

AGRONIMBUS

By Team Prometeos



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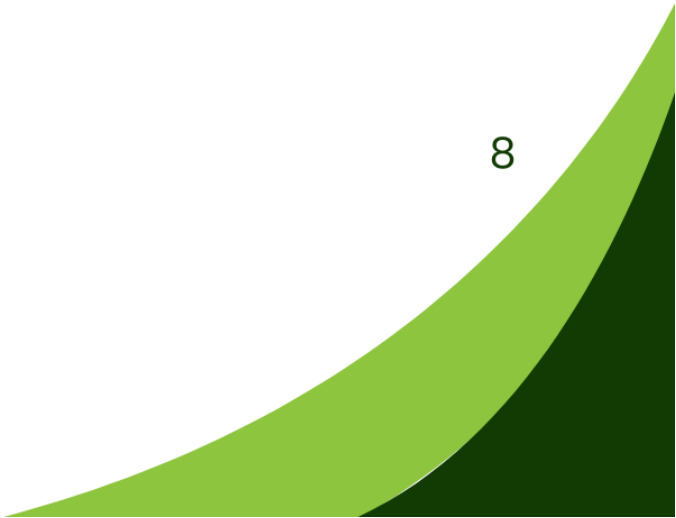
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High-Level Summary

Agronimbus is an innovative mobile application that transforms decision-making in agriculture using real-time satellite data provided by NASA. It is designed to ensure accessibility and convenience for farmers, enabling them to manage their agricultural activities efficiently and timely from anywhere, directly from their phone or mobile device, without the need for a stationary computer. Additionally, it helps them anticipate climatic challenges, prevent natural hazards such as landslides, and optimize crop management.

With Agronimbus, users can monitor critical factors such as soil quality, moisture, and temperature, receiving personalized recommendations to maximize their productivity. The system also features a virtual assistant named Orito, who offers suggestions and guidance based on the collected data, helping farmers improve the yield of their crops efficiently and sustainably.

The application combines an intuitive interface with advanced technologies, making complex data analysis accessible to any farmer, from small producers to large agricultural enterprises. Agronimbus responds to the growing need for smart solutions in a sector increasingly affected by climatic uncertainty and environmental challenges.

In essence, Agronimbus not only provides real-time information but also acts as a strategic ally for farmers, ensuring that each decision is backed by precise and up-to-date data, with the goal of enhancing agricultural production and contributing to more sustainable resource management.

Project Demo

Agronimbus offers an interactive experience designed to facilitate crop management using artificial intelligence and real-time data. Below is a demonstration of the application's components:

- Login

Users can access the application through a straightforward login or registration process. If the farmer is a new user, they can register in just a few steps by providing their location and crop preferences.

- Main Screen (Home)

Upon logging in, users are welcomed by a main screen displaying key information: their name, personalized avatar, and real-time data from their geographic location such as temperature, humidity, and latitude. On this same screen, users can access a crop suggestion section where Orito, the virtual assistant, offers recommendations based on current weather and soil conditions.

- Crop Management

In the Crop Management section, farmers can monitor the status of each crop based on soil quality, moisture, and temperature, as well as consult statistics about their best crop and current rank. Users receive notifications about badges earned for completing significant activities, motivating them to continuously improve their agricultural practices.

- Weather Monitoring

The Monitoring feature provides a map view with forecasts of landslides and other climatic phenomena in real-time, based on data provided by NASA. Points on the map are highlighted in red when there is a high risk of landslides and in yellow when the risk is moderate, allowing farmers to make preventive decisions to protect their crops.

- News and Updates

In the News section, farmers can access the latest updates related to agricultural conditions and receive recommendations on best practices, as well as stay informed about the latest industry developments.

Final Project

With an intuitive interface designed to be accessible to all users, Agronimbus transforms complex data into actionable information quickly and efficiently, enabling farmers to enhance their agricultural decisions and ensure more sustainable management of their lands. To view the complete demo of this project, please visit the following link: https://www.canva.com/design/DAGS15NUIcY/TuKvAskkUNod5amwAFMCPg/watch?utm_content=DAGS15NUIcY&utm_campaign=designshare&utm_medium=link&utm_source=editor

Project Details

Problem

Farmers face a range of water-related challenges due to unpredictable weather, pests, and diseases. These factors not only affect crop health but also negatively impact farmers' incomes and global food security. Depending on the geography, farmers may suffer from prolonged droughts or devastating floods, and in some cases, these extreme phenomena occur within the same season, further complicating the management of their lands.

Additionally, climate change is leading to the emergence of new pests and diseases, exacerbating the difficulties of maintaining stable agricultural production. This climatic and ecological uncertainty increases the risk for farmers and their livelihoods, who need advanced tools to make informed decisions and ensure the sustainability of their crops.

Proposed solution

Agronimbus emerges as a comprehensive solution to address these challenges. Leveraging real-time satellite data from NASA, the application enables farmers to monitor critical factors such as soil moisture, water quality, and weather forecasts. With these tools, users can anticipate extreme phenomena like landslides, droughts, or floods, adapting their agricultural practices to protect their crops.

Furthermore, Orito, the virtual assistant from Agronimbus, provides personalized recommendations based on the location and weather conditions of each user, helping farmers manage their water resources efficiently, reduce losses, and maximize the yield of their lands. This solution not only improves decision-making but also contributes to a more sustainable use of water and other natural resources, supporting farmers in the era of climate change.

Relevant details

- Real-Time Monitoring with Risk Prevention

The Monitoring component is key to the success of the application, as it provides accurate visualization of climatic risks, such as landslides and precipitation, based on real-time data from NASA. In the event of a detected risk, farmers receive practical recommendations on the best actions to follow to minimize the impact on their crops. These suggestions include preventive measures against possible natural disasters, enabling them to make informed decisions and protect their lands. Additionally, the system classifies risks using colors: red for high danger and yellow for moderate danger, which facilitates quick identification of the threat level.

- Integrated Calendar for Monitoring Consultations

Agronimbus incorporates a calendar that allows users to consult historical monitoring data, facilitating the tracking of weather and soil conditions over time. This is useful not only for assessing the impact of past events but also for planning future plantings and improving long-term decision-making. The calendar enables detailed visualization of information for each monitored day, allowing farmers to make comparisons and adjust their agricultural strategies based on previous climatic patterns.

- Virtual Assistant for Personalized Recommendations

Orito, the virtual assistant of the application, provides a personalized experience, guiding the user through each step of decision-making. Orito offers crop suggestions and, in case of detected risks, indicates which crops are most resilient to plant under the current soil and climate conditions.

Use of Artificial Intelligence

Currently, Agronimbus utilizes both historical and real-time data provided by NASA to offer recommendations to farmers. However, in future phases of the project, advanced artificial intelligence could be implemented to enhance the accuracy and personalization of the suggestions. One key proposal is the development of a predictive algorithm using tools like Keras and TensorFlow.

This machine learning model could leverage historical data managed via Pandas, enabling the prediction of future weather conditions and their impact on crops. Initially, the system could employ a basic neural network with three neurons, and as more data is acquired, increase the complexity to improve the accuracy of the predictions.

Additionally, the use of ChatGPT as a virtual assistant in the system would also provide users with a more interactive and personalized experience. Through this technology, farmers could make natural language inquiries about the status of their crops, receive recommendations, or even clarify doubts about how to proceed in the face of climatic risks. This integration would ensure a smoother and more accessible interaction for users, optimizing real-time decision-making.

With these implementations, Agronimbus would evolve into an even more robust tool, capable of providing precise predictions and instant support for farmers, anticipating risks and enhancing agricultural management.

Space Agency Data

At Agronimbus, we utilize data from the Global Precipitation Measurement (GPM) and other resources provided by NASA to monitor and manage weather-related risks, including precipitation and landslides. Through the Precipitation Apps platform, the data are visualized and updated in real-time, covering a wide range of meteorological phenomena globally. The following section includes a screenshot from the NASA website, which served as a primary source of information.

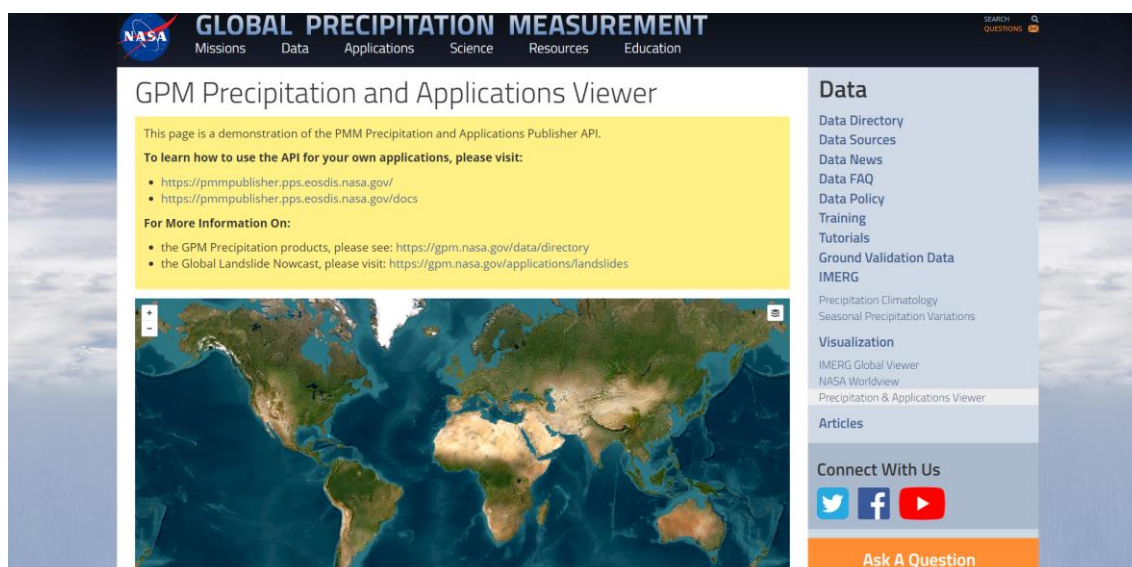


Illustration 1. Data source: NASA website. Taken from: [3].

For this project, we have used data from September 1 to October 5, which has been essential to feed our climate monitoring component. This system allows farmers to visualize not only the amount and distribution of precipitation but also the areas at higher risk of landslides. In the Agronimbus interface, users can access a map that highlights affected areas, with red markers for high risks and yellow for moderate risks. These indicators enable informed decision-making about crops and preventive measures, providing recommendations on how to proceed in case of heavy rains or landslides. Screenshots of the precipitation data can be accessed via the following link: <https://drive.google.com/drive/folders/1y3SrttSfqBZRKzLjfczzveZ7hTieQ9ld?usp=sharing>

References

- [1] "Agriculture and Water Management Data Pathfinder - Find Data | Earthdata". Earthdata. Accedido el 6 de octubre de 2024. [En línea]. Disponible: <https://www.earthdata.nasa.gov/learn/pathfinders/agricultural-and-water-resources-data-pathfinder/find-data#weather>
- [2] "Estadísticas Agropecuarias". Instituto Nacional de Estadística y Censos. Accedido el 6 de octubre de 2024. [En línea]. Disponible: <https://www.ecuadorencifras.gob.ec/estadisticas-agropecuarias-2/>
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