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AgriVision: AI-Driven Solutions for Sustainable Agriculture

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Abstract- *With the incorporation of both AI technologies and easy-to-use UI and UX components, AgriVision transforms the agricultural management landscape. The dataset provided below demonstrates the features of the app such as irrigation and fertilization, condition of the soil, pests and weather notifications, diseases and weeds recognition, and water table control. With its integrated approach, AgriVision assists farmers in ways, which include increasing agricultural productivity, as well as supporting the efficient usage of available resources and sustaining the environment.*

The app stands out with soil condition assessment where it tests pH, nutrient and org matter levels and offers recommendations on crop care. This is supported by periodic conditions which evolve to accommodate the evolving soil condition to promote the growth and productivity of crops.. The research in this present context offers a full data set derived from the real-world application of AgriVision.

Key Words: *AgriVision, Agriculture, Artificial Intelligence application for crops, datasets, crop observation*

1. AI POWERED SMARTPHONE APP – "AGRIVISION"

Currently, AgriVision is a new generation mobile application developed to redefine the process of agriculture with the help of Artificial Intelligence. [1] Designed for farmers, AgriVision provides the tools for crop and soil management based on real-time data and personalized analysis, as well as for effective communication with clients. The app has key tasks of endless measurement of the soil moisture, temperature, and humidity to provide proper irrigation and fertilization schedule. These insights reach the farmers through filter notifications and voice messages crucial information which is communicated beyond the farmers' literacy level. [10]

In the characterization of the soil there is a definite strength in assessing the Ph, nutrients, and organic matter to make recommendations on crops. This is further supported by regular foliar applications that do real-time adjustments to changing in ground conditions for effective and efficient crop development.The uniqueness of the AgriVision is its voice chatbot whereby farmers can use their voices to communicate with the application. This feature is most beneficial for users with colored vision or a hard time with reading or writing since it supplies instant responses and suggestions.

On environmental management, AgriVision tracks the weather activity and likely pest attacks, and alerts farmers on probable harms and ways to avoid them in case of unfavourable weather or pest attack. The app also uses AI based image recognition for diagnosis of crop diseases and weeds that are invading crops giving a detailed prescriptions for management. These are Arial and courier new for text support and Microsoft Sam as voice support to cover all the necessary support. Another significant part of AgriVision is the monitoring of water table level and giving information on the available water table depth to the farmers, especially on how to avoid watering frequently and how to avoid over watering in order to minimize on the use of the resource. Due to the simplicity of the graphic design and translated language options, this app is one of the most effective tools to help farmers worldwide. Dynamic learning abilities guarantee that the outputs provided by AgriVision improves with time and better suited for each individual.

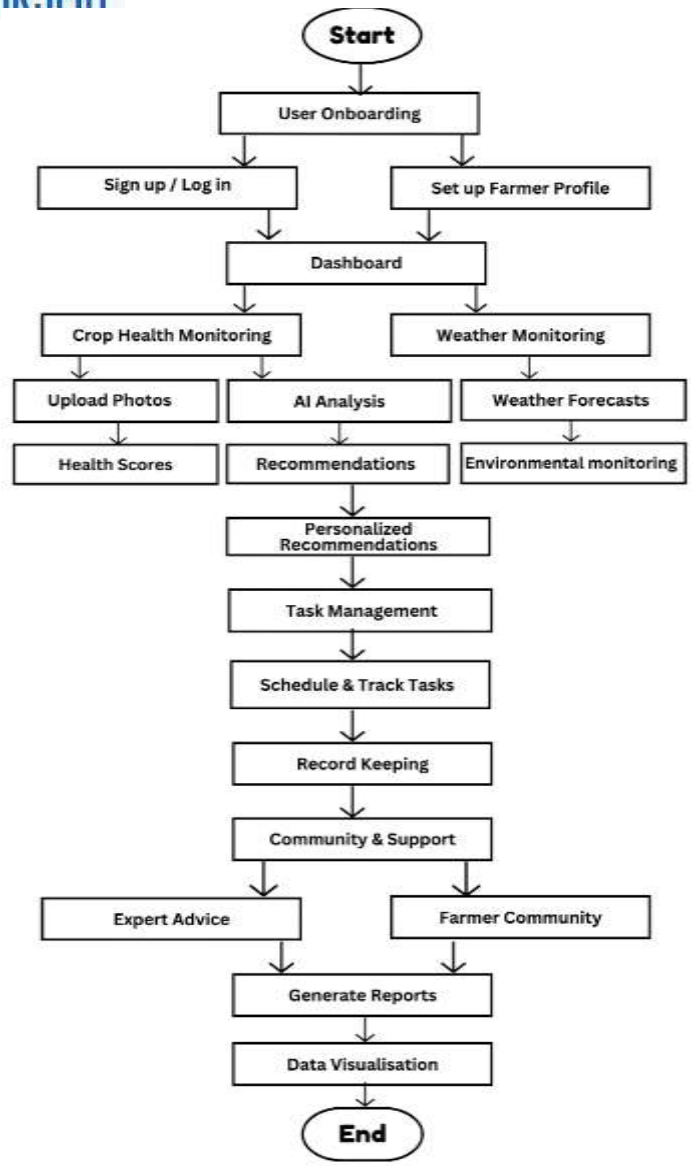

Figure 1: *Working Flowchart of AgriVision*

1.1 FEATURES

The following dataset exposes how AgriVision works such as offering information on irrigation and fertilization, the state of the soil, pests and climate, diseases, and weeds, and controlling water table. Through incorporation of these features, AgriVision appears as an innovative solution in agricultural management enhancement, increased yields, and sustainable farming.

Crop Health Monitoring : This feature of the application includes proper crop monitoring using image recognition, which uses the phone's camera to take pictures of crops and AI algorithms analyze images to detect signs of pests, diseases, and nutrient deficiencies, and health scores i.e. providing a health score for each crop based on the analysis, highlighting areas that need attention. [2]

Weather and Environmental Data : This feature integrates weather APIs to include geo-location weather forecast and alerts, and also give recommendations based on environmental factors by using IoT sensors such as moisture, temperature, and humidity (optional). [3]

Predictive Analytics : It involves the analysis of past data and present crop conditions to forecast future crop production and disease incidences due to climate and present state of crops. [4]

Personalized Recommendations : They can recommend when crops require fertilisation and watering depending on crop type and current soil analysis and also recommend treatments for identified pests and diseases, organic and chemical. [5]Farm Management Tools : Allow users to schedule and track farm tasks (e.g., planting, fertilizing, harvesting) and maintain records of crop performance, treatments, and yields for future reference. [6]

Community and Support : Access a network of agronomy experts for personalized advice and support and connect with other farmers to share experiences, tips, and advice. [7]

Data Visualization and Reports : Provide visual dashboards showing crop health trends, weather patterns, and yield predictions and generate detailed reports for review and planning purposes. [8]

Integration with Other Tools : Optionally integrate with IoT sensors for real-time soil and environmental monitoring and sync with agricultural equipment for automated operations and data collection. [9]

2. DATASET STRUCTURE

Table 1: Irrigation and Fertilization Recommendation

ID	Timestamp	Soil Moisture (%)	Temperature (°C)	Humidity (%)	Water Needed (L)	Fertilizer Type	Fertilizer Amount (g)	Voice Notification
1.	2024-08-24 08:00:00	38	28	68	20	NPK	50	"Water your crops with 20 liters of water and apply 50 grams of NPK fertilizer."
2.	2024-08-24 12:00:00	40	30	60	15	Urea	30	"Apply 15 liters of water and 30 grams of Urea fertilizer."

Table 2: Soil Condition Monitoring and Crop Care

ID	Timestamp	pH Level	Nutrient Content (ppm)	Organic Matter (%)	Soil Health Rating	Crop Suggestions
1.	2024-08-24 08:00:00	6.2	350	5.0	Good	Corn, Soybeans
2.	2024-08-24 12:00:00	5.8	300	4.5	Fair	Wheat, Barley

Table 3: Pest Attack, Weather, and Environmental Monitoring

ID	Timestamp	Weather Condition	Pest Alert	Environmental Threat	Preventive Measures
1.	2024-08-24 08:00:00	Clear	None	None	None
2.	2024-08-24 12:00:00	Rain	Aphids	Heavy Rainfall	Use insecticidal soap, reinforce drainage

Table 4: Illness, Weed Detection, and Removal Recommendations

ID	Timestamp	Detection Type	Image URL	Recommend -ed Action	Voice Notification
1.	2024-08-24 08:00:00	Crop Illness	http://example.com/illness1.jpg	Apply fungicide	"Crop illness detected. Apply fungicide as per recommendations."
2.	2024-08-24 12:00:00	Weed Infestation	http://example.com/weed2.jpg	Manual removal	"Weed infestation detected. Manual removal recommended."

Table 5: Water Table Monitoring

ID	Timestamp	Water Table Level (m)	Water Management Advice
1.	2024-08-24 08:00:00	2.5	Monitor water usage; avoid over-irrigation.
2.	2024-08-24 12:00:00	2.7	Ensure efficient water use; consider rainwater harvesting.

Table 6: User Interaction and Feedback

ID	Timestamp	User ID	Interaction Type	Query / Feedback	Response Time (s)	Voice Assistance
1.	2024-08-24 08:00:00	12345	Query	"How much water should I use today?"	3	"You should use 20 liters of water today."
2.	2024-08-24 12:00:00	67890	Feedback	"The soil health rating seems off."	5	"Thank you for the feedback. We will review the soil health algorithm."

This structured dataset will help in managing and analysing the various functionalities of the AgriVision app, ensuring it operates efficiently and meets the needs of farmers effectively.

3. BENEFITS OF AGRIVISION

Improved Decision-Making:
A sample real time soil condition status, weather data, crop status as well as stock information in a format that farmers can easily understand is obtained by AgriVision and used immediately.
This contains tools such as irrigation advice, fertilization advice, and pest management advice for farmers in order to conserve their resources and get better yields.

Voice Chatbot Integration:
By using a voice chatbot, farmers who are unable to read can engage the model — thus making it possible to share with them sophisticated equipment.
It offers crop status, query on irrigation use of fertilizer management of pests, weather conditions, and yield.
By so doing, the voice chatbot fosters greater usage of PA by providing a platform for two-way communication and converting technical and literacy barriers into linguistic ones.

Resource Efficiency:
Through giving concrete advices, AgriVision assists the farmers use water sparingly and the use of fertilizers to a maximum in order to avoid waste and polluting the environment.
The app recommends chemical-free and environmentally friendly supplements to enhance the quality of crops as well as nutrients without using a lot of chemicals.

Environmental Monitoring:
The app offers alerts of unfavourable climate for the crop and possible pest infestations to allow farmer to act accordingly.
This policy means that AgriVision checks the environmental status of the farm and then gives recommendations on the manner in which the farming should be done.

Smartphone App Accessibility:
Currently, the farmer uses a mobile application that features a user-friendly interface to interact with the AI system, which makes Avi technology adopted by AgriVision suitable for the farmer who may not have access to expensive technological implements.
The application provides alert on crop risks, recommendations and environment change to keep farmers informed at any given time.

Reduction of CNN Overuse Risks:
While AgriVision's tools do not make immediate decisions behalf of the farmers, they educate and warn farmers based on data and experience.
The system takes an approach to analysis the images and identify the lack of nutrients before it can offer recommendations making it impossible for the crops to be destroyed by over application of fertilizers or chemicals.

Integration of Farmers' Own Experience:
Some factors often include on-ground conditions and certain specifics inherent in individual farms, and these factors may still elude optimal implementation of AI. This means that, at least in a theoretical way, farmers can cross-check the recommendations made by AgriVision, and implement practical solutions that are in line with their general knowledge of their crops and fields.
The role of the farmers is to bring in their experience while the technology provides the recommendations. With their help, the farmers can find out some things that the technology might overlook and act accordingly in charge of proper crop management and maintenance which depends on their specific farming conditions.

4. DRAWBACKS OF AGRIVISION

Dependency on Technology:
Some of the problems that may be as a result of the use of this application is that farmers may relay too much on the application without using conventional techniques that are equally effective.
Thus, the applicability of the recommendations highly depends on the quality of data received from sensors, which could be questionable.

Cost and Accessibility:
Some of the important hardware requirement, for instance, sensors, smartphones, internet connectivity – can be expensive for small holder or low income farmers. To use AgriVision, the owners need a steady internet connection and matching devices, which are unavailable in some rural and developing countries.

Limited Personalization:
However, since it gives an individual alert the user is advised the app may not capture every detail of a specific farm hence the recommendations may not suit specific conditions.

Data Privacy Concerns:
The app gathers and saves personal information concerning specific farming practices and environmental conditions selecting the data privacy and security risks of the application.

Adaptation Challenges:
Some of the farmers may find it hard to embrace the new technological advance possibly making it hard to master the operations of the designed app.
The idea that some farmers may prefer traditional ways of working over digital solutions may likely remain a barriers to innovation.

5. CONCLUSION

From the use of AI in crop monitoring the world gets a new hope towards practicing sustainable agriculture. The purpose of this study is to bring the existing gap between technology and field practice, due to modernisation of farming into a single entity and a harmonious working entity. The continuous engagement with the farmers and changes in the methodology reflect that the targets that AI aims at solving are relevant and essential problems that affect farming societies.

6. FUTURE SCOPE

AgriVision, the latest and by far the most functional mobile application in agricultural management, has all the chances to shift the focus of farming in the future. It will provide better crop forecasts and made-to-order suggestions using AI and machine learning, in order to improve crop management decisions. IoT farming and Smart Farming technologies will connect farming IoT devices which will help in providing real time data to the farmers and further automate the farming process; data analytic and decision support systems will give farming intelligent innovative ways to improve the crop management and resource management. It will also add new functionality, such as precision agriculture, which will encourage environmentally friendly practices locally. Thus, AgriVision plans to increase global coverage with the help of multilingualism and proper regional adjustments.
Apart from these technologies, the trust within the agriculture production chain shall be facilitated through use of Block-chain by AgriVision. The app will also include educational learning modules and farmer based forums for sharing knowledge. The app will need to

incorporate into wider agricultural programmes and establish synergies with agritech firms and governments, as well as rely on NGOs to find innovation opportunities. Increased user involvement in the process through gamification principles and effective notifications, as well as performers' improvements to hardware facilities, corresponding to user increase and various circumstances of farming. In total, these enhancements help AgriVision try to pursue meaningful advancements and sustainable growth for agriculture.

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