**LA GRANDEE INTERNATIONAL COLLEGE**

**Simalchaur, Pokhara**

A project report on

**Agro**-**Tech Hub**

**Submitted to**

LA GRANDEE International College

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In the partial fulfillment of the requirement for the degree of BCA affiliated to

Pokhara University

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**Date:02/07/2025**

# Acknowledgement

We have presented this report focusing on the topic **''Agro-Tech Hub".** This report has been prepared for partial fulfilment of the requirement for degree of BCA and to have practical experience.

We are heartily thankful to the faculty of BCA, **LA Grandee International College** and our supervisor **Mr. Sunil Sapkota** for his role to motivate and lead for this report. We obliged towards his constant guidance, supervision and feedbacks which enabled us to prepare a well-executed report.

Further, we express our gratitude to LA Grandee family, classmates, seniors and teachers who have directly and indirectly supported us during our report.

Sincerely,

Nischal Sharma

Parash Parajuli

Subash Paudel

# Student's Declaration

**"Agro-Tech Hub"**

We hereby declare that we are the only authors of this work and that no sources other than the mentioned here have been used in this. We assure you that the work we present here is unique to ourselves and resemblances to another similar project are purely coincidental.

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Program: BCA 8th Semester

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# Supervisor's Declaration

I hereby declare that the project entitled **“Agro-Tech Hub”** has been carried out under my direct supervision by **Nishchal Sharma, Parash Parajuli, and Subash Paudel** during their eighth semester for the partial fulfilment of the requirements for the degree of BCA program under Pokhara University.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Mr. Sunil Sapkota**

(Project Supervisor)

Date: 02/07/2025

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# Letter of Approval

We certify that we have examined this report entitled “**Agro-Tech Hub**” and are satisfied with the project defense. It is satisfactory in the scope and qualify as project in partial fulfillment of the requirements for the degree of BCA under Pokhara University.



# Abstract

Farming is a way of life for many people in Nepal, but farmers often struggle with issues like poor market access, lack of timely advice, and limited use of modern tools. Agro-Tech Hub was developed to help solve these challenges using technology. It’s a user-friendly digital platform that connects farmers directly with buyers, provides expert farming tips based on local conditions, and even offers access to financial services like loans and insurance. The platform also encourages farmers to share experiences and learn from each other, building a strong farming community. Built using Flutter and Django, Agro-Tech Hub is designed to work well even in remote areas with basic smartphones. By making the farming process more efficient, informed, and connected, this project aims to help farmers increase their productivity, earn better incomes, and bring positive change to agriculture in Nepal.

**Keywords:** smart farming, market access, crop monitoring, community platform, financial inclusion, Flutter, Django, smallholder farmers.

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# Abbreviations

|  |  |
| --- | --- |
| BCA | Bachelor of Computer Application |
| PU | Pokhara University |
| ERD | Entity Relationship Diagram |
| DFD | Data Flow Diagram |
| IT | Information Technology |
| API | Application Programming Interface |
| UI | User Interface |

# Introduction:

Agriculture has always been at the heart of Nepal’s economy and daily life. For many families across the country, farming isn’t just a way to earn a living it’s a way of life. From planting to harvest, generations of farmers have relied on traditional methods passed down over time. But today, despite their hard work and deep connection to the land, farmers face many challenges. Limited access to markets, outdated tools, lack of information, and unpredictable weather patterns make farming harder than it needs to be. Add to this poor internet connectivity, high costs of modern equipment, and a lack of financial support, and it’s easy to see why many smallholder farmers struggle to get ahead.

At the same time, the world is changing. Technology is helping people in every corner of life including agriculture. Mobile apps, artificial intelligence, and data tools are opening new doors for farmers around the globe. These tools can help monitor crops, predict weather, manage pests, and even connect farmers directly with buyers. The potential to grow more food, earn better incomes, and work more efficiently is huge but only if the technology is made accessible and relevant to the people who need it most.

That’s where our project, **Agro-Tech Hub**, comes in. We wanted to create something practical and easy to use a digital platform that supports Nepali farmers at every step. Our aim is to bridge the gap between traditional farming and modern tools in a way that makes sense for Nepal. Agro-Tech Hub offers simple yet powerful features: personalized crop advice based on local conditions, a community space where farmers can share experiences, market connections to help sell produce at fair prices, and even access to financial services like loans and crop insurance.

What makes Agro-Tech Hub different is that it’s built with the local farmer in mind. Many existing platforms are too broad or too complex, and they don’t always consider the specific needs of farmers in Nepal. Our app provides localized guidance in familiar languages and is designed to be friendly even for those who are not tech-savvy. Farmers can upload pictures of their crops, ask questions, and get advice tailored to their situation just like getting help from a trusted neighbor or expert.

More than just an app, Agro-Tech Hub is a growing community. It’s a place where farmers can connect, learn, and support each other. It’s about creating a shared space where knowledge flows freely and farming becomes smarter, together. And with built-in tools to help farmers access credit and protect their crops, we hope to remove some of the financial pressure that holds back many from growing their potential.

In the end, this project isn’t just about technology. It’s about giving farmers the tools, confidence, and support they need to thrive. We believe that with the right platform, Nepali farmers can take charge of their future growing not only better crops, but stronger communities and a more sustainable agricultural economy for the country.

# Problem Statement

The current landscape of agricultural support platforms is saturated with solutions that focus primarily on content dissemination rather than delivering a holistic and interactive farming experience. While existing platforms provide access to information and market listings, they often weaknesses the following:

* High Costs:
* Small-scale farmers cannot afford expensive tech solutions.
* Lack of Awareness:
* Many farmers dont know about Agro-Tech or how it can help them.
* Complex Technology:
* User-unfriendly designs make adoption difficult for rural farmers.
* No Training or Support:
* Insufficient guidance on how to use Agro-Tech effectively.

# Objectives:

These objectives highlight the core aims of the project:

* To help Nepali farmers with a digital tool made for their needs.
* To give farmers real-time farming advice using smart technology.
* To teach and share farming knowledge through a community platform.
* To connect farmers directly with buyers and experts.

# Background Study

# Agriculture is a central pillar of Nepal’s economy, employing a large portion of the population, particularly in rural areas. However, the sector faces multiple challenges such as outdated farming practices, poor market access, lack of timely agronomic support, and limited use of modern technology. While Agro-Tech solutions have shown promise in improving agricultural productivity and sustainability around the world, their adoption in Nepal remains low. This is due to barriers such as high costs, lack of internet connectivity in remote areas, limited awareness among farmers, and the absence of platforms tailored to the local context. Many existing tools are not user-friendly, are not available in local languages, and do not address the specific needs of Nepali farmers. These gaps have created a digital divide, preventing farmers from benefiting from modern advancements. Recognizing this, the Agro-Tech Hub project was developed to provide an affordable, accessible, and localized digital platform that integrates market access, expert crop advice, financial services, and community learning to support and empower smallholder farmers in Nepal.

Many small farmers in Nepal have very limited resources and face problems like bad weather, pests, and changing market prices. Without proper advice or data, they often rely on guesswork or traditional methods that don’t always work. There is also a lack of coordination between farmers, buyers, cooperatives, and government agencies, which causes delays and low profits. To solve these issues, the Agro-Tech Hub aims to provide a simple, smart platform that connects farmers with the right information, services, and people—helping them improve their income and farming practices.

# Requirement Document:

This Requirement Document outlines the key specifications for the **Agro-Tech Hub**, a digital platform designed to support Nepali farmers through technology. It defines the **functional and non-functional requirements, technologies used**, and presents a **requirement matrix** linking each feature with its purpose, priority, and module. The goal of this document is to ensure a clear understanding of what the system must deliver, how it should perform, and the tools necessary for its development. By capturing both technical and user-focused requirements, this document serves as a roadmap for building a reliable, user-friendly, and impactful agricultural support system.

## **Functional Requirements:**

These are the key features and actions that the Agro-Tech Hub platform must be able to perform:

1. **User Authentication**

* Users (farmers, experts, buyers) can register and log in to the platform.
* Secure user management with password encryption.

1. **User Roles and Access Control**

* Distinct user roles: Farmer, Buyer, Expert, Admin.
* Role-specific dashboards and access levels.

1. **Crop Management and Monitoring**

* Farmers can upload crop data (images, videos, text) to get personalized feedback.
* Real-time crop tracking and updates.

1. **Market Linkage**

* A digital marketplace where farmers can connect with local buyers and wholesalers.
* Product listings, price display, and buyer-farmer communication.

1. **Community Forum**

* Interactive community space where users can ask questions, share experiences, and offer solutions.

1. **Multimedia Learning Resources**

* Access to articles, videos, and tutorials about modern farming techniques.

1. **Financial Services Integration**

* Loan application interface.
* Crop insurance details and application system.

## **Non-Functional Requirements:**

These are quality attributes that ensure usability, reliability, and efficiency of the system:

1. **Performance**

* The app should load within 3 seconds.
* It must handle at least 500 concurrent users.

1. **Security**

* All personal and financial data must be encrypted (SSL/TLS).
* Secure login, password policies, and data protection mechanisms.

1. **Usability**

* User interface must be simple, clear, and in Nepali and English language.
* Minimal clicks to complete key actions (e.g., post a crop, request advice).

1. **Scalability**

* The system should support future feature additions and a growing user base.

1. **Availability**

* The platform should be available 24/7 with 99% uptime.

1. **Compatibility**

* Must be responsive and work seamlessly on Android smartphones, tablets, and modern web browsers.

## **Technologies Used:**

| **Category** | **Technology** |
| --- | --- |
| * **Frontend:** | Flutter (for Android and cross-platform UI) |
| * **Backend:** | Django (Python framework for backend APIs) |
| * **Database:** | PostgreSQL or SQLite |
| * **AI/ML:** | Jupyter Notebook (for AI crop advisory features) |
| * **IDE:** | Visual Studio Code |
| * **Testing:** | Google Chrome, Firefox, Brave browsers |
| * **Version: Control** | Git + GitHub |
| * **Hosting: (Future)** | Heroku, Firebase, or AWS (for production deployment) |

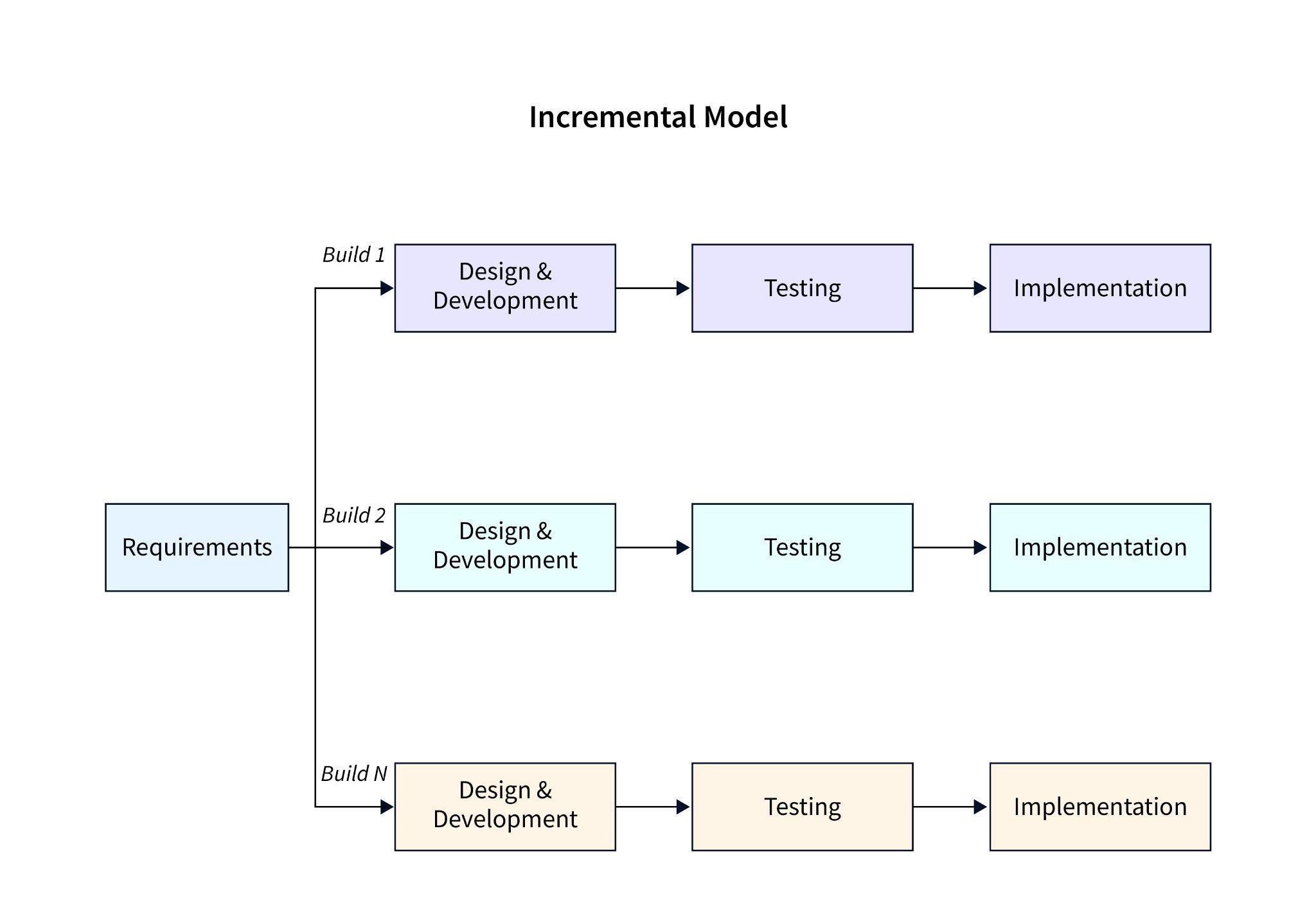
## **Requirement Matrix:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Requirement ID** | **Description** | **Type** | **Priority** | **Module** |
| FR-01 | User registration and login | Functional | High | Authentication |
| FR-02 | Role-based access (Farmer, Buyer, Expert) | Functional | High | User Management |
| FR-03 | Upload crop photos/videos for advisory | Functional | High | Crop Management |
| FR-04 | Real-time advisory system | Functional | High | Advisory Engine |
| FR-05 | Digital marketplace for selling crops | Functional | Medium | Marketplace |
| FR-06 | Crop insurance & loan request | Functional | Medium | Financial Services |
| FR-07 | Discussion forum/community board | Functional | Medium | Community Module |
| NFR-01 | Mobile responsiveness | Non-Functional | High | UI/UX |
| NFR-02 | 99% uptime guarantee | Non-Functional | High | Backend |
| NFR-03 | Language support (Nepali/English) | Non-Functional | Medium | UI/UX |
| NFR-04 | Fast load time (< 3 seconds) | Non-Functional | High | Performance |
| NFR-05 | Data encryption and secure login | Non-Functional | High | Security |

Table 5.4. 1: Requirement Matrix

# Program Design:

## **Methodology**:

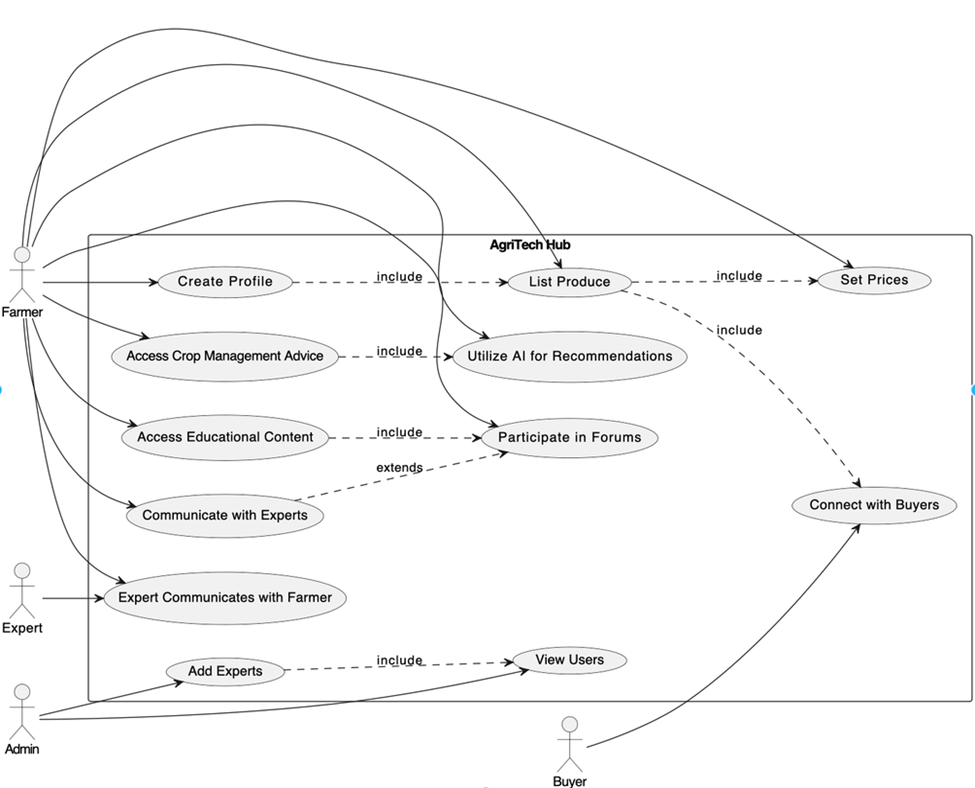


*Figure 6.1 Incremental Model*

The Incremental Model is a software development approach where a product is built in small, functional sections rather than all at once. Each increment adds new features, allowing for early delivery, continuous feedback, and flexibility in changes. This model reduces initial risks, provides users with a working product quickly, and adapts well to evolving requirements. However, it requires careful planning to ensure smooth integration of all parts. Ideal for projects where needs are unclear initially or when early user input is valuable.

## **Block diagram:**

Block diagram of the Agro-Tech Hub is provided below:



*Fig 6.2 Block Diagram*

# Development:

The development journey of **Agro-Tech Hub** was a truly collaborative and hands-on experience. From the very beginning, we knew that building something impactful for farmers meant more than just writing code, it meant listening, learning, adapting, and evolving with every step.

We followed the **Incremental Software Process Model**, which helped us break the project down into manageable phases. This approach gave us room to focus on each feature like crop advisory, expert interaction, and market access one step at a time. We would first build a basic version of a feature, test it out, gather feedback, and then improve it in the next cycle. This way, nothing felt rushed, and we could keep refining the product as we learned more.

Our starting point was the core: getting users especially farmers and agricultural experts registered and into the system. Once that was in place, we focused on features that would let farmers upload crop images and receive tailored advice. Gradually, we built out the marketplace, allowing farmers to connect directly with buyers, and finally added a community forum where users could interact, ask questions, and share their experiences.

We kept our team organized through regular weekly check-ins. These sessions helped us stay aligned, talk through challenges, and prioritize what needed the most attention. We often used group chats and GitHub to manage our code and keep everything in sync a huge help as the project grew more complex.

Some of the most important features we worked on included:

* **Farmer and Expert Profiles** so each user had their own personalized experience.
* **Crop Advisory System** where farmers could upload pictures and get suggestions based on AI or expert feedback.
* **Marketplace Listings** a space for farmers to showcase their products and connect with buyers.
* **Community Forums** giving farmers a place to talk, learn, and help each other.
* **Security** from login to data protection, we made sure the platform was safe and trustworthy.

We used **Flutter** for the app’s user interface, which helped us keep the look and feel consistent across different devices. On the backend, **Django** handled all the data and logic smoothly. For AI and analytics, **Jupyter Notebook** was our go-to tool to test and prototype.

Testing was a regular part of our work we didn’t wait until the end. Every new feature went through unit and integration testing, and we also brought in a few local farmers to try things out and give us honest feedback. This direct input was incredibly valuable and helped us make the platform more practical and user-friendly.

Looking back, this development phase wasn’t just about building software. It was about creating something meaningful for a community that often gets overlooked in the tech world. It taught us how to balance technical skills with empathy, and how real-world feedback is just as important as clean code. In the end, Agro-Tech Hub became more than just an app it became a platform that genuinely tries to support and empower Nepali farmers.

We group of three individual students were confined to the development of the final year project and here is the work division chart among us:

|  |  |  |  |
| --- | --- | --- | --- |
| S. N | Name of the member | Work Assigned | Remarks |
| 1. | Subash Poudel | Coding, Testing,  Documentation | Coding for mobile  app and web app. Implemented testing processes for the apps. |
| 2. | Parash Parajuli | System Design,  Documentation, Coding (Design) | Designed the system workflow for the app. Coded the frontend designs. |
| 3. | Nishchal Sharma | Coding, Testing,  Documentation | Coding for the  API’s required for the app.  Documenting the report according to the development  phases. |

Table 7. 1: Work Division

# Testing:

Regardless of the development methodology, the goal of testing is to ensure that what has been built functions as intended. Testing plays a critical role in assuring the quality and reliability of the software. As part of our development process, we included testing at various stages to identify and fix bugs before deployment.

We designed and executed several test cases to verify that the Agro-Tech Hub application meets its functional requirements.

|  |
| --- |
| **Project Name: Agro-Tech Hub (Test Case No: -1)** |
| Test Case Id: TC001, TC002, TC003, TC004, TC005 |
| Test Priority: High |
| Module Name: Login modules |
| Test Title: Module testing of Login function |
| Test Executed By: Astha Shrestha |
| Pre-condition: The user must have a registered account |
| Description: Validate login for valid, invalid, and password reset conditions |

**Test Steps:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Step** | **Test Case ID** | **Test Case** | **Test Steps** | **Expected Results** | **Test Data** | **Actual Data** | **Status** | **Step** | **Test Case ID** |
| 1 | TC001 | Valid Farmer Login | Enter correct email/password | Redirected to Farmer Dashboard | Email: [farmer@agro.com](mailto:farmer@agro.com), Password: farmer123 | Success | Pass | 1 | TC001 |
| 2 | TC002 | Valid Expert Login | Enter correct expert credentials | Redirected to Expert Dashboard | Email: [expert@agro.com](mailto:expert@agro.com), Password: expert123 | Success | Pass | 2 | TC002 |
| 3 | TC003 | Invalid Login | Enter incorrect credentials | Show "Invalid Credentials" error | Email: [fake@x.com](mailto:fake@x.com), Password: wrong | Error shown | Pass | 3 | TC003 |
| 4 | TC004 | Forgot Password | Click "Forgot Password", submit email | Reset link sent to user | Email: [farmer@agro.com](mailto:farmer@agro.com) | Link received | Pass | 4 | TC004 |
| 5 | TC005 | Reset Password | Enter OTP and new password | Password changed successfully | Code: 2345, Password: newpass | Success | Pass | 5 | TC005 |

Table 8.1. 1: Test case for user login

|  |
| --- |
| **Test case No - 2** |
| Test Case Id: TC006, TC007, TC008, TC009 |
| Test Priority: High |
| Module Name: Registration |
| Test Title: User Signup Validation |
| Test Executed By: Simran Shilpakar |
| Pre-condition: New user must not already exist |
| Description: Verify signup flow for farmer and expert, and handle duplicate cases |

**Test Steps:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Step** | **Test Case ID** | **Test Case** | **Test Steps** | **Expected Results** | **Test Data** | **Actual Data** | **Status** | **Step** | **Test Case ID** |
| 1 | TC006 | Farmer Registration | Fill form and submit | Account created, verification sent | Email: newfarmer@agro.com | Verified | Pass | 1 | TC006 |
| 2 | TC007 | Expert Registration | Submit form + PAN docs | Await admin approval | Email: expert@agro.com | Under review | Pass | 2 | TC007 |
| 3 | TC008 | Duplicate Email | Register with same email | Error: Email already in use | Email: farmer@agro.com | Error displayed | Pass | 3 | TC008 |
| 4 | TC009 | Email Verification | Click verification link | Redirect to login | Email: expert@agro.com | Verified | Pass | 4 | TC009 |

# Gantt Chart:

A Gantt chart compares the quantity of work or production that has been performed over a period of time to the amount that was anticipated during those times using a series of horizontal lines.

**Following is the Gantt chart of Agro Tech Hub:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| SDLC | May | June | | | July | |
| Analysis |  |  | |  |  |  |
| Design |  |  | |  |  |  |
| Coding |  |  |  |  |  |  |
| Testing |  |  | |  |  |  |
| Maintenance |  |  | |  |  |  |
| Documentation |  |  | |  |  |  |

Fig 7.0: Gantt Chart

\*Note: The Duration of one interval is of 15 days.

# Deliverables:

To launch Agro-Tech Hub successfully, we'll focus on the following deliverables:

* **A Mobile Application (Agro-Tech Hub App)**
* User-friendly design tailored for farmers.
* Works both online and offline.
* **AI-Based Agronomic Advisory System**
* Provides personalized crop and weather advice.
* Gives AI recommended crop management service using chatbot.
* **Market Linkage Platform**
* Connects farmers directly with buyers.
* Reduces the role of middlemen.
* **Community Learning Feature**
* Allows farmers to share tips, success stories, and questions.
* Encourages peer-to-peer learning.
* **Communication with Experts**
* Experts provides the suggestions to the farmers.
* **Dashboard for Monitoring and Evaluation**
* Helps track user engagement, feedback, and system performance.
* Useful for continuous improvement and reporting.

# Conclusion:

In conclusion, Agro-Tech Hub represents a transformative approach to modernizing agricultural practices for smallholder farmers. By offering a suite of integrated features—ranging from personalized agronomic advice and crop monitoring to market linkages and community engagement. The platform addresses key challenges and enhances farming efficiency. The ability to post crop progress photos and receive tailored guidance not only supports improved agricultural outcomes but also fosters a collaborative environment for knowledge exchange. As a result, Agro-Tech Hub is poised to significantly boost agricultural productivity, facilitate better market access, and drive sustainable development within the farming community. The project's innovative approach demonstrates a promising path forward for integrating technology with agriculture to support and uplift smallholder farmers.