# Agromist Mobile Lab

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## ABSTRACT

Agromist Mobile Lab is a digital platform that transforms traditional agricultural lab testing by connecting farmers with accredited labs through an integrated web and mobile system. It simplifies the entire process of booking, executing, and reporting tests for soil, water, and agricultural inputs. The platform includes four specialized modules—Admin, Lab, Farmer, and Lab Employees—to manage different aspects of the testing process. Farmers can easily register, locate labs, place orders, and track test progress using a mobile app, while lab personnel can efficiently manage tests with features like GPS-based farmer location and order verification. The system enhances efficiency, accuracy, and transparency, reduces manual errors, and provides timely test results. By leveraging data analytics and modern technology, Agromist Mobile Lab empowers farmers to make better-informed decisions, improve crop yields, and promote sustainable farming practices.

***Keywords: Agricultural Testing, Soil and Water Analysis, Mobile Application, Web Application, Digital Agriculture***

## I. INTRODUCTION

The platform digitizes the entire lab testing workflow—from booking a test to receiving reports—making it easier for farmers to make informed decisions. Using either a web portal or a mobile application, farmers can register, search for nearby accredited labs, book tests, and track their progress in real time. This eliminates the need for physical visits and long waiting periods, which have traditionally been barriers to effective agricultural planning. In addition to empowering farmers, the platform also supports labs and their employees by providing dedicated modules for order management, employee coordination, pricing, and report generation. This integrated system ensures that the testing process is organized, timely, and accurate, ultimately boosting overall service efficiency.

Agromist Mobile Lab consists of four key modules—Admin, Lab, Farmer, and Lab Employees—each tailored to handle specific functions within the system. The Admin module manages core settings like city and lab listings, designations, test categories, and demand forecasting. The Lab module, accessible via the web, allows labs to assign tasks, manage pricing, and generate detailed test reports. Farmers, on the other hand, can access a user-friendly mobile app to place orders and receive updates, while Lab Employees use a separate mobile interface with GPS integration to locate farms, verify orders, and update statuses. This level of digital integration ensures accountability, reduces manual errors, and shortens the time needed to complete and deliver test results.

Beyond just digitization, Agromist Mobile Lab introduces powerful data analytics tools that help forecast demand, optimize lab operations, and provide actionable insights to both farmers and lab personnel. These features contribute to better crop management, resource allocation, and long- term agricultural planning. By modernizing the approach to agricultural testing, the platform not only empowers farmers but also strengthens the entire agricultural ecosystem. It bridges the technological divide between rural communities and scientific agricultural practices, ensuring that farmers receive the precise information they need to improve yield, reduce input waste, and adopt sustainable methods. In doing so, Agromist Mobile Lab is not just a technological innovation—it is a catalyst for a more data-driven, efficient, and farmer-centric agricultural future.

## II. RELATED WORK

This paper is to understand how the Internet of Things (IoT) and wireless sensors are changing traditional farming into a smarter and more accurate process. It explains how these technologies help farmers in every stage of farming—like preparing the soil, planting, watering, checking crop health, controlling pests, harvesting, and moving the crops. The goal is to show how IoT makes farming easier and more productive, while also discussing the challenges of using new technology with old farming methods. It also looks at current uses and future possibilities of IoT in agriculture. It involves learning about different sensors that are used to check soil, crop health, and pest presence. It also explains how these sensors send data using technologies like Zigbee, LoRa, and Bluetooth. The use of drones to monitor crops and improve crop yield is also included. The project studies how data is collected, shared, and used in real time to help farmers. Techniques like image analysis, sensor monitoring, and data processing are used to help farmers make better decisions and grow crops more

effectively.[1]

This paper is to develop a Smart Agriculture System using advanced technologies like IoT, Arduino, and Wireless Sensor Networks to improve farming practices. The main goal is to monitor environmental conditions such as temperature, humidity, soil moisture, and even animal movement in the field, which can damage crops. By using sensors connected to an Arduino board, the system collects real-time data from the field and, in case of any abnormal condition, sends alerts via SMS and mobile app notifications to the farmer’s smartphone using Wi-Fi or mobile data (3G/4G). This helps the farmer take immediate action and protect the crops. The proposed methodology involves setting up sensors in the agricultural field to track various environmental parameters. These sensors are connected to an Arduino board, which processes the data and sends it to a central system through the internet. A

mobile application is developed for farmers to receive alerts and manage irrigation schedules. The system uses a two-way communication setup that allows farmers to inspect data and control irrigation from anywhere. This setup is designed to be low- cost, energy-efficient, and suitable for remote areas where water is limited, making it a practical solution for smart and sustainable farming.[2]

The aim of this paper is to develop an Intelligent Agricultural System that uses smart farming techniques powered by IoT to address the challenges faced due to the decline in traditional farming practices. With increasing migration from rural to urban areas, agriculture is facing manpower shortages. To overcome this, the system uses modern technologies like Arduino, IoT, and Wireless Sensor Networks to automate and monitor farming activities.

The main goal is to improve crop productivity by constantly monitoring environmental factors such as temperature and humidity, which are crucial for healthy crop growth. The proposed method involves setting up sensors in the field that collect real-time data on environmental conditions. These sensors are connected to an Arduino board, which sends the data to a mobile application through wireless networks. Farmers can monitor the data and control actions like irrigation using an easy- to-use Android application. This smart farming system helps reduce manual labor, increases efficiency, and supports farmers in making quick decisions for better crop yield, making it a practical and affordable solution for modern agriculture.[3]

This paper is to explore how modern technologies like Next Generation Internet of Things (NG-IoT), artificial intelligence (AI), robotics, and remote sensing can support sustainable and smart agriculture by reducing environmental impacts such as water overuse, greenhouse gas emissions, and soil pollution. The paper focuses on improving farming through data-driven decision-making while also highlighting the importance of human-centered systems and explainable AI to make these technologies more accessible and trustworthy for farmers. The methods used involve reviewing recent developments in ICT tools and their applications in agriculture, analyzing real-world projects in Greece that use these technologies, and evaluating their performance and effectiveness in the field. The study also emphasizes the need for user-friendly designs and transparent decision-making systems to ensure that smart farming remains reliable, efficient, and adaptable to real farming needs.[4]

The aim of this study is to provide a comprehensive and objective review of Digital Agriculture (DA) using Citespace, a powerful data visualization tool that reveals trends and connections within academic literature. With digital technologies advancing rapidly, DA plays a key role in enhancing agricultural productivity and environmental sustainability, yet it remains in the early stages of development in many countries. To address the lack of systematic reviews, especially in countries like China, this study analyzes 2,264 publications from the Web of Science (WoS) database covering the period from 1997 to 2022. The method involves using Citespace to classify DA research into six major categories— Remote Sensing, Climate-Smart

Agriculture, Artificial Intelligence, Internet of Things, Big Data, and System Integration—while also identifying three key research phases and future directions. The study highlights the need for more focus on technological innovation, effective management practices, and supportive policies to guide the future development of digital agriculture.[5]
This paper is to explore the role of digital technology in achieving sustainable agriculture, particularly for smallholder farmers, and to identify the knowledge gaps and limitations in current digital services. Focusing on the case of Tanzania, the study highlights how most advanced digital tools are mainly accessible to large-scale farmers, while smallholder farmers lack comprehensive digital support throughout the entire farming cycle. To investigate this, the authors conducted an extensive literature review from relevant databases. The findings show that in many developing countries, digital solutions often address only specific stages of farming or parts of the value chain, which limits their overall impact. The study also points out the inequality between large and small farmers and notes the environmental impact of some ICT applications. Based on these insights, the paper suggests the development of an inclusive digital platform that supports smallholder farmers across the full farming cycle and encourages collaboration among all agricultural stakeholders at the national level. [6]

This paper is to understand how smart farming, using technologies like IoT, cloud computing, and artificial intelligence, is changing traditional farming methods. It focuses on how modern machines, sensors, and tools help farmers manage their crops better—from planting to harvesting, and even during packing and transport. The goal is to show how these new technologies improve farming and what problems farmers may face when using them with older farming practices. The method used in this study involves looking at the different wireless sensor tools used in smart farming and how they work in real-life farming activities. It explains how these tools help farmers during all stages of crop growth and how they make farming more efficient. The paper also talks about the challenges that come up when trying to mix new technologies with traditional methods, such as technical issues and connection problems, and gives ideas on how to solve them.[7]

The aim of this paper is to explore how smart farming (SF) can address the growing challenges in modern agriculture, such as climate change, urban expansion, and a shortage of skilled farmers. By using advanced information and communication technologies, smart farming helps improve crop quality and quantity with less manual work. The paper focuses on identifying the most important technologies used in SF and the best ways to combine them for effective farming. It also looks at how farmers and technology providers can choose the right tools for specific needs in agriculture. The method used in this study is a detailed review of 588 research papers from the IEEE database, following Cochrane review guidelines to ensure accuracy. The papers were analyzed to find the key technologies involved in smart farming, including sensors, communication systems, big data, machines (actuators), and data analysis. The study also explores how these technologies are combined to create systems that support remote monitoring, automation, and smart decision-making, helping farmers manage their fields more efficiently and independently.[8]

The aim of this work is to study the Farm Connect application, which is developed to bridge the gap between farmers and consumers using digital technology. The focus is on how this platform offers features like online marketplaces, real-time inventory tracking, and direct communication tools to improve access to fresh produce, ensure fair pricing, and build stronger relationships between farmers and buyers. The goal is to make the entire process of buying and selling farm products more transparent, efficient, and sustainable.
The method involves analyzing how the Farm Connect application functions and how its features benefit both farmers and consumers. It looks at the convenience of real-time updates, the role of direct interaction in building trust, and the overall impact on the agricultural supply chain. By studying these aspects, the work highlights how digital platforms like Farm Connect can support a more balanced, accessible, and eco-friendly agricultural system.[9]

The aim of this article is to explain how Smart Connected Farms (SCFs) can help improve farming by using modern technologies like sensors, internet, and data analysis. It focuses on how farmers, scientists, and technology experts can work together to solve problems such as climate change and low crop production. SCFs allow farmers to be part of a network where they can share information, make better decisions, and improve their income and productivity. The method used in this study is a review of different technologies and ideas needed to build SCFs. It includes high-speed internet, wireless sensors to collect data from farms, and cloud or edge computing to process this data. The article also looks at how farmers feel about sharing their data, and what helps or stops them from using new technology. It combines both the technical and social sides of smart farming to give a full picture of how SCFs can work in real life and help farmers in different parts of the world.[10]

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## III. METHOODLOGY

The methodology adopted for the Agromist Mobile Lab fig.1 shows that involves a structured and modular approach that integrates digital technologies to streamline the process of agricultural lab testing.

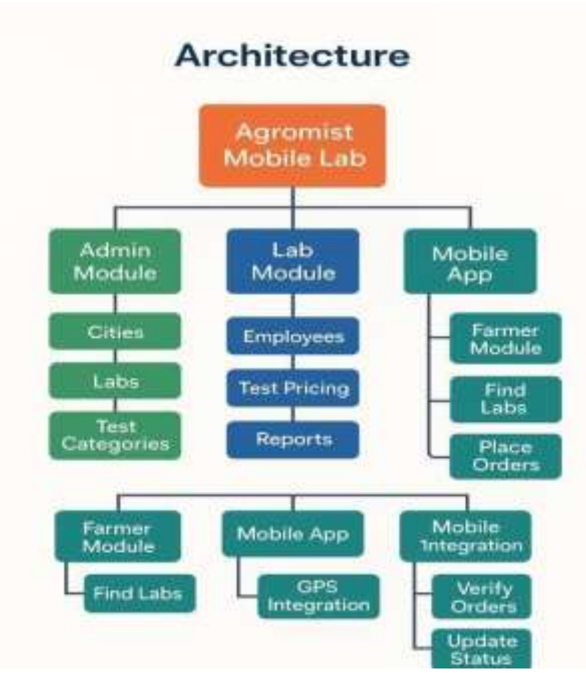


**Fig 3.1.1: Architecture diagram for**

**Agromist Mobile Lab**

The system is designed with user-centric functionality and efficient backend processes to serve farmers, lab personnel, administrators, and testing centers. The development lifecycle includes requirement analysis, system design, module development, integration, testing, and deployment.

**3.1 Requirement Analysis:**

The first step in the methodology involves understanding the specific needs of various stakeholders—farmers, laboratories, lab employees, and admin. Detailed research was conducted to identify challenges in the traditional lab testing workflow, such as lack of accessibility, delays in result processing, manual errors, and communication gaps. Based on these findings, the core features and functional requirements of the system were defined.

**3.2 System Design:**

The architecture of the Agromist Mobile Lab system was designed to be modular, scalable, and user-friendly. It was divided into four main modules: Admin, Lab, Farmer, and Lab Employee. Each module is equipped with its own interface and functionalities, and all modules are connected through a centralized database. The use of web-based and mobile platforms ensures cross-device compatibility and realtime access. The system also incorporates GPS integration for field tracking and order management.

**3.3 Module Development:**

Each module was developed using appropriate technologies to serve its specific function:

1. Admin Module: Designed for web access, this module manages cities, labs, test categories, order tracking, and demand forecasting.

2. Lab Module: Allows labs to manage test pricing, assign tests to employees, monitor lab activities, and generate reports.

3. Farmer Module (Mobile App): Enables farmers to register, find nearby labs, book tests, upload samples, and monitor order status.

Lab Employee Module (Mobile App): Integrates GPS to help employees reach farmer locations, verify test orders, and update test progress and status.

### 3.4 Integration and Testing:

After individual modules were developed, they were integrated into a unified system. Functional, usability, and performance testing were carried out to ensure the system's reliability, security, and responsiveness. The mobile apps were tested on various devices to guarantee compatibility and ease of use. Security measures were also implemented to protect user data and ensure safe transactions.

### 3.5 Deployment and Maintenance:

Once fully tested, the system was deployed on both Android platforms and the web. Continuous feedback mechanisms were set up to gather user experiences and improve system performance. Maintenance includes regular updates to app features, bug fixes, and enhancements based on user demand and evolving agricultural needs.

This methodological approach ensures that the Agromist Mobile Lab system is robust, user-friendly, and capable of transforming the agricultural testing process by leveraging digital tools for improved efficiency and reach.

## IV. TOOLS AND TECHNOLOGIES USED

### A. Frontend Technologies

#### 1. Android Studio

Android Studio is the official integrated development environment (IDE) for Android application development, developed by Google and built on JetBrains' IntelliJ IDEA. It provides a powerful and user-friendly platform for building native Android apps using programming languages like Java and Kotlin. Android Studio offers a wide range of features including a code editor, visual layout editor, APK analyzer, real-time debugging tools, and performance profilers, all of which streamline the development process. One of its standout features is the emulator, which allows developers to test their applications on virtual Android devices with different screen sizes and Android versions.
Android Studio also

supports Gradle-based build automation, making project configuration and dependency management more efficient. The IDE includes built-in support for Google services, such as Firebase for cloud messaging and analytics, and GPS services for location-based functionalities. With regular updates and strong community support, Android Studio continues to evolve as a comprehensive tool for developing responsive, scalable, and high- performing mobile applications, making it an essential part of any Android development workflow—especially in applications like Agromist Mobile Lab that require real-time communication, location tracking, and user-friendly interfaces for farmers and lab employees.

#### HTML, CSS, and JavaScript

HTML, CSS, and JavaScript are the foundational technologies used in web development to create and design interactive, responsive, and user-friendly websites and applications. These three technologies work together to define the structure, style, and behavior of web pages.

1. **HTML** (HyperText Markup Language) is the standard markup language used to create the structure of web pages. It defines the layout and organizes content such as text, images, tables, forms, and links using a set of predefined tags and elements. In the context of the Agromist Mobile Lab, HTML is used to build the structural framework for the Admin and Lab web interfaces, ensuring all necessary data fields, forms, and sections are properly arranged.

2. **CSS** (Cascading Style Sheets) is used to control the visual presentation of the HTML content. It defines the appearance of web elements, including fonts, colors, spacing, layout, and animations. CSS makes web applications

visually appealing and responsive across different devices and screen sizes. For Agromist Mobile Lab, CSS is essential in creating a clean and intuitive design for the admin and lab dashboards, making them accessible and easy to navigate.

**3. JavaScript** is a high-level scripting language that adds dynamic and interactive behavior to web pages. It allows for real- time updates, form validations, interactive charts, pop-up modals, and asynchronous communication with the server using technologies like AJAX. In Agromist Mobile Lab, JavaScript enhances user experience by allowing users to interact with the platform smoothly—for example, updating order status without reloading the page or dynamically displaying lab locations and test categories based on user inputs.

**B. Backend Technologies**

**1. ASP.NET**

ASP.NET is a web development framework created by Microsoft that is used to build websites and web applications. It allows developers to create dynamic and interactive web pages using languages like C#. ASP.NET makes it easier to manage data, connect with databases, and create secure login systems. In the Agromist Mobile Lab project, ASP.NET is used to develop the web-based parts of the system, such as the Admin and Lab modules. These modules help administrators and lab staff manage tasks like adding test categories, viewing orders, assigning work to lab employees, and generating reports. ASP.NET helps ensure that all this happens quickly and safely. It also works well with SQL Server, so storing and retrieving information like farmer details, test reports, and lab locations becomes simple. With ASP.NET, the system can also connect with the mobile app by sending and receiving data through APIs. Overall, ASP.NET helps make the Agromist platform fast, secure, and easy to use for managing agricultural lab testing services.

**C. Database Technology**

**1. SQL Server 2014**

SQL Server 2014 is a powerful relational database management system (RDBMS) developed by Microsoft. It is used to store, manage, and retrieve data efficiently and securely. SQL Server 2014 supports structured query language (SQL) for performing operations like creating tables, inserting data, updating records, and generating reports. It also provides features like data encryption, automatic backups, and performance optimization tools to ensure smooth handling of large volumes of data.

In the Agromist Mobile Lab system, SQL Server 2014 plays a key role by acting as the central database for the entire platform. It stores important information such as farmer profiles, lab details, test categories, orders, pricing, and test results. Each module— Admin, Lab, Farmer, and Lab Employee— retrieves and updates data from this database to perform its specific tasks. For example, when a farmer places a test order or when a lab updates test results, all that information is saved and managed in SQL Server.

SQL Server 2014 also supports relationships between tables, making it easier to connect different pieces of information—like linking a farmer to their test orders or connecting a lab employee to their assigned tasks. It ensures data integrity, fast access, and security, which are critical for a platform that handles sensitive agricultural testing data. Overall, SQL Server 2014 helps the Agromist Mobile Lab system function efficiently by managing all the backend data in an organized and reliable way.

## V. RESULT

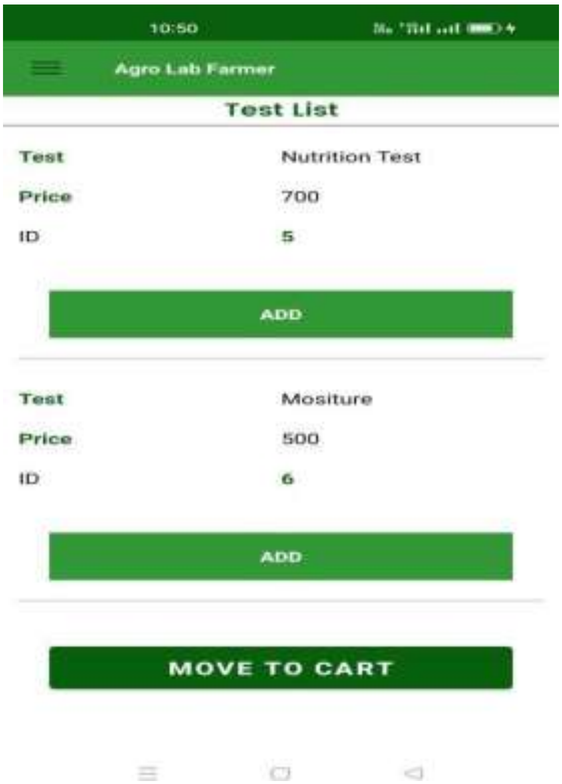


**Fig 6.1:Test List Screen For Agro Lab Farmer**

The snapshot displays the Test List page of a selected lab, showing available tests along with their prices. Farmers can easily view and add desired tests to their cart for quick and convenient booking.


**Fig 6.2:Order Summery Screen Of Agro Lab**

The snapshot shows the Cart page where selected tests are listed with their total cost. Farmers can review their selections and proceed to place the order directly from this page.

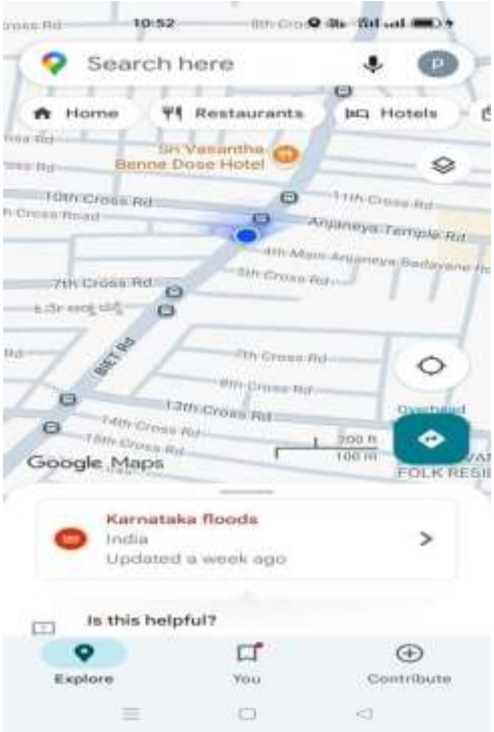


**Fig6.3:GPS**

The snapshot displays the Google Map integration used to pinpoint the exact location of the farmer's land. This helps lab employees navigate accurately for sample collection and on-site testing.

## VI. CONCLUSION

In conclusion, the Agromist Mobile Lab stands as a transformative solution in the field of agricultural testing, offering farmers a seamless and technology-driven way to access essential soil, water, and input analysis services. By digitizing the entire process—from test booking to result reporting—the platform bridges the gap between rural agricultural practices and modern scientific support. With dedicated modules for Admins, Labs, Farmers, and Lab Employees, the system ensures smooth coordination, transparency, and efficiency in lab operations. The use of mobile and web technologies empowers farmers to make informed decisions, improve crop yields, and adopt sustainable farming practices. Overall, Agromist Mobile Lab not only enhances accessibility and service quality in agricultural testing but also plays a crucial role in modernizing and strengthening the agricultural ecosystem.

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