AgriGuard

Empowering Farmers with Innovative Solutions

Introduction

AgriGuard: A Digital Solution for Farmers

AgriGuard is built to ensure farmers have access to information, tool and resources that matter. At the heart of the project was to use a user-centered design approach that would give users an intuitive, impactful experience.

The Importance of Reflection

In this presentation we look back on the design process and explain the problems we faced, the choices we made and the things we learnt. It highlights the importance user feedback has in the development of a successful product.

Requirement Gathering

1 Surveys and Interviews

We carried out extensive surveys and interviewed farmers of different scale and experience. This helped us to understand the challenges they faced and their needs.

2 Key Findings

Based on the data collected in step , we could understand their pain points — which led us to develop personalized crop suggestions based on their location, real-time weather forecasting for certain areas, and a marketplace that can connect buyers and sellers of agricultural products.

Problem Statement

Farmers have major issues such as climate change, unavailability of timely and localized soil health and crop management information, and continuous cultivation that results in soil degradation. Lack of knowledge in fertilizers and pest control leads to high risk of using dangerous chemicals. There is a compelling need to empower farmers with the right tools and information to enhance agricultural sustainability.

Solution Statement

AgriGuard is a comprehensive digital platform that aims to resolve the problems of farmers, offering specific resources and tools to effectively manage crops. The application contains user profiles, in which farmers can receive customized recommendations based on their respective soil conditions and regional climate. There is a home dashboard with real-time weather updates and alerts for crop diseases that enable proactive decision-making. Detailed crop information, which includes nutrient requirements and growth parameters, enables farmers to make informed planting decisions. An integrated marketplace in AgriGuard also makes purchasing seeds and tools easy for farmers. In general, AgriGuard allows access to the informationand tools that farmers need to make decisions that will help them improve yields and adopt sustainable farming practices.

Stakeholder Roles and Challenges

Farmers (Primary Users)

- **Roles**:
  - Utilize AgriGuard for soil analysis and crop recommendations.
  - Monitor weather conditions and receive alerts for adverse events.
  - Access an integrated marketplace to buy seeds and sell produce.
- **Challenges**:
  - Climate unpredictability leading to crop loss.
  - Soil degradation from continuous cultivation.
  - Limited access to real-time, region-specific information..

Agricultural Scientists (Support Providers)

- **Roles**:
  - Analyze soil data to provide tailored recommendations.
  - Conduct research on sustainable farming practices.
- **Challenges**:
  - Limited availability of real-time data for accurate analysis.
  - Difficulty in translating complex scientific information into actionable advice.

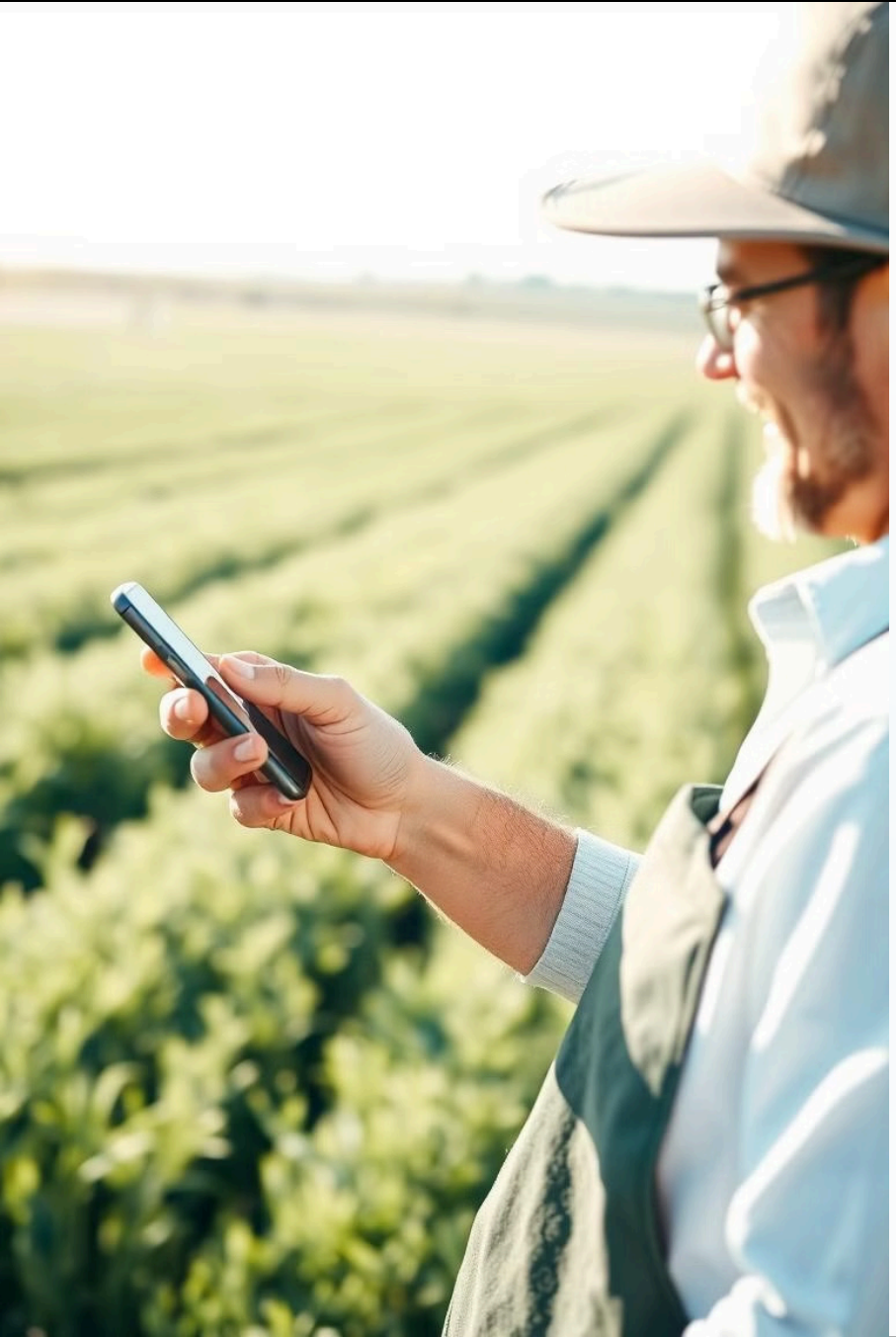
Stakeholder Roles and Challenges

Educational Institutions (Researchers)

- **Roles**:
  - Conduct research on advanced farming techniques.
  - Provide training programs for farmers on new technologies.
- **Challenges**:
  - Lack of practical data from real farms limits research applicability.
  - Disconnect between research findings and farmer access to new techniques.

Farming Businesses (Commercial Users)

- **Roles**:
  - Supply essential agricultural inputs like seeds and fertilizers.
  - Buy crops from farmers for market distribution.
- **Challenges**:
  - Weather volatility affecting crop availability.
  - Dependency on accurate soil and weather data for operations.



User Insights

Need for Timely Weather Alerts

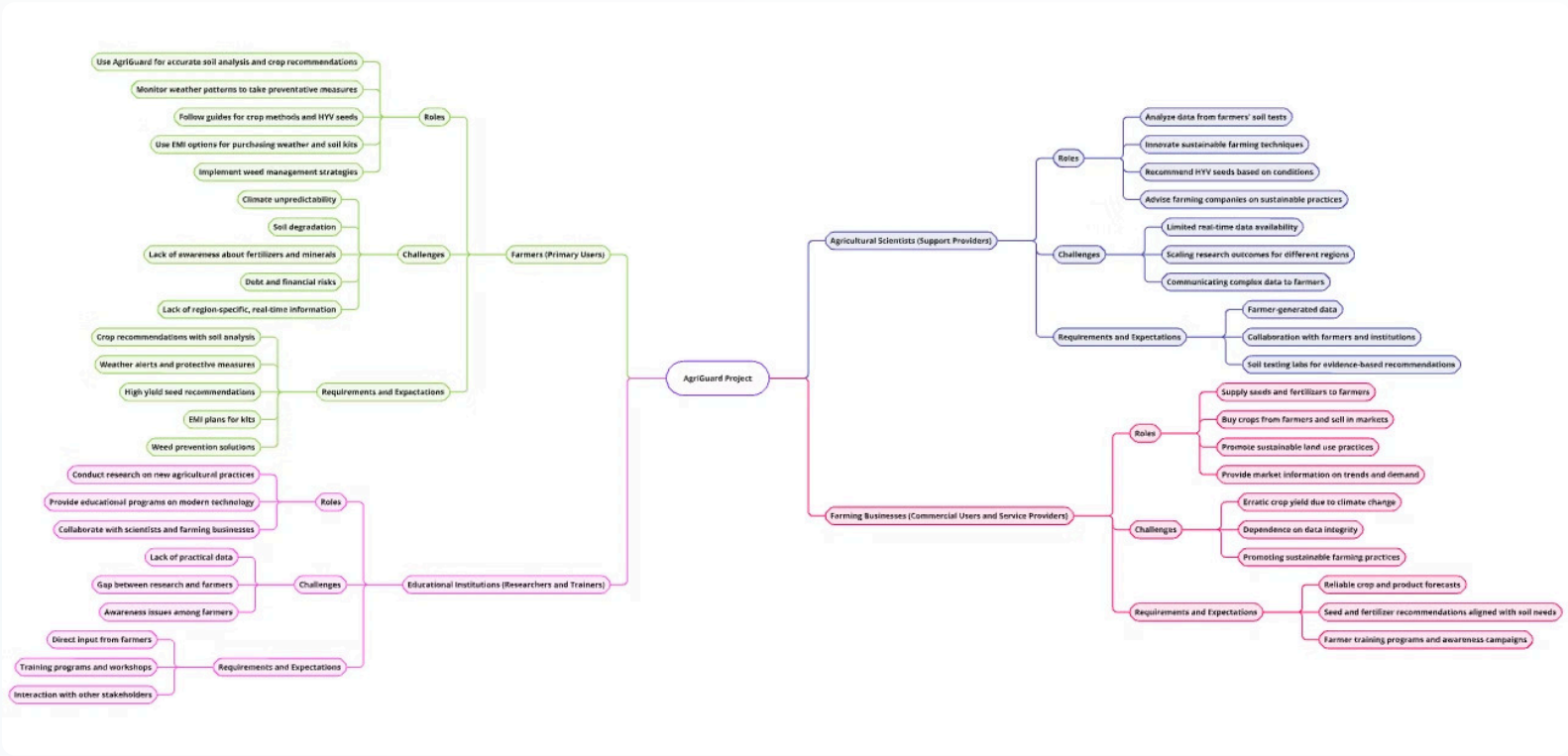
"I often lose crops due to sudden weather changes. Having an app that sends timely alerts would be extremely helpful."

Challenges in Accessing Quality Seeds and Farming Tools

"Finding reliable sources for quality seeds and tools is a constant struggle. An app that connects farmers to reliable suppliers would be beneficial."

Mind Map

Click here



User-Flow Diagram

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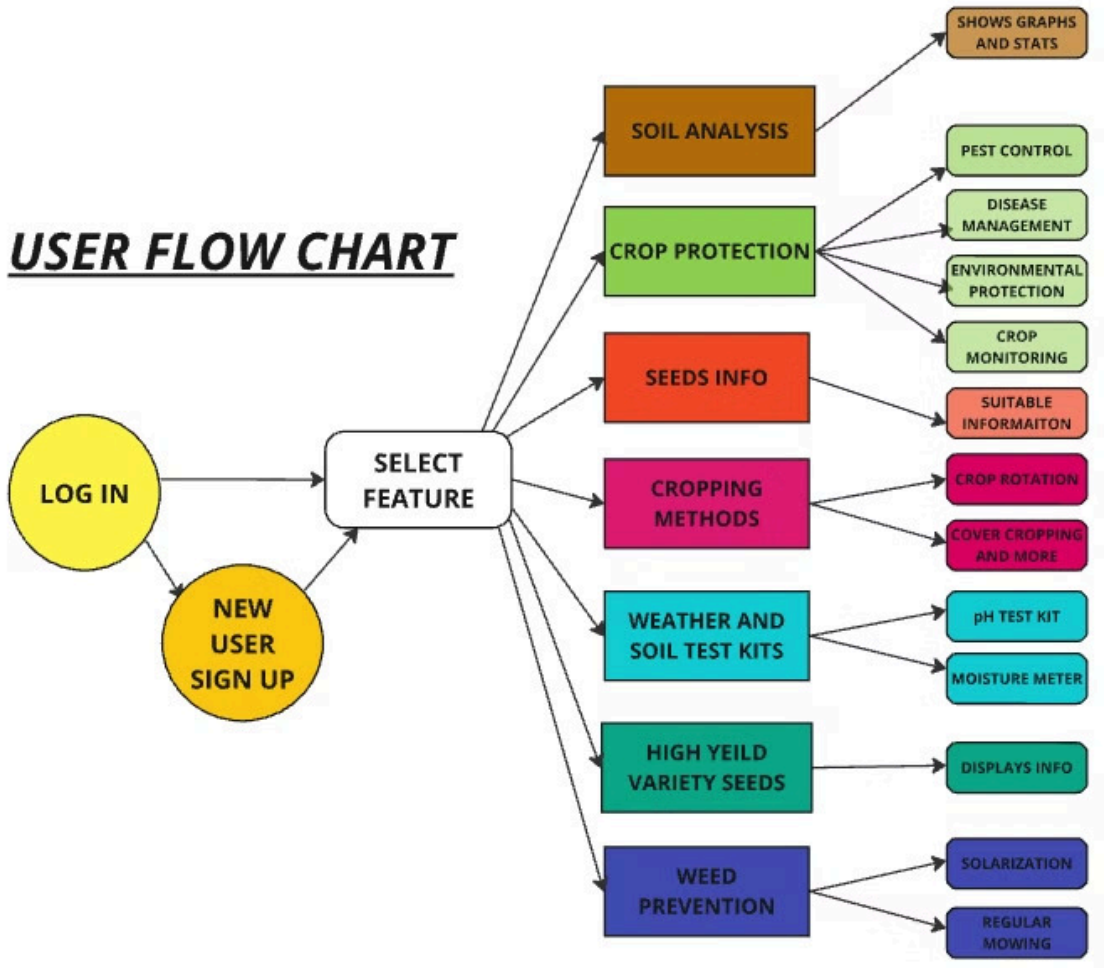

Personas and Empathy Mapping

Small-Scale Farmer

Resource-poor farmer with small land holding, mainly grows crops for domestic consumption and local market. Their biggest concerns are about being able to access information and resources quickly.

Large-Scale Farmer

This represents better-off farmers usually specializing on commercial farming, intensifying production and maximizing yields. They want insights on latest market trends and how they can manage their resources better.

Personas - Detailed Profiles

Daya ben

Age:-37

⛏️tenant farmer

About the User

Daya mam is a farmer who works on another persons land as she does not own a land of her own

•She was a very hard-working farmer she use to do this just to feed his family as she is a widow and has to take care of two kids

•She has been contracted by the landlord to take 40 percent of the total yield generated

•She is so much frustrated due to frequent crop failures. Thus, she wants proper equipment ,protection kits and all the precautions to take while growing that particular crop.

•As she is very poor all these things are not accessible to her.

Needs

•Needs proper information on climate conditions and cheap equipment to get better yield as landlords pay them some portion of their yield

Frustations

•Overburdened by landowners

•No stable income as the landowner pays her based on yield that year

Goals and Needs:

- Daya Ben aims to increase her farm’s productivity and income by growing more high-demand crops.
- She is seeking ways to improve soil health and ensure consistent water supply.
- She wants to stay connected with local markets to get better prices for her produce.

Challenges:

Access to modern farming tools and techniques are limited.

Challenges in managing irrigation and fertilizer application in the absence of guidance.

Is looking to make local connections with buyers or distributors who would like to purchase her produce at a fair price.

Technology Comfort:

- Daya Ben is not a technology-savvy person but owns a basic mobile to stay connected to the local community.
- She is willing to learn simplistic technologies that can enhance her agricultural approach.

Jack steve

Age:-38

Owner of nacco Pvt. ltd.

About the User

Jack is the owner of Nacco, a chips company, an American nachos company

•He owns a company named Nacco, which is a nachos company; he needs a proper supply of raw materials for making nachos, which come from farms he owns.

•He needs proper knowledge of soil as he would get a better yield by getting proper soil information.

•So, he needs a proper method by which he could give samples of soil from time to time and know which mineral his soil precisely lacks.

Needs

•Wants easy access to the climate conditions in the region where his farms lie

•Wants proper soil information to get the knowledge of suitable fertilizer and seeds needed to get the maximum yield

Frustrations

•No proper system to know precisely which mineral his soil is lacking

•Unacceptable losses in case of climate change

Goals and Requirements:

- Jack aims to produce a top-quality supply chain for his nacho chips firm. He needs raw materials from his farms to be consistent in their quality.
- He requires dependable access to soil data to maximize yields for crops he grows and maintain good farming practices.

Challenges:

- His farms are prone to floods during specific periods, affecting his crops. He requires a flood warning and protection system early in case his crops get destroyed.
- He is unaware of determining which crops would grow best in his particular type of land and climatic conditions.

Technology Comfort:

- Jack is a highly techno-friendly person, and he makes use of sophisticated equipment to track his business affairs.
- He believes in decisions made by data and analytics and isn't afraid to adopt IoT devices or soil monitoring systems.

Raju charan singh

Age:-47

⛏️farmer

About the User

Raju lives in Bihar and works on this own farm. His ancestors did not come from a farming background, so he faces many challenges regularly

•Raju has everything the decent size of land, home, etc

•The problem, however with him is he has his land in Bihar's flood-prone area that cause his crops to get damaged every now and then during a specific season for which he needs a very early detection of floods and proper equipment that help him not to allow this flood to reach the field.

•He doesn't know which crops will yield best in Bihar or the best practices to follow at the time of their plantation.

Needs

•He wants proper information about when flood is coming

•Want equipment to secure his crops

•As his ancestors were not farmers he do not know what are the best practice he should follow for better yield and the precautions he should take

Frustations

•Was unable to get beforehand information on surprise storms and heavy rainfall

•Wasn't aware which crop he would get maximum yield

Goals and Needs:

- Raju wants to increase his crop yield and achieve higher profits.
- He wants to avoid flood damage during the monsoon season and adopt the best soil and crop management practices.

Challenges:

- His farm is in a flood-prone area, which causes maximum crop damage during the monsoon season.
- He needs to know the soil quality properly and which crops will grow the best on his land.
- A reliable method is needed to detect flood risks early and protect crops before damage occurs.

Technology Comfort:

- Raju is uncomfortable with advanced technology but uses a primary mobile phone to stay connected.
- He is open to learning simple tools that can help improve his farming techniques and protect his crops.

Empathy mapping

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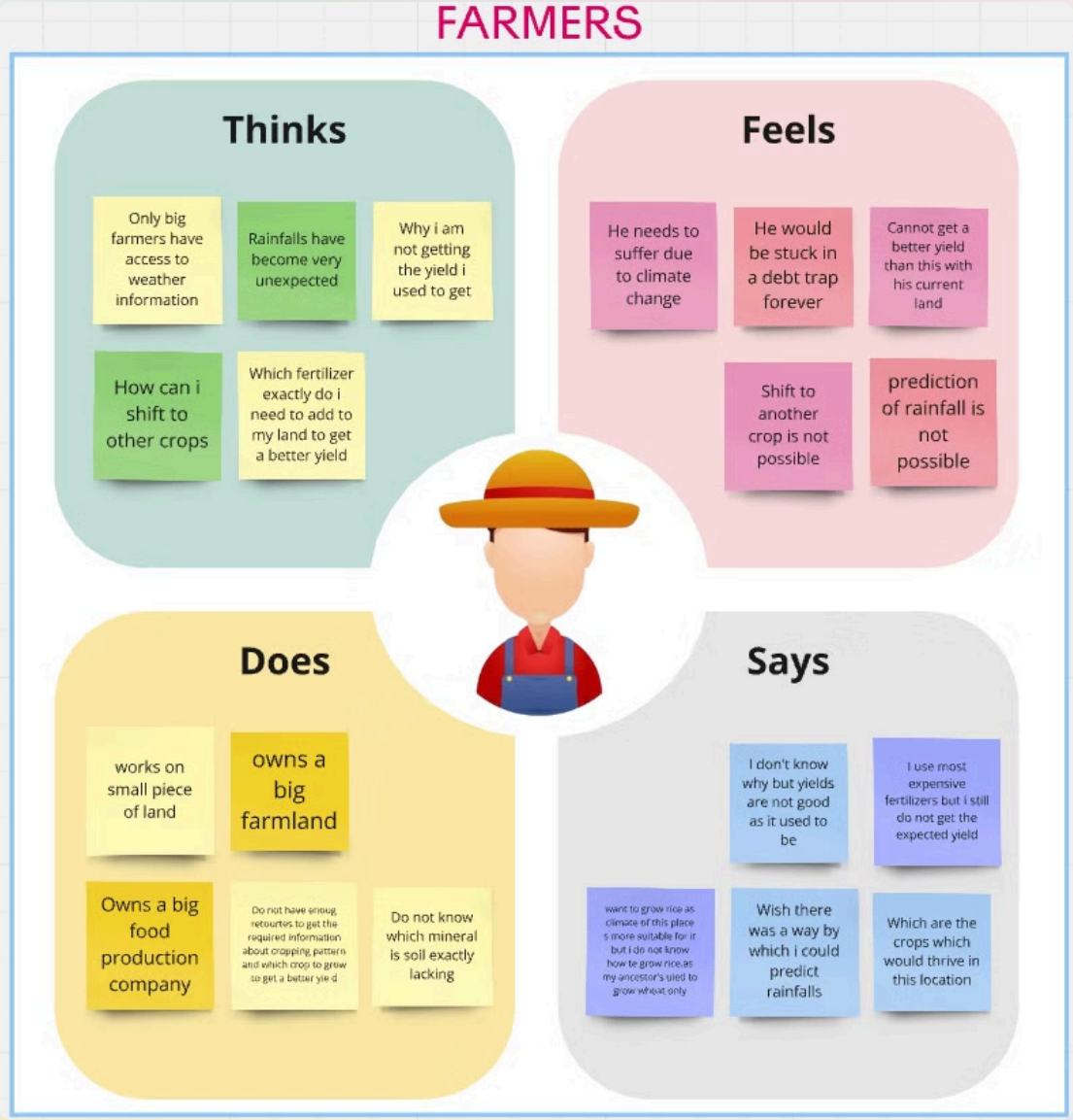

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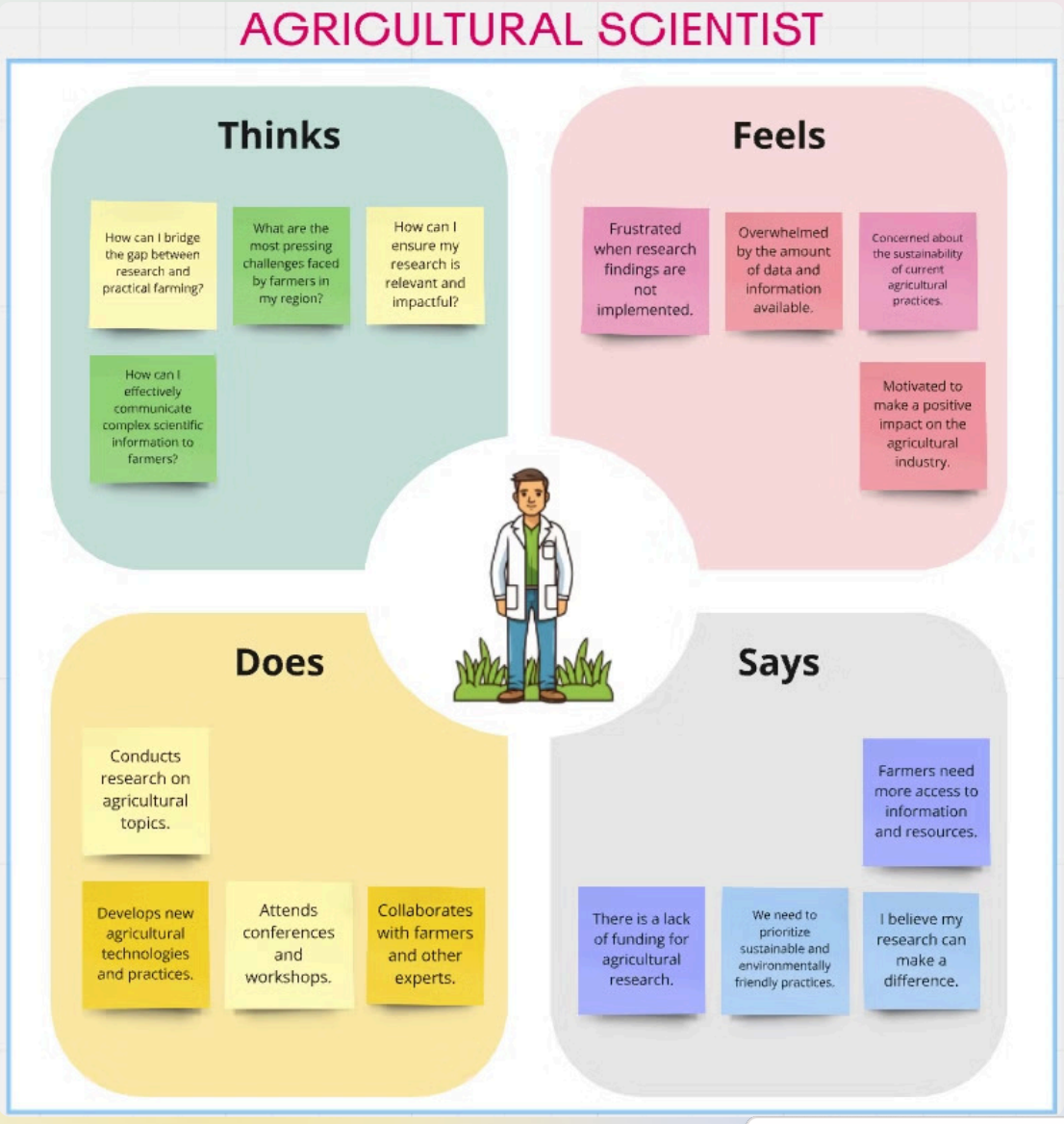

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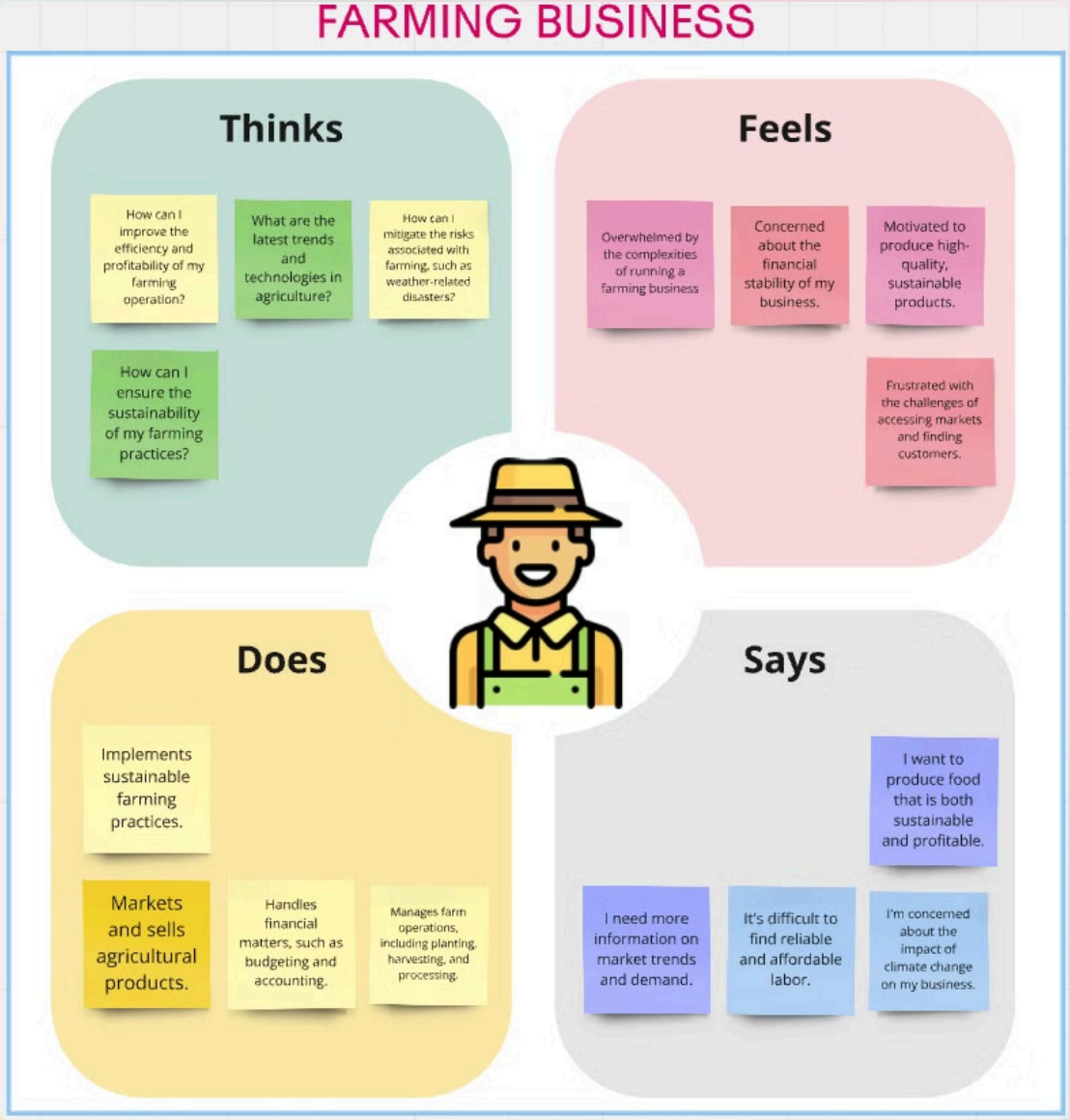


Story Board

Story Board

Story Board

Story Board

Problem Understanding

1

Climate Unpredictability

The uncertain weather pattern poses challenges to the farmers, as it can lead to crop failure. This affects their earnings and food security.

2

Soil Degradation

Frequent farming leads to soil degradation and reduced fertility, hence lowering productivity. Sustaining the soil in use can only ensure productivity over the long term.

3

Limited Access to Real-Time Information

Farmers do not get the information on time about weather developments, market prices, or even agricultural best practices. It usually makes it difficult for a farmer to make proper decisions in time.

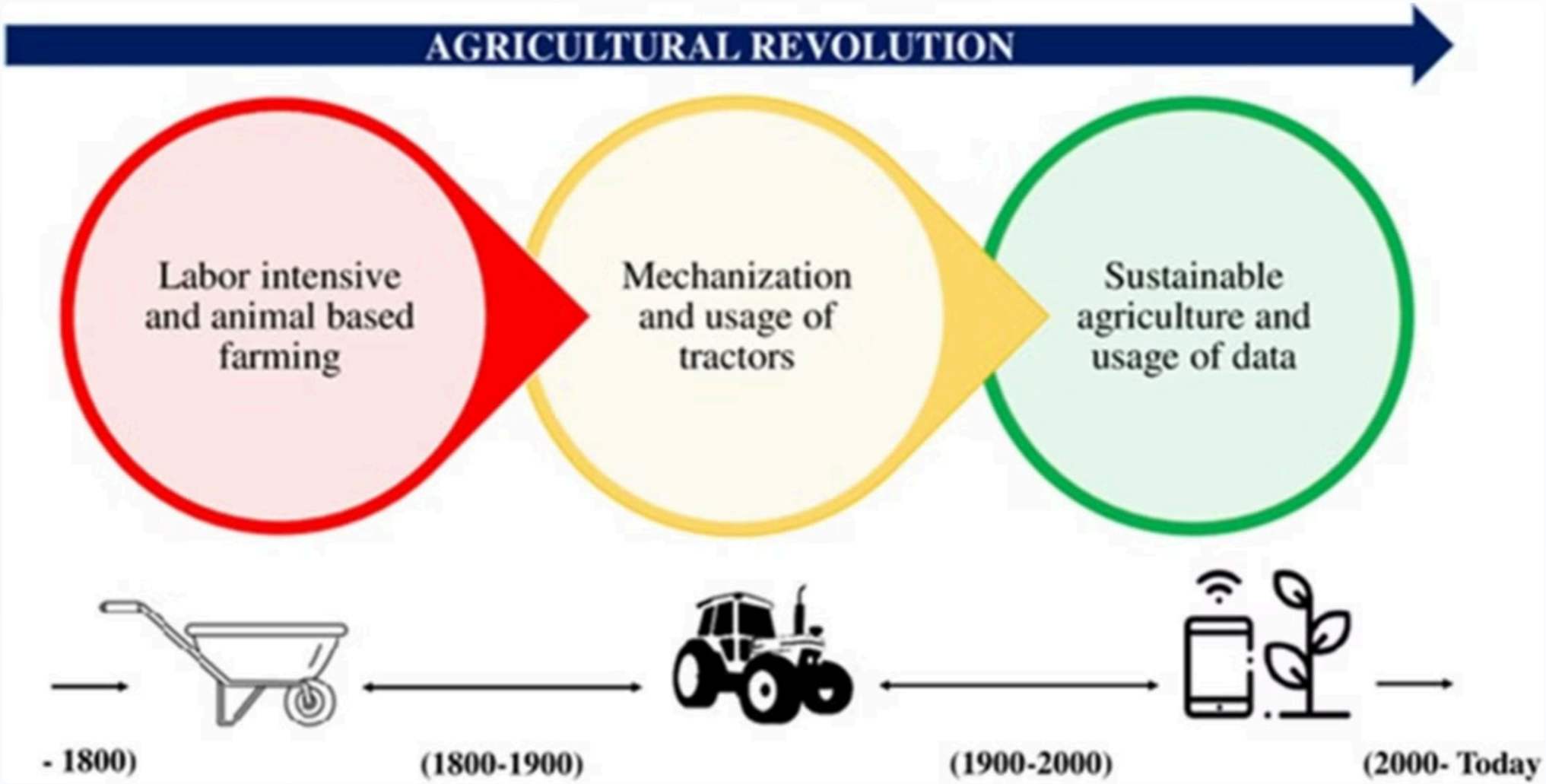
Problem Understanding

The agricultural sector is one of the most important foundations for human survival and for the world economy, supplying food, raw materials, and jobs to billions worldwide. In contrast, however, it faces a dauntingly complex set of challenges, all of which are rapidly interacting and exacerbated by environmental, technological, and socio-economic factors. These challenges not only affect the productivity and economic viability of farmers but also threaten food security and the sustainability of agricultural systems everywhere.

1. Climate Change and Extreme Weather Events
2. Soil Degradation and Loss of Fertility
3. Lack of Accurate and Local Information
4. Weed, Pest and Disease Management:
5. Market Volatility and Economic Vulnerability

AgriGuard: A Comprehensive Solution

AgriGuard is a solution built to tackle the multifaceted challenges faced by farmers today. By providing personalized, real-time insights and offering access to cutting-edge tools and technology, AgriGuard can help transform agricultural practices, improve productivity, and ensure economic stability for farmers.

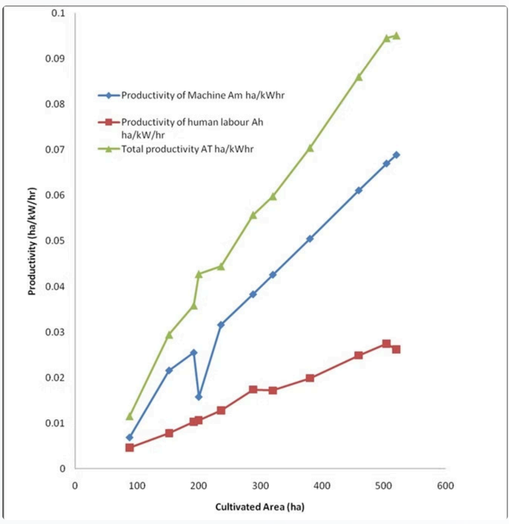


Core Features of AgriGuard:

- Personalized weather forecasting and alerts AgriGuard provides location-specific, accurate, and timely weather forecasts for the specific conditions of a farmer's location. There are no generalized weather reports available, and granular data such as:
  - Localized predictions on temperature and humidity.
  - Precipitation forecasts; when the precipitation may occur, as well as intensity.
  - Extreme weather alerts that include heatwaves, frosts, storms, or drought conditions to allow farmers sufficient time to prepare.

By helping farmers plan and adjust their activities according to the forecasted weather, AgriGuard minimizes crop loss and damage because of unforeseen weather conditions. This feature also helps in making decisions regarding planting, irrigation, and harvesting times.

- **Soil Health and Crop Suitability Analysis** AgriGuard uses **soil sensors** and **satellite data** to provide farmers with detailed reports on soil health, including nutrient levels, pH balance, and mineral content. The platform also uses this data to recommend specific crops that are best suited to the local soil type and climate, allowing farmers to:
  - **Maximize soil fertility** by applying targeted fertilizers and soil amendments.
  - **Optimize crop selection** to suit local environmental conditions, increasing the likelihood of a successful harvest.
  - **Sustain soil health** through advice on crop rotation and organic matter management, preserving the land for future generations.
- **Sustainable Farming Techniques and Best Practices** AgriGuard integrates expert agricultural advice and **best practices** into the platform, guiding farmers in the adoption of sustainable farming techniques. This includes:
  - **Crop rotation strategies** to replenish soil nutrients and reduce pest cycles.
  - **Water conservation techniques**, including **precision irrigation** systems that minimize water waste.
  - **Integrated pest management** strategies, which focus on eco-friendly ways to control pests and weeds, reducing reliance on harmful chemicals.



By using data-driven recommendations, AgriGuard helps farmers increase yields while minimizing environmental impact and input costs.

- **Seed Selection Assistance** AgriGuard helps farmers select the best **high-yielding, disease-resistant seeds** suited to their local climate and soil conditions. By analyzing environmental variables like temperature, rainfall, and humidity, as well as soil conditions, AgriGuard can provide seed recommendations that:
  - **Improve resilience** to weather extremes, pests, and diseases.
  - **Increase productivity**, as the right crop varieties will thrive in the given environment.

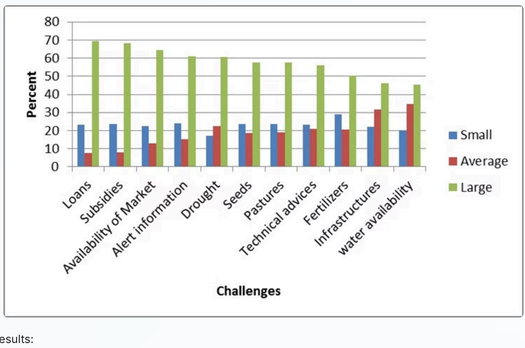
Farmers can also access information on the **latest hybrid seeds**, which have been developed to offer better disease resistance, drought tolerance, and higher yields.

- **Market Access and Price Optimization** AgriGuard offers direct connection between farmers and both local and international buyers. Such intermediaries often take unfair prices from farmers. Among the features are:
  - Actual trends in the market so that farmers can sell their products at the right time when prices are high. Price forecasting, which indicates the time when prices are going to increase or decrease, thus guiding them on better financial decisions.
  - Direct sales channels, linking farmers with wholesalers, retailers, and export markets to expand their reach and get better value for their produce.
- **Remote Support and Online Learning** AgriGuard provide remote support to farmers based in rural and disadvantaged geographies through mobile applications and online consultation services, virtual training modules. This means the following:
  - Farmers of remote areas have access to expert advice and support over a geographical boundary.
  - Training programs and capacity building for farmers increase their ability to use modern and advanced farming technologies and enhance their skills in agriculture.
- **Access to Specialized Tools and Equipment** AgriGuard associates with equipment manufacturing companies and distributors to offer quality farm equipment and machinery at affordable rates. This could include:
  - Precision farming tools such as GPS-enabled tractors and smart irrigation systems Soil testing kits through which a farmer can keep track of his soil health and take remedial measures accordingly.
  - Pest control equipment that enables farmers to control pest outbreaks without the use of harmful chemicals.

Through these collaborations, AgriGuard reduces the cost of access to modern farming tools, enabling farmers to improve their productivity.

Target Audience:

- **Smallholder Farmers:** They have limited access to resources and require low-cost, high-impact solutions to improve farm performance.
- **Large Commercial-Scale Farmers:** This form of farmer will enjoy powerful analytics and AI-enabled insights to optimize the scale farms, reduce cost, and increase yield.
- **Farmers Living in Rural Areas:** By bridging the digital gap, AgriGuard serves mobile-first solutions to remote farmers who don't have extensions or agricultural experience.



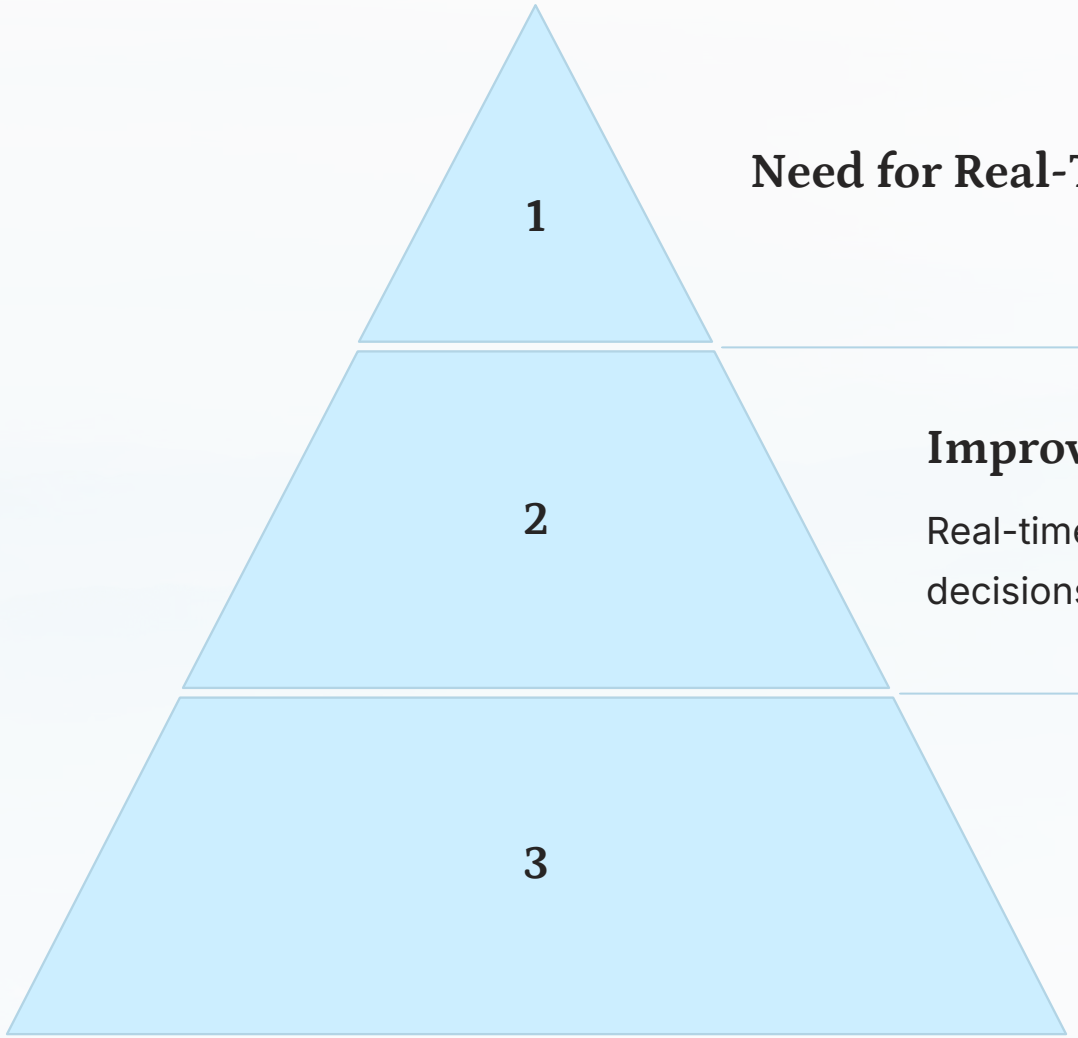
Expected Results:

1. **Increased agricultural productivity:** The farmers will receive weather forecasts, soil analysis, and crop recommendations that increase their yields.
2. **Economic security:** optimizing market access, financial forecasting, and cheap tools reduce the shocks of economic cycles and debt for farmers.
3. **Sustainability:** it ensures the preservation of the environment, increases biodiversity, and maintains sustainability in agriculture in the long run.
4. **It increases the incomes of farmers:** Provides opens access to other resources; therefore, with the improved standard and mental wellbeing, millions of farmers have been lifted out of poverty.

Conclusion

AgriGuard lies way above the field average, since it is a dynamic, constantly updating system that remodels agricultural practices. It offers data to producers which is vital to production, income and sustainable agriculture production. For its special positioning and pioneering the AgriGuard project in creating robust, equitable and a sustainable models and framework for agricultural modeling in the context of climate variability, soil erosion, market volatility, lack of available resources and ultimately benefiting from a better future of agriculture.

Problem Understanding - Insights



Need for Real-Time Information

Improved Decision-Making

Real-time information empowers farmers to make informed decisions regarding planting, harvesting, and resource allocation.

Sustainable Agriculture

Access to knowledge and tools promotes sustainable farming practices, ensuring long-term productivity and environmental well-being.

Lo-Fi Design

Before working on the actual prototype, we worked on the lo-fi prototype of our app. We followed basic design principles in our process like visibility, consistency and navigability.

1

Initial LoFi

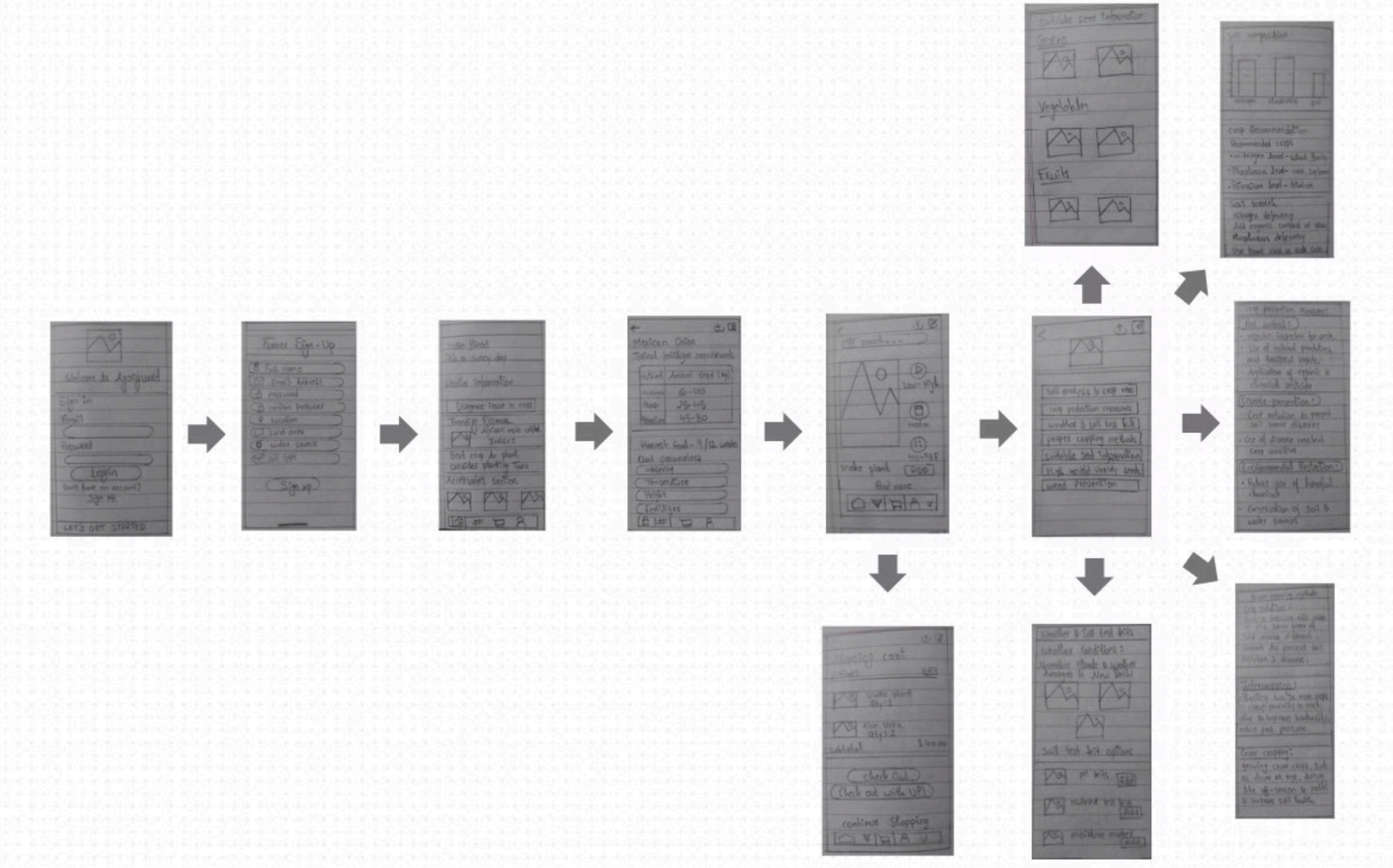
Lo-fi wireframes were created to explore different layout options and navigation structures, focusing on user-friendliness and ease of use.

2

Refined LoFi

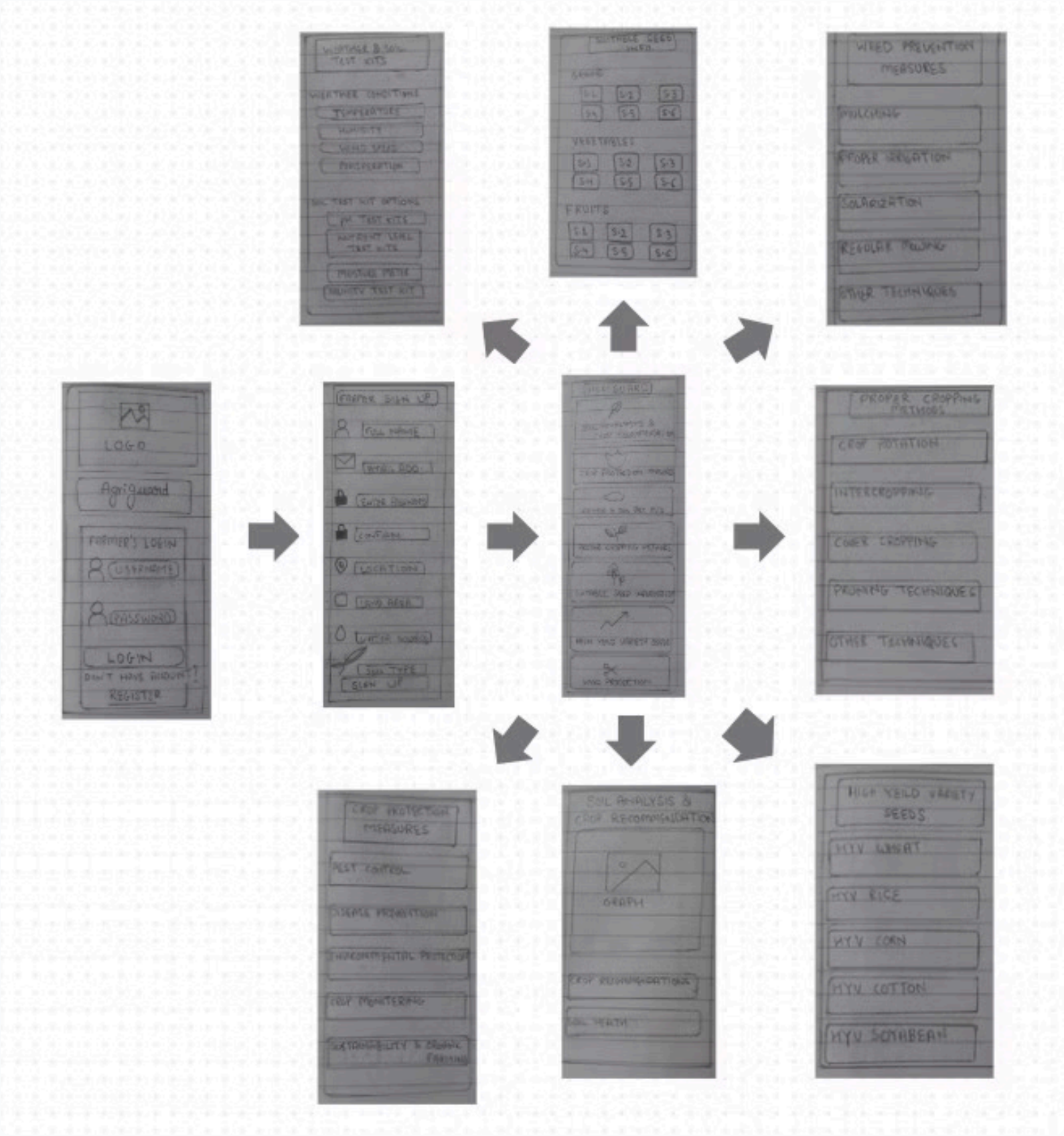
Feedback from users was incorporated into the designs, ensuring that the app met their specific needs and addressed their pain points

Initial Lofi



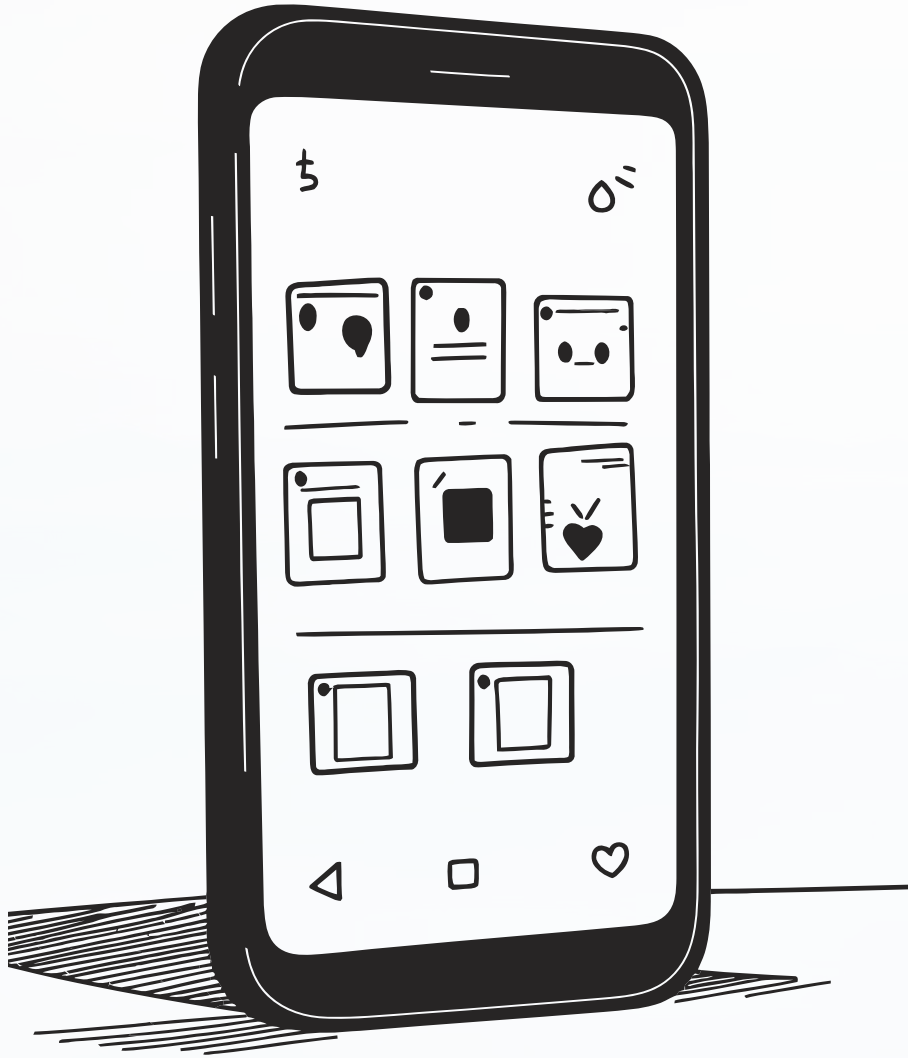
Refined Lofi

From the users’ feedback, some changes were made on the initial wireframes in order to enhance the usability and to solve the major issues. For instance, users wanted better visibility of the weather and the organization of the marketplace. These changes were incorporated in subsequent designs to make the app more easy to navigate and improve the general usability.



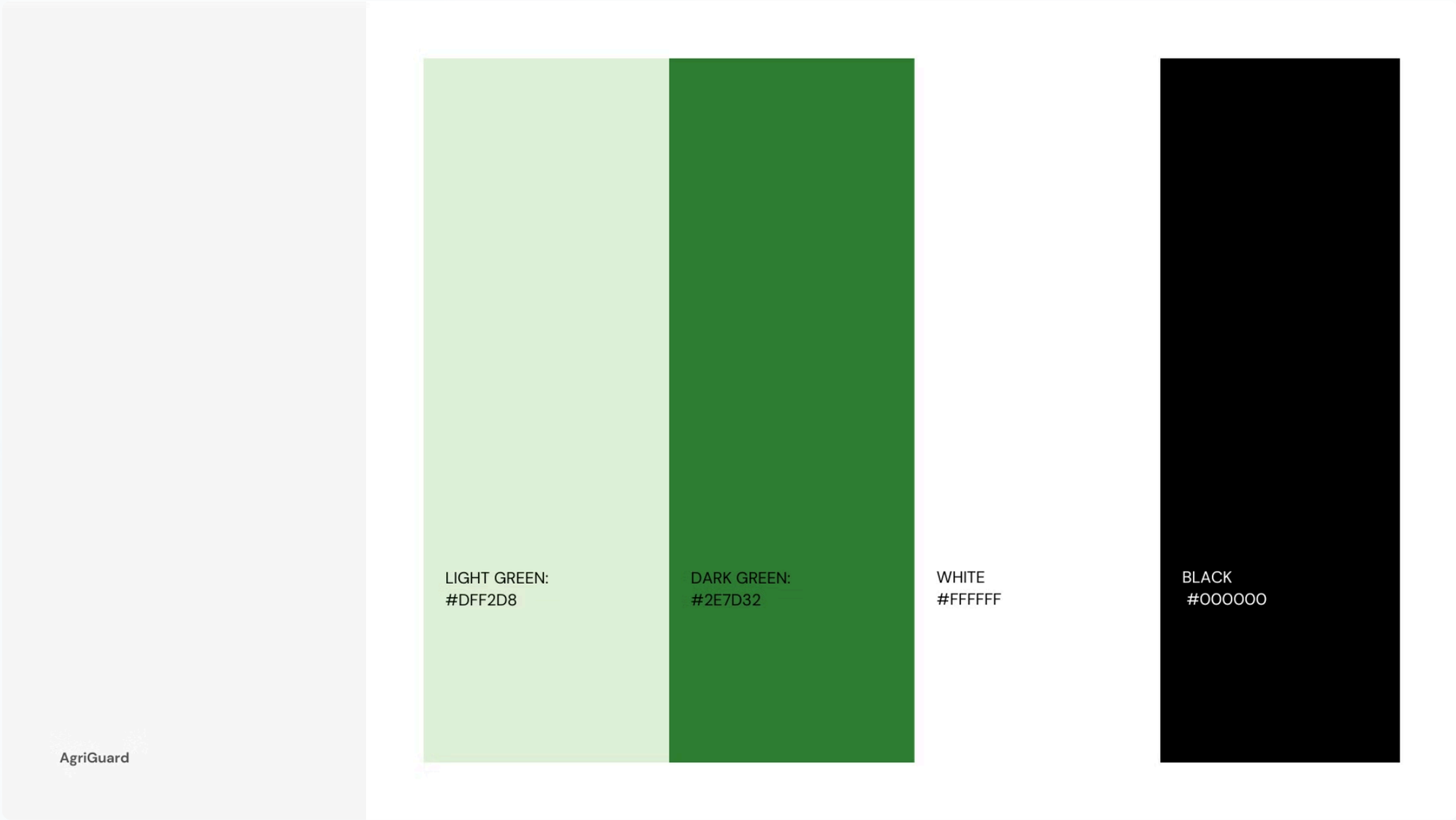
Hi-Fi Prototype

High-fidelity mockups of the final app design, showcasing visual appeal and key functionality.



Colour Scheme

The primary colour used in our design is Green, symbolizing growth, agriculture and sustainability. This color will be used on headers butons and other key highlight areas on the app.



Typography

Our font of choice is ‘Poppins’ which is a geometric sans-serif font.

It is modern and easy to read and it is quite flexible to be used on both web and print.

Comprehensive High-Fidelity Design

The high-fidelity design of the AgriGuard app includes a range of features to assist farmers and encourage sustainable farming.

Intelligent Diagnostic Tool

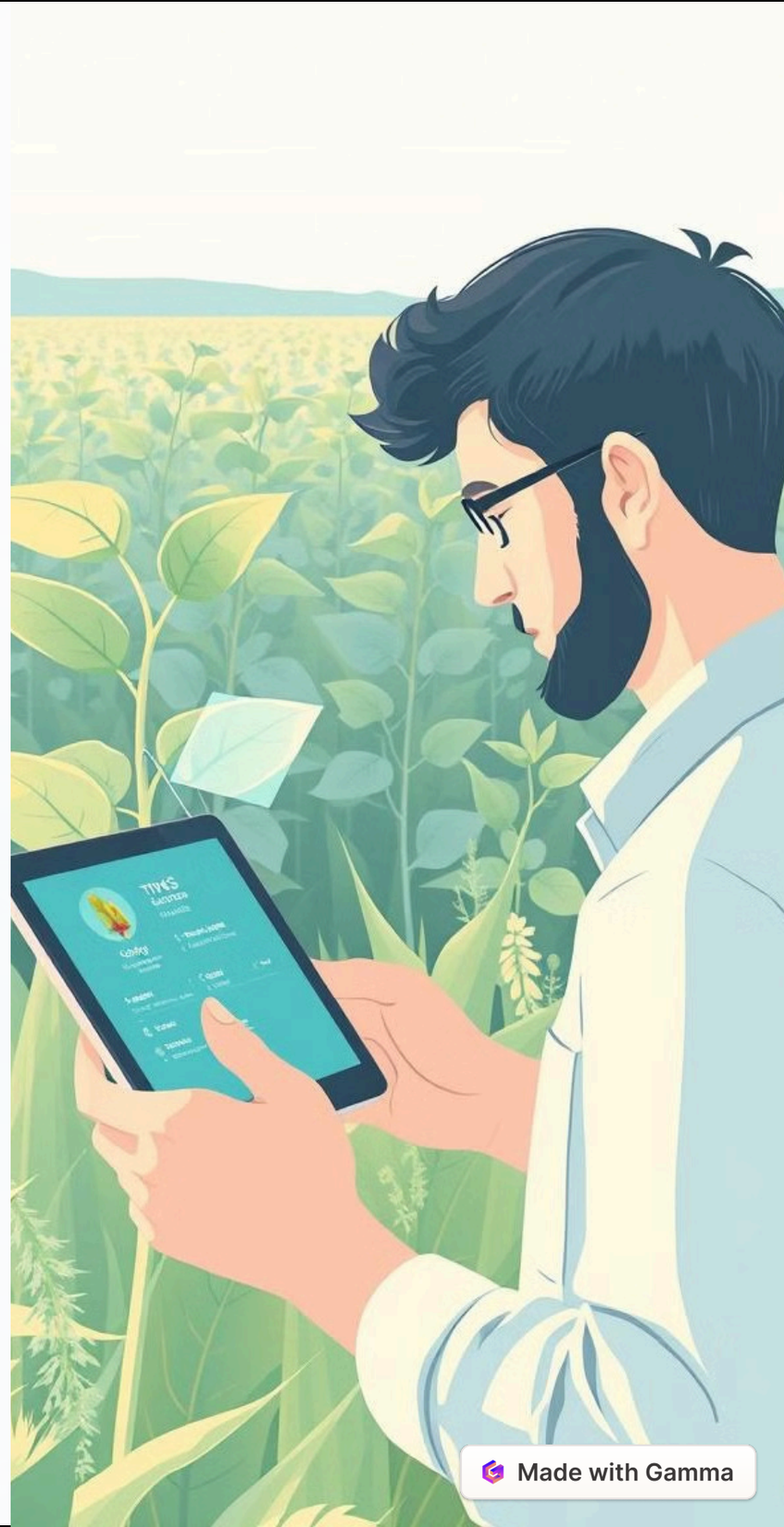
An intelligent diagnostic system enables users to diagnose and solve crop problems within a short period by using visual inputs and comprehensive farm data.

Integrated Marketplace

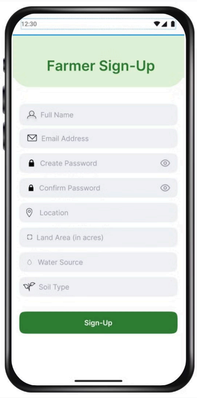
The app comes with a marketplace where farmers can easily buy farming inputs, machinery, and other farming produce among other things from the app without having to navigate to other apps.

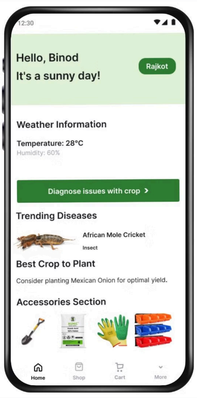
User-Centric Interface

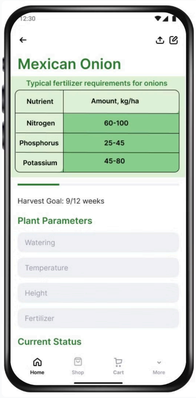
The high-fidelity design is characterized by a simple and clear structure and a convenient system of navigation, which will make using the application easy for farmers regardless of their level of IT literacy.

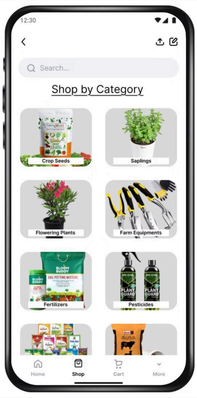


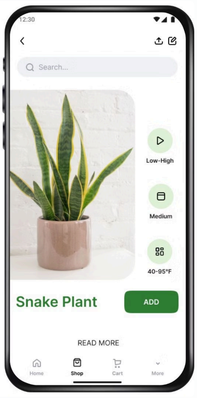
Final HI-FI

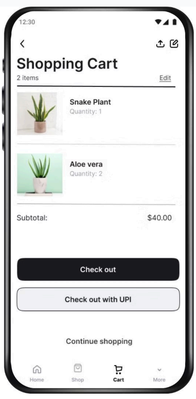


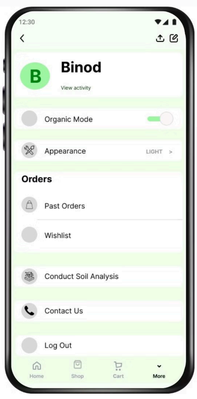


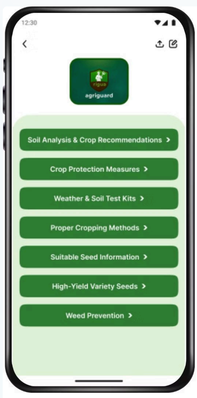


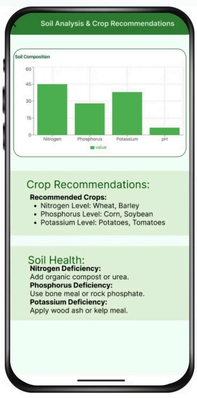


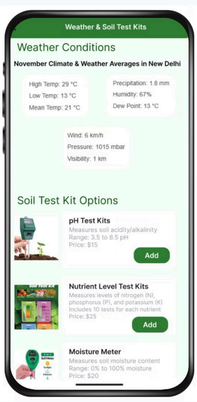


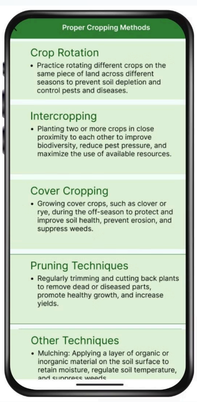


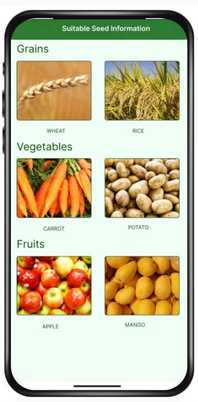












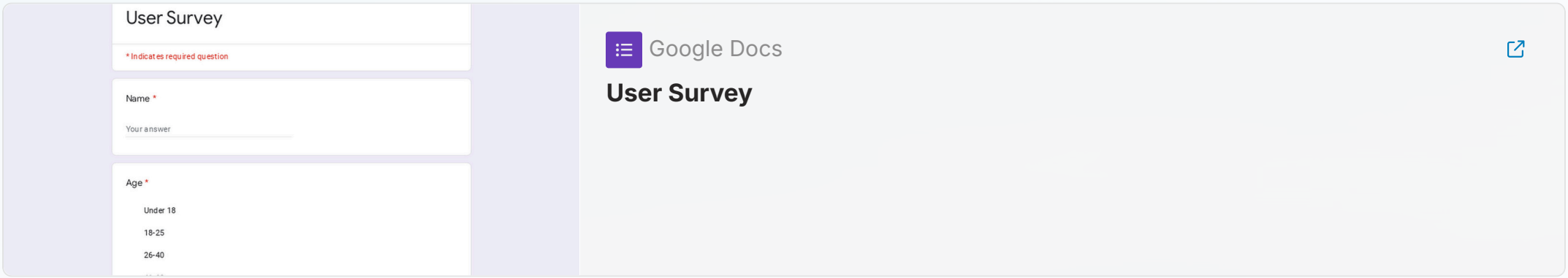
User Testing and Evaluation

To ensure the AgriGuard app meets the needs of our target users, we conducted an interview and surveys to evaluate how effectively and efficiently our app is working.

User Testing Results

- **Positive Feedback:** It was found that the organization many liked the simple layout of the dashboard and the easy accessibility of many aspects of the farming process.
- **Usability Suggestions:** Some of the features that participants suggested include the addition of multiple language support to address the various farming communities, and better ways to navigate within the application to reach certain features.
- **Feature Requests:** Some of the users mentioned their desire for additional functionality, including the compatibility with smart farming equipment and applications for joint planning of work among farming cooperatives.

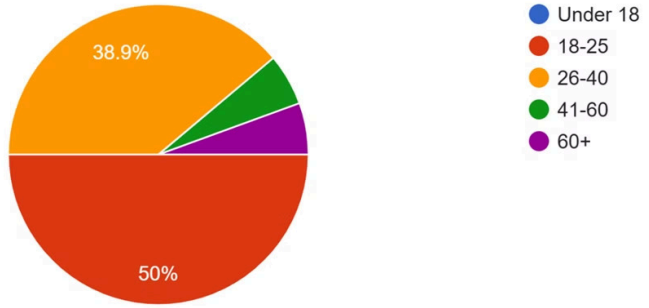
Interview Link:



Survey

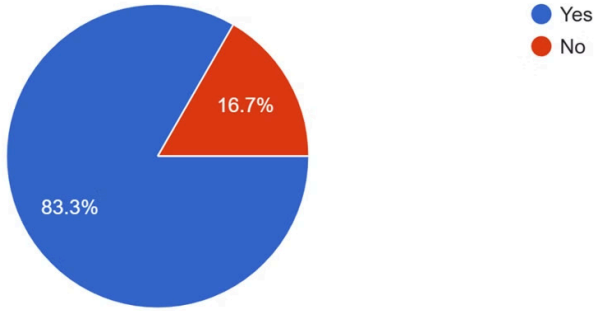
Age

18 responses



Did you find the app logo relevant and aesthetically pleasing?

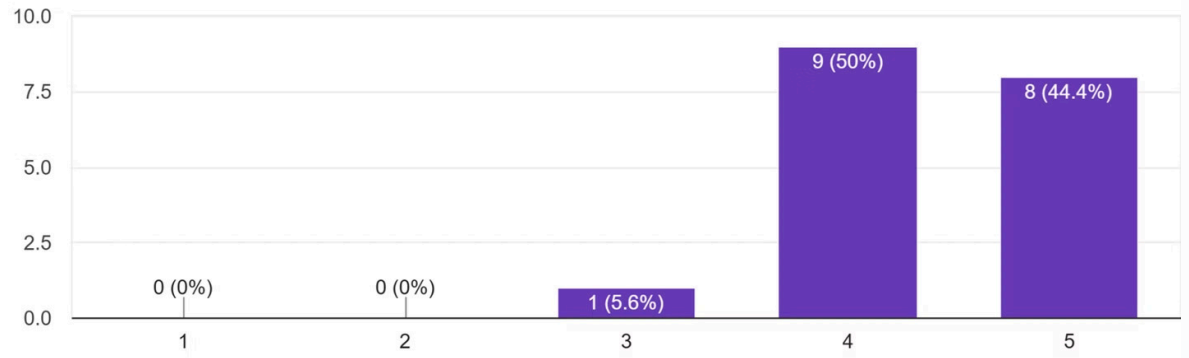
18 responses



Survey

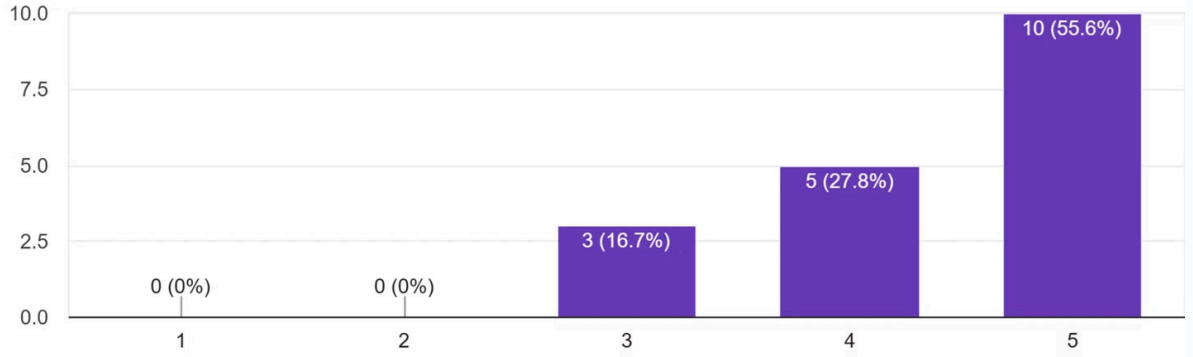
How would you evaluate the app's user flow and design?

18 responses



How would you rate the design of the prototype?

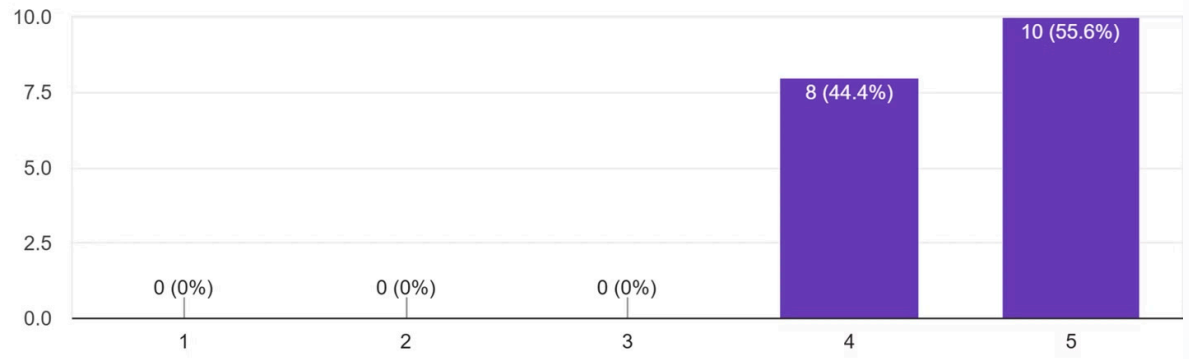
18 responses



Survey

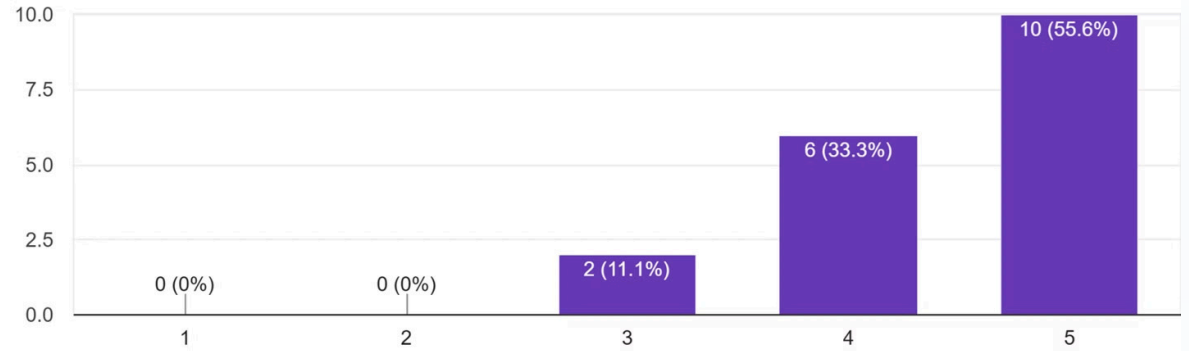
How would you assess the app's overall visual appeal?

18 responses



How effective and useful do you find the prototype?

18 responses



Audio Interview

Google Docs

Interview.m4a

Learnings and Reflections

We received some valuable information during the design phase of Agriguard and this showed us how important it is to have users' feedback. The combination of our ideas, the users' requirements and perceptions allowed us to align the application's functions and interface with the needs of the agricultural community. We also discovered the significance of proper teamwork and variety of knowledge since it was possible to finish this task with the help of successful cooperation within the teams. Due to the individual expertise of every member, we were able to design a single interface that meets the requirements of the contemporary agriculture industry.

Through this project, we not only honed our design and presentation skills but also became proficient in using tools like:

Miro

Figma

Canva

Google Docs

Challenges Faced

Aligning User Needs and Technical Feasibility

One of the major difficulties was to make sure that all the features and functionalities of the app solve the user's pain and at the same time are technically feasible within the project scope.

Managing Differing Design Opinions

Since the point of view of the design team can be very different in this case, it was important to ensure effective communication to reach an agreement on which design options are the most effective ones.

Conclusion: Empowering Sustainable Agriculture

Through the iterative design process of the AgriGuard app, the authors have developed a highly useful tool that can help farmers improve their practices and support sustainable agriculture. When it comes to the needs of the audience, it provides targeted functionality that enhances productivity and promotes collaborative work among individuals of a community. The features of the app and innovation include a user-friendly interface, farmers' ability to come up with right decisions as well as make appropriate use of available resources and the potential to change the environment. This integrated approach presents the app as an enabler of change in the future of farming for sustainability and food security.

Future Directions

AI-Driven Insights

Feed in advanced AI algorithms in order to differentially recommend the farmers the best practices regarding their cultivation depending on their special needs.

Expanded Marketplace

Agriculture should be able to cover a wider distribution of products, services, and tools for use by different farming businesses.

Meet the Team

Nirmit Jain

Project Manager

Hi-Fi Design, Learnings and Reflections, Final Compilation

2024388

Mithil Kaul

Research Analyst

Problem Understanding

2024348

Parth Malik

UI/UX Designer

Lo-Fi Design, Hi-Fi Design

2024406

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Requirement gathering

2024427

Naman Galav

Application Analyst

User Testing and Evaluation

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Manas Singh

Research Analyst

Personas and Empathy/Scenario Mappings

2024330