

Agri Sight: AI-Powered Crop Selection and Product Recommendation System

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Abstract

Agriculture is important to many economies around the world. Farmers face many challenges, including selecting suitable crops, accessing product information, understanding government programs, and dealing with uncertainty caused by price fluctuations and climate change. Traditional farmers and new agricultural enthusiasts alike may have difficulty making informed decisions because they do not have timely access to reliable resources. The aim of this research article is to develop a centralized, internet-based resource for farmers that provides crop prediction, product recommendations, government subsidy information, and real-time market rates by incorporating user input data, such as location, soil type, and season. The system recommends suitable crop choices and agricultural products based on the user's input data. By integrating emerging technologies into agriculture, including considerations related to climate change, the proposed smart website is intended to help farmers increase productivity, minimize risks, and maximize profits while providing an easy-to-use approach for accessing up-to-date agricultural information through the Internet.

Keywords: Smart Agriculture; Crop Prediction; Product Recommendation; Government Schemes; Market Rates; Web Application.

1. Introduction

Farmers' livelihoods depend on agriculture, but many farmers continue to make decisions based on traditional knowledge and speculation. Many farmers do not adequately consider soil, climate, and market conditions when choosing crops, which can lead to lower yields and profits. Additionally, many farmers have limited awareness of available government programs, subsidies, agricultural markets, and pricing information. These challenges are further compounded by climate change, which creates unreliable weather patterns and increases risks for farmers. Agricultural challenges such as income instability, market uncertainty, and limited access to support systems can further affect farming communities [7].

The purpose of this study is to develop an online agricultural support system that provides farmers with information to aid them in making better-informed choices. The proposed website will provide crop recommendations, information about agricultural products, links to government

programs, and agricultural market information. The increasing use of digital technologies and innovative agricultural systems also demonstrates the potential to improve resource utilisation and support more sustainable approaches to agriculture [8].

The goal of the proposed agricultural support tool is to reduce uncertainty associated with farming and assist farmers who utilize traditional farming methods as well as those who want to adopt more current agricultural techniques. By bringing relevant agricultural information together through a centralized web-based platform, Agri Sight aims to support farmers in making informed decisions regarding crop selection and agricultural products.

2. Literature Review

A variety of researchers have developed systems that provide farm-specific recommendations to help growers select suitable crops and improve agricultural productivity. Digital agricultural tools can support crop selection by considering

environmental and agricultural parameters such as soil type, temperature, and other relevant conditions. Such systems can help reduce the risk associated with selecting unsuitable crops [2], [3].

Machine learning techniques have also been applied to crop recommendation and yield prediction. One study using Ant Lion Optimization and Decision Trees applies machine learning to predict suitable crops and estimate their potential yield. The decision tree provides understandable decision rules, while the optimization technique is used to improve the prediction process [3]. However, the technical complexity of such approaches may make them difficult for farmers to use directly.

Data mining techniques provide another foundation for processing agricultural data and identifying useful patterns for decision-making [4]. In addition, research on Explainable Artificial Intelligence (XAI) has explored crop recommendation systems that use soil nutrient information and historical crop-yield data. Providing explanations for recommendations can improve users' understanding and confidence in the system [6]. However, such systems primarily focus on crop recommendations and do not necessarily integrate agricultural product selection, government support information, or market-price information.

Existing crop recommendation research has therefore largely focused on identifying suitable crops using environmental, soil, historical, and machine-learning-based information [5]. While these approaches can support crop-selection decisions, agricultural information is often distributed across different sources, including government programs, agricultural markets, and product information. Government agricultural portals and digital-agriculture initiatives further demonstrate the importance of providing accessible agricultural information and digital services to farmers [1], [2].

Innovative technology-enabled agricultural systems have also explored broader approaches to improving agricultural resource utilisation, sustainability, and resilience [8]. However, most of the reviewed systems focus on a particular agricultural function rather than combining crop recommendations, agricultural product recommendations, government scheme information, and market-related information within a single user-oriented platform.

Therefore, there is a need for a simple web-based

agricultural support platform that brings these functions together in one place. Agri Sight is proposed to address this gap by providing crop recommendations based on user inputs while also providing information about agricultural products, government programs, and market prices.

3. Methodology

The overall development of the system follows a systematic approach, beginning with the initial concept and progressing through multiple stages to develop the final product.

3.1. Data Acquisition and Preprocessing

The project is implemented using a client-server approach, in which the front end provides the user interface, while the back end collects, processes, and presents user information to provide crop recommendations.

3.2. Data Collection

The application collects a limited amount of user input data required for the system, including:

- Location
- Season
- Crop preference

The remaining data required for providing crop recommendations is stored in the database. The database also stores information related to price fluctuations, government support programs, and other relevant agricultural information.

3.3. Crop Recommendation

Based on the data collected from the user and the crop-related data stored in the database, the system provides a list of recommended crops that are suitable for the specified environmental conditions.

3.4. Fertilizer and Seed Recommendations

Fertilizers, seeds, and other agricultural products are recommended based on the user's selected crop and preferred farming methods or practices.

3.5. Relevant Agricultural Government Support Programs

The application provides information about agricultural government support programs and available subsidies. This enables users to identify relevant government-sponsored programs that may provide financial or other forms of support.

4. Simulation

The website was tested under various conditions to evaluate its functionality and performance. The testing included the following types of information and system functions:

- Crop forecasting based on different input options
- Product recommendations based on crop type
- Access to government schemes and subsidy information
- Market price display
- Usability on computers and mobile phones

Various individuals tested the platform to verify its proper functioning, navigation, and presentation of results.

5. Results and Discussion

The results indicate that the website provides crop forecasting and recommendation functions, enabling farmers to identify suitable crops based on their land and seasonal conditions, along with relevant agricultural products for their selected crops. The availability of information about government incentive programs and schemes increases awareness of the options available to farmers and may support their participation in relevant programs. In addition, the availability of up-to-date market price information can assist farmers in planning their finances and making informed decisions regarding their agricultural produce.

Overall, the platform provides a means of reducing uncertainty in agricultural decision-making and creates an opportunity for farmers to improve their profitability. The interface is designed to be simple and straightforward, allowing farmers with limited technological knowledge to use the system with ease.

6. Comparison with Existing Systems

Most agriculture-related recommendation systems recommend crops using combinations

of datasets that include soil, environmental, and historical data. Some systems also use machine learning techniques to improve prediction accuracy. However, not all systems provide an explanation for why a particular crop is recommended, and many focus primarily on crop prediction.

While several agricultural systems provide similar crop recommendations, they generally do not combine information about agricultural products, such as seeds and fertilizers, with government schemes, subsidies, and current market prices. Consequently, farmers may need to access different sources to obtain the information required for agricultural decision-making, including information related to market conditions and the timing of crop sales.

The proposed system, Agri Sight, is designed as a web-based agricultural support platform that brings these functions together in one place. The system provides crop recommendations based on the user's location and seasonal conditions while also providing information about relevant agricultural products and services.

In addition to crop and product recommendations, the platform provides information about current and upcoming government programs and subsidies. It also provides current market-price information for agricultural produce, which can assist farmers in making informed decisions regarding the sale of their crops.

The website is designed to be easy to use and is intended to accommodate both traditional and modern agricultural users. By providing multiple agricultural services through a single platform, the proposed system aims to simplify access to agricultural information and support farmers in their decision-making processes.

7. Potential Enhancements

There are several opportunities for further development of the proposed agricultural web portal. The following enhancements could improve the experience of farmers using the platform:

7.1. Weather Forecasting:

Integrating weather forecasting would allow farmers to plan their agricultural activities based on expected weather conditions, such as rainfall and temperature.

7.2. Mobile Application:

A dedicated mobile application could provide farmers with access to the same services available through the web portal on their mobile phones.

7.3. Artificial Intelligence:

Integrating artificial intelligence could enable more accurate and personalized crop and product recommendations.

7.4. Multilingual Support:

Multilingual support could allow farmers from different regions to access and use the web portal in their preferred language.

7.5. Real-Time Alerts and Notifications:

Real-time alerts and notifications could inform farmers about changes in market prices and newly available government programs.

7.6. Soil-Moisture and IoT Integration:

Integration with soil-moisture sensors and other IoT devices could help farmers monitor soil moisture and crop conditions, thereby supporting more efficient and smart farming practices.

8. Conclusion

In conclusion, this research paper presented Agri Sight, a web-based agricultural application designed as a decision-support tool for farmers in the areas of crop selection and product recommendations. The system addresses several challenges faced by farmers, including limited knowledge of crop selection, limited access to information about agricultural products and government programs, fluctuations in market prices, and risks associated with climate change.

By using information such as location, soil type, and season to support crop selection, and by providing information about relevant agricultural products, Agri Sight aims to assist farmers in making informed agricultural decisions. The system also provides information about government programs and current market prices, enabling farmers to access relevant information through a single platform.

Agri Sight is designed with user-friendly navigation to accommodate both traditional and modern agricultural users. By bringing different agricultural services and information together in one web-based platform, the proposed system aims to simplify agricultural decision-making and support improved and sustainable agricultural practices.

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