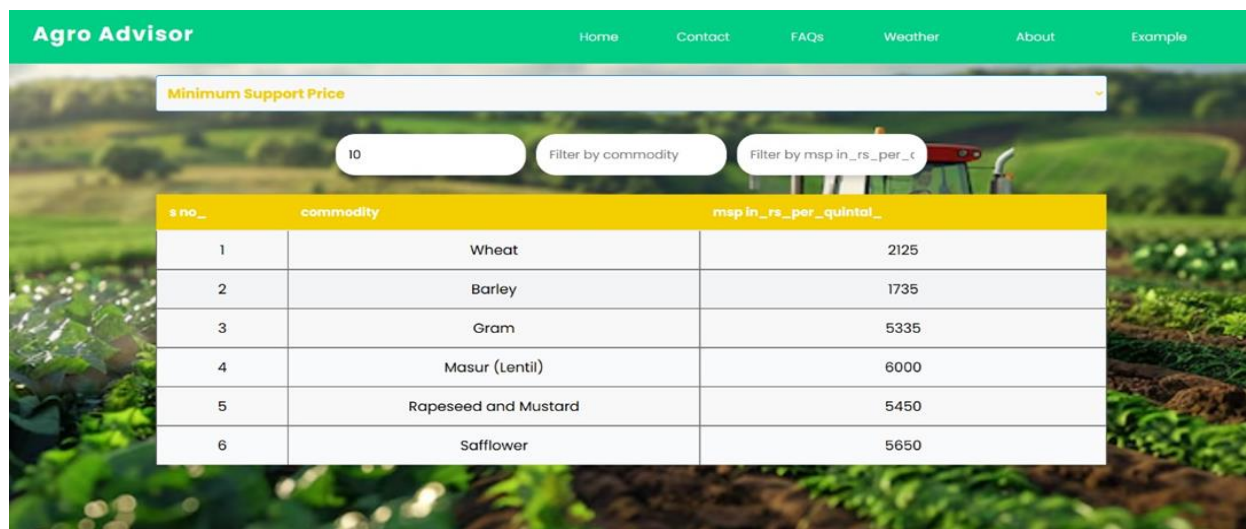


Figure 6.4 Minimum Support Price

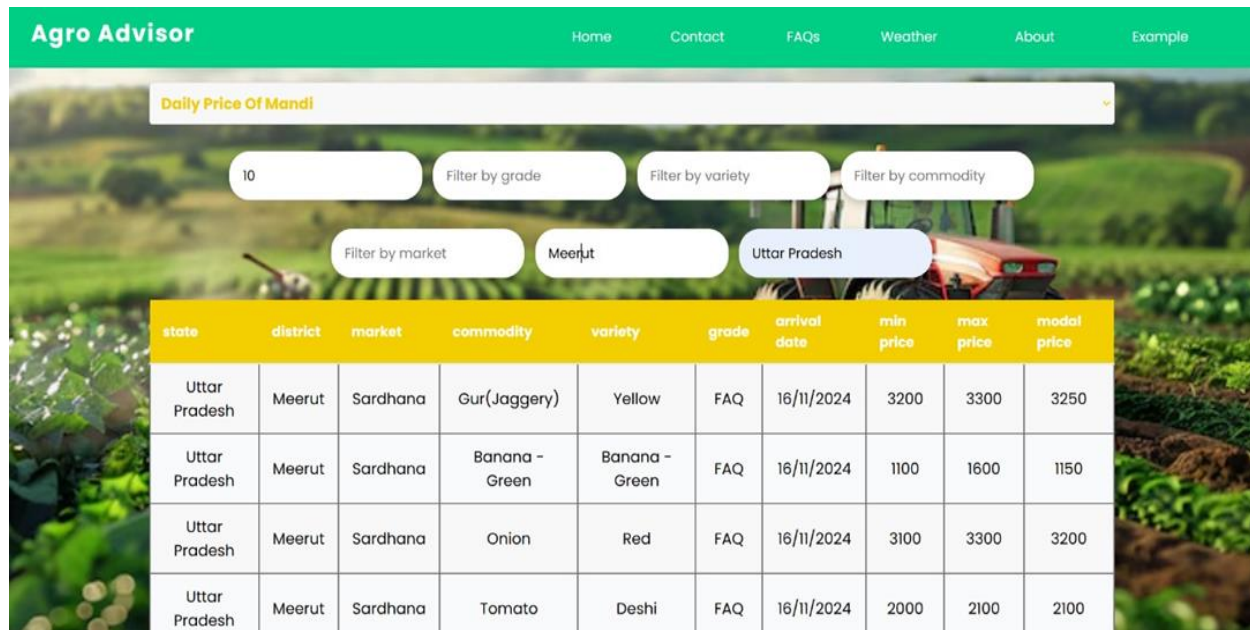


Figure 6.5 Daily Mandi Price

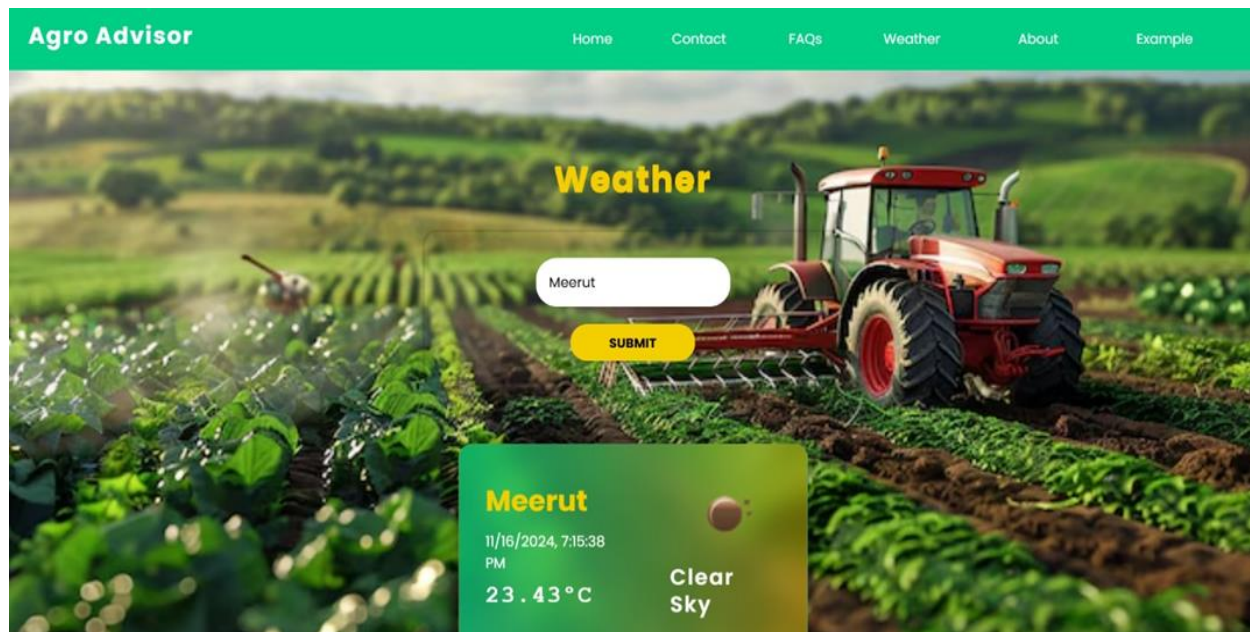


Figure 6.6 Weather Prediction

VII. CONCLUSION

This research focused on developing the Agro Advisor system utilizing Machine Learning (ML) to support farmers in decision-making. The system incorporates multiple functionalities, including crop prediction based on environmental conditions, real-time mandi prices, Minimum Support Price (MSP) data, and daily weather updates. By leveraging ML algorithms, the

system accurately forecasts crop yields while considering crucial environmental parameters such as temperature, humidity, and weather trends. Furthermore, the integration of government data on mandi prices and MSP ensures that farmers receive timely market insights. The inclusion of daily weather forecasts helps in proactive planning against weather-related uncertainties. Ultimately, the Agro Advisor system aims to enhance agricultural decision-making

by equipping farmers and stakeholders with reliable, data-driven insights.

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