American International University-Bangladesh (AIUB)

Department of Computer Science

Faculty of Science & Technology (FST)

Land Survey to Trace Cultivate Lands.

The project will be Evaluated for the following Course Outcomes

CO3: *Select* appropriate software engineering models, project management roles and their associated skills for the complex software engineering project and evaluate the sustainability of developed software, taking into consideration the societal and environmental aspects	Total Marks	
Appropriate Process Model Selection and Argumentation with Evidence	[5 Marks]	
Role and responsibilities in your group for the selected process model	[5Marks]	
Evaluate the sustainability of the developed software in terms of both society and the environment (Impact identification)	[5Marks]	
Submission, Defense, Completeness, Spelling, grammar and Organization of the Project report	[5Marks]	
CO4: *Develop* project management plan to manage software engineering projects following the principles of engineering management and economic decision process	Total Marks	
Develop the project plan, its components of the proposed software products using WBS and testcases	[5Marks]	
Identify all the activities/tasks related to project management and categorize them within Project estimation, and schedule of the tasks using appropriate resources	[5Marks]	
Identify all the potential risks in the specific project and prioritizing/categorizing those, and also mitigation plan to overcome the risk factors.	[5Marks]	

1. PROJECT PROPOSAL

1.1 Background to the Problem

Bangladesh is an agricultural country. So, land resource is one of the major asset of our country. Because of Bangladesh's fertile soil, most of the people are dependent on agriculture.

Agriculture is one of the largest economic sectors in Bangladesh. The agricultural sector is standing at the center of our economy, which ensures our food security. The share of agriculture in Bangladesh's GDP (GROSS DOMESTIC PRODUCT) is 11.50 percent. According to the provisional calculation of BBS, the contribution of agriculture to the GDP in FY 2021-22 is about

11.50 percent. But in recent years, the share of agriculture in GDP (Gross Domestic Product) is decreasing. In 2012, the share of agriculture in GDP was 16.18%. In 2021 it was 11.63% and in 2022 the share of agriculture in GDP was 11.50%. Others sector which are improving rapidly than our agricultural sector. Although our food production has increased its not enough compare to our population and for our economic structure.

Bangladesh is one of the most densely populated country. Its land is decreasing as the population grows rapidly. So, it also affects our arable land. According to the Bangladesh of Statistics Agricultural Census-2019, the net decline in relative arable land over an 11-year period amounted to 416,000 acres. In recent years, the government estimates the decrease rate of arable land is 0.02 percent. But arable lands decrease faster than this percentage. According to Bangladesh Government Agriculture Information Service, Infrastructure development such as roads, industries and unplanned buildings eliminates approximately 80,300 hectares of arable land per year. So, this is a very serious problem that we cannot ignore because our food production depends on how much arable land we have and how we will utilize that arable land.

1.2 Solution to the Problem

The primary objective of the project is to build a system where our government can see all the information about cultivated lands or arable lands. In our system, we will keep all the information about arable land, how much arable land available we have, how much product we will get from those lands, because of what problems our production was reduced, how much-cultivated land decreased, etc. Using this information, Government can take the initiative immediately and can take proper action to solve those problems. Because of taking actions immediately and quickly by the government, farmers will be greatly benefited.

The system leverages state-of-the-art technology to address critical issues in Bangladesh's agricultural sector and incorporates advanced functionalities that not only optimize land management but also have a profound impact on societal, health, safety, legal, and cultural dimensions.

Key Functionalities: We will analyze our arable land by using GPS and GIS technology. Where we can easily monitor those lands including Real-time monitoring. Capturing images of those lands, analyzing, and processing them, and storing those data for further uses. Extracting information by comparing the newly collected data with the previous data and showing the statistical view of how much cultivated land decreased in a particular area or how much-cultivated land increased in those areas and the condition of the soil and how much amount of crop production we will get in the future. Also, we will be able to predict what type of necessary steps should be taken in the future. The system will also allow user to employ any specialist in a specific area for help purposes. Also, the system will allow users with a login and password reset feature.

Environmental and Social Impact: Moreover, the proposed Land Survey System significantly enhances societal well-being through its contributions to food security, sustainable agriculture, and

informed decision-making. By incorporating real-time monitoring and a user-friendly interface, it actively supports crop health and safety while promoting legal compliance and cultural sensitivity through compliance tracking, preservation of historical data, and community engagement features. This holistic approach addresses multifaceted challenges in Bangladesh's agricultural sector, aligning with societal values and fostering a resilient and responsible land management ecosystem. The land survey to trace cultivate land system positively impacts society by enhancing sustainable farming practices, optimizing land use, and fostering environmental conservation through informed decision-making.

The target group users of the system are the government officials in agriculture departments who are responsible for legal compliance. Using the system they can make efficient decisions. Government officials can track and monitor land use patterns in real-time to identify unauthorized land conversions, deforestation, or illegal activities. They can also monitor soil erosion and environmental impacts of agricultural practices to ensure sustainable resource management and compliance with environmental regulations. By providing these functionalities, the Land Survey System can become an asset for government officials in Bangladesh, empowering them to make informed decisions, improve service delivery, and contribute to a more sustainable and productive agricultural sector Key contributions include centralized data management framework, GIS integration for spatial analysis, real-time monitoring, and reporting mechanisms.

Although there have been several studies to use technology for monitoring and tracking cultivated lands in Bangladesh, each with its unique approach and contributions such as:

- **Remote Sensing for Land Use Mapping:** Numerous studies utilize satellite imagery and aerial photography to map land use patterns in Bangladesh (e.g., [Zhu et al., 2019], [Paul et al., 2020]).
  Reference: Remote Sensing | Free Full-Text | A Framework for Fine-Grained Land-Cover Classification Using 10 m Sentinel-2 Images (mdpi.com)
- **GIS for Land Management:** Studies employ GIS for land management and decision-making in Bangladesh (e.g., [Rahman et al., 2015], [Mondal et al., 2018]).
  Reference: Remote Sensing | Free Full-Text | Assessment of Land Use Land Cover Changes for Predicting Vulnerable Agricultural Lands in River Basins of Bangladesh Using Remote Sensing and a Fuzzy Expert System (mdpi.com)

Where these studies have focused on high-resolution imagery, developing time-series analysis, integrating soil quality and irrigation data, providing localized land management recommendations, we can significantly extend the existing research by combining multiple approaches such as integrate remote sensing and GIS, focusing on specific challenges like land degradation, inefficient cropping practices, water scarcity, practical recommendation for farmers and policymakers.

There are several existing software solutions such as:

- **Land Management Information System (LMIS) by DoLR:** Bangladesh government tool for land record management but lacks real-time monitoring and advanced analysis capabilities.
- **Krishibid:** Mobile app offering agricultural information and services, but mainly focuses on market prices and lacks comprehensive land management features.

These solutions have some limitations in the point of view of our project such as, most existing solutions focus on broad-scale land use mapping or basic data collection, lacking real-time monitoring and advanced analysis capabilities. Limited integration of remote sensing, GIS, and mobile data collection for a comprehensive picture of cultivated lands. Often lack user-friendly interfaces and features tailored to specific needs of Bangladeshi government official related to land management system. Although Bangladesh management information system (LMIS) hold all information about the land of our country, there are no system to analysis them or take any decision based on data related to land of our country. We propose to solve these problems by extending integration, real time monitoring, advanced analysis, user-friendly interface, and specific functionalities such as monitoring crop health, land erosion and also predict information about the future.

In conclusion, this project proposes a comprehensive Land Survey System tailored to address the critical challenges facing Bangladesh's agricultural sector. By leveraging advanced technology and integrating remote sensing, GIS, and mobile data collection, the system aims to provide real-time insights, foster informed decision-making, and ultimately contribute to improved land management and revitalized agricultural practices. Addressing limitations of existing solutions and focusing on specific Bangladeshi needs, the project has the potential to significantly impact food security, environmental sustainability, and the overall well-being of the nation. Through further research, refinement, and implementation, this innovative project can play a crucial role in propelling Bangladesh's agricultural sector towards a more prosperous and sustainable future.

2. Functional and Non-Functional Requirements:

2.1 Functional Requirements:

1. Login Page:

1.1 The software will allow government officials to login to the system using their email, NID number and password.

1.2 The login credentials (email, NID number and password) will be verified from a central database record.

1.3 If the credentials are matched, then it will go to the home page.

1.4 Otherwise, if the credentials are not matched in three tries, then the account associated with the NID number will be locked and the user needs to send a request to unlock the account and change their password.

Priority: High.

Preconditions: valid NID number, email address, and password.

2. Password Reset page:

2.1 The user will input their NID number and email to reset the password.
2.2 An email with a verification code will be sent to the user's email address.
2.3 The user can change the password if they input the correct verification code.

Priority: High.

Preconditions: valid NID number and email address and an account must be associated with this NID number.

3. Satellite Image Analysis:

3.1 The system will utilize a satellite imagery system for presenting maps.
3.2 The system will allow the user to input their desired location to monitor. And check if the location is correct or not.
3.3 The system will also suggest the user locations based on their given input.
3.4 If the user can find their desired location, the system will give many options to the user.
3.5 There will be a dashboard where the system will give options to the user where the user can select their desired option.

Priority: High.

Precondition: The user must log in to the system.

4. Crop Health Information:

4(a) Analysis and view:

4.1 The user views the specific location for analysis.

4.2 The user can collect previous data on crops and also real-time data is collected to provide current information on crop health.

4.3 The user can compare the previous data and current data to inspect the crop health.

4.4 The user can view the compared data with a histogram.

4(b) Generate Report:

4.5 The system generates a detailed analytical report based on the comparative analysis.

4.6 The report should include key findings, trends, and insights regarding the crop health for the selected location.

4.7 System predicts data on crop health for the specified location and timeframe. The predicted output may include forecasts of potential issues such as diseases, pest infestations, or yield estimates.

4.8 The user should have the option to export the generated report in common formats (PDF, Excel).

5.Soil Condition:

5(a) Analysis and View:

5.1 The system provides a user-friendly interface where users can select specific locations for soil condition analysis.

5.2 Users can collect both historical and real-time data on soil conditions.

5.3 Users can compare previous soil data with the current data to inspect changes and trends in soil conditions.

5.4 The system allows users to view the compared data using histograms, to represent and interpret the distribution of soil properties.

5(b) Generate Report:

5.5 The system generates a detailed analytical report based on the comparative analysis of soil conditions.

5.6 The report includes key findings, trends, and insights regarding the soil conditions for the selected location. It highlights significant changes or patterns observed in the soil data.

5.7 The system predicts data on future soil conditions for the specified location and timeframe. This may include forecasts of potential issues like changes in moisture levels, nutrient deficiencies, or other factors affecting soil health.

Priority: High

Precondition: The user must select specific areas.

6. Environmental Impact:

6.1The system will allow the user to view the information on arable land lost during river erosion and the rate of river erosion.

6.2 Users can also view accretion of land on the bank side.

6.3 Users can analyze air pollution rate and human settlement rate which impact on arable land.

6.4 And user can also see past activities and analyze the past data such as how much river erosion occurs, the fill rate of ponds, human settlement rate, and how much arable land we lost.

Priority: High.

Precondition: The user must select the area.

7. Historical data Preservation:

7.1 Users can select an area by using the map shown on the screen or the user can write down the name of the area on the search bar.
7.2 The user must select the year to see previous data, or it will show the data of the current year.
7.3 Users can select seasons to specify the time zone more precisely.
7.4 The user can select any option from the dashboard where multiple options will be given and options are arable land accretion or erosion, soil condition, crop condition, and weather condition, comparison between selected years.
7.5 After selecting the option, the system will show the data for that chosen option.
7.6 The system will show the data on another page and the data will be shown in various types of graphs.

Priority: High.

Precondition: The central database must store accurate data of previous years. The user must select the specific area.

8.Cultivated and arable Land Analysis:

8.1 Users can view currently cultivated and arable land in a specific area using the satellite imagery system.

8.2 Users can also select to view the cultivated and arable land data from the previous years.

8.3 The system should also allow users to compare current data and previous years data to analysis the increased or decreased arable land ratio and cultivated land.

8.4 The system will also give prediction if the arable and cultivated land will increase or decrease based on historical data.

8.5 Based on the increasing or decreasing of cultivated land from previous years, the system will also show the users the land to crop production ratio and the user can decide if the land to crop production ratio is stable or not.

Priority: High.

Precondition: The user must select the specific area.

9. Expert Consultation:

9.1 Users can view available experts.

9.2 Users can search for experts using their names.

9.3 Users can view their personal information.
9.4 Users can filter out experts for a particular region.

9.5 Users can assign those experts for a particular area.

Priority: Medium

Precondition: The user must verify the problematic areas.

2.2 Non-Functionality Requirements:

Performance: The system should provide a responsive user interface, with page loading and doing tasks such as searching for a place or monitoring data on a land not extending standard time. The system should be scalable to accommodate a growing volume of land-related data.

Reliability: The system should be uptime all the time, to ensure it is available to users whenever needed. Moreover, data taken into the system should be accurate and consistent, with appropriate validation checks to maintain integrity.

Integrity: The system should provide proper security, should deal with unauthorized access to the system and prevent any information loss, protect the privacy and safety of land related data entering the system.

Interoperability: The system should support seamless integration with Geographic Information System (GIS) platforms for spatial analysis and mapping. Various projects done under the supervision of government of Bangladesh related to GIS and other monitoring systems can be used to update our central database.

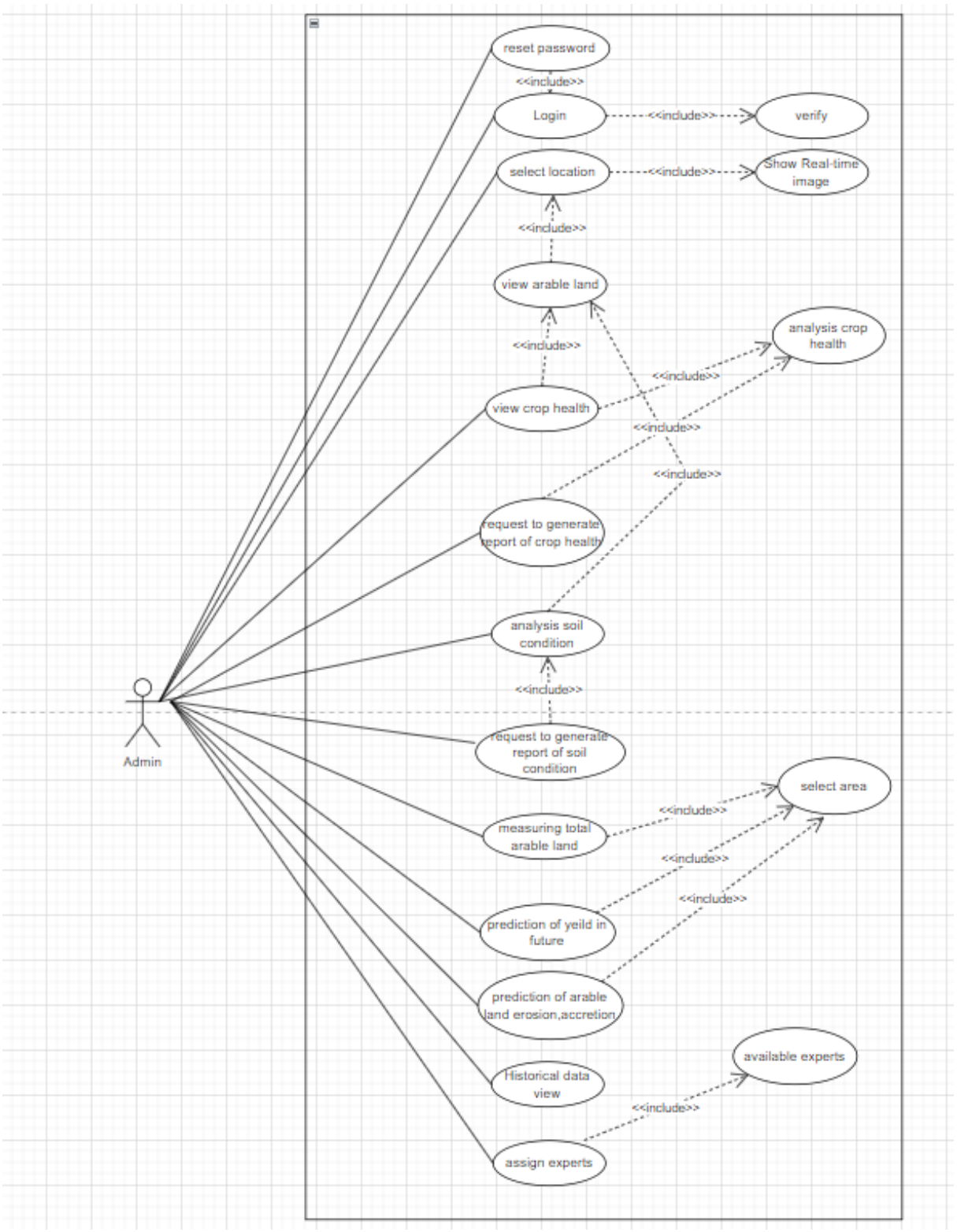
Robustness: Our system should be functional properly when confronted with invalid inputs or defects in connected software. For example, when a user gives any invalid NID number or email or any invalid location to monitor, the system should function properly will display proper message to the user.

Maintainability: The system should be designed with a modular architecture to facilitate easy updates, additions, or maintenance. Comprehensive documentation should be provided for system architecture for future reference and maintenance.

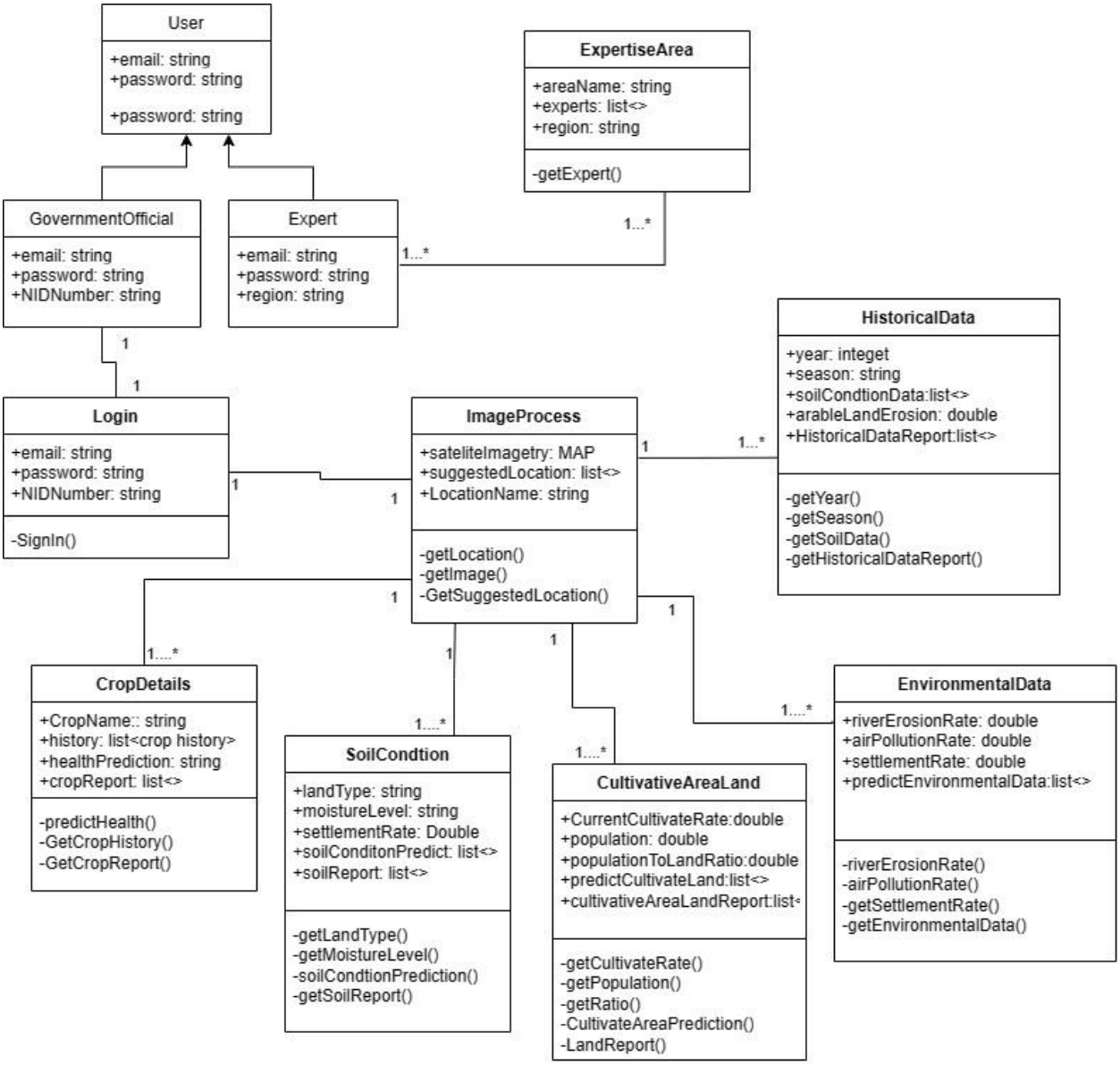
Legal and compliance: The system must ensure compliance with data protection laws and regulations, safeguarding user privacy and sensitive information. The system should also adhere to local laws and regulations related to land surveys

3.Diagrams:

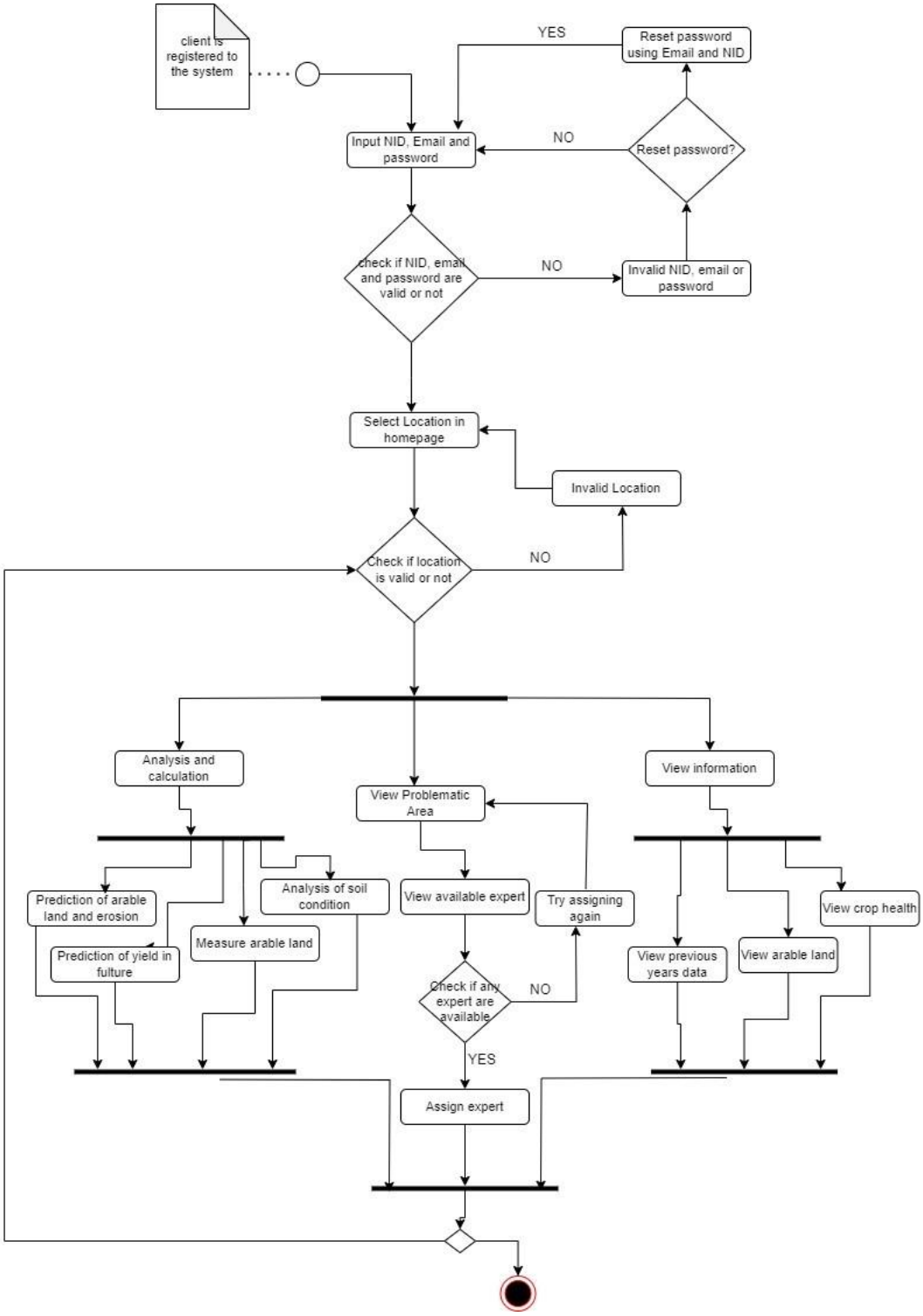
3.1 Use Case Diagram:



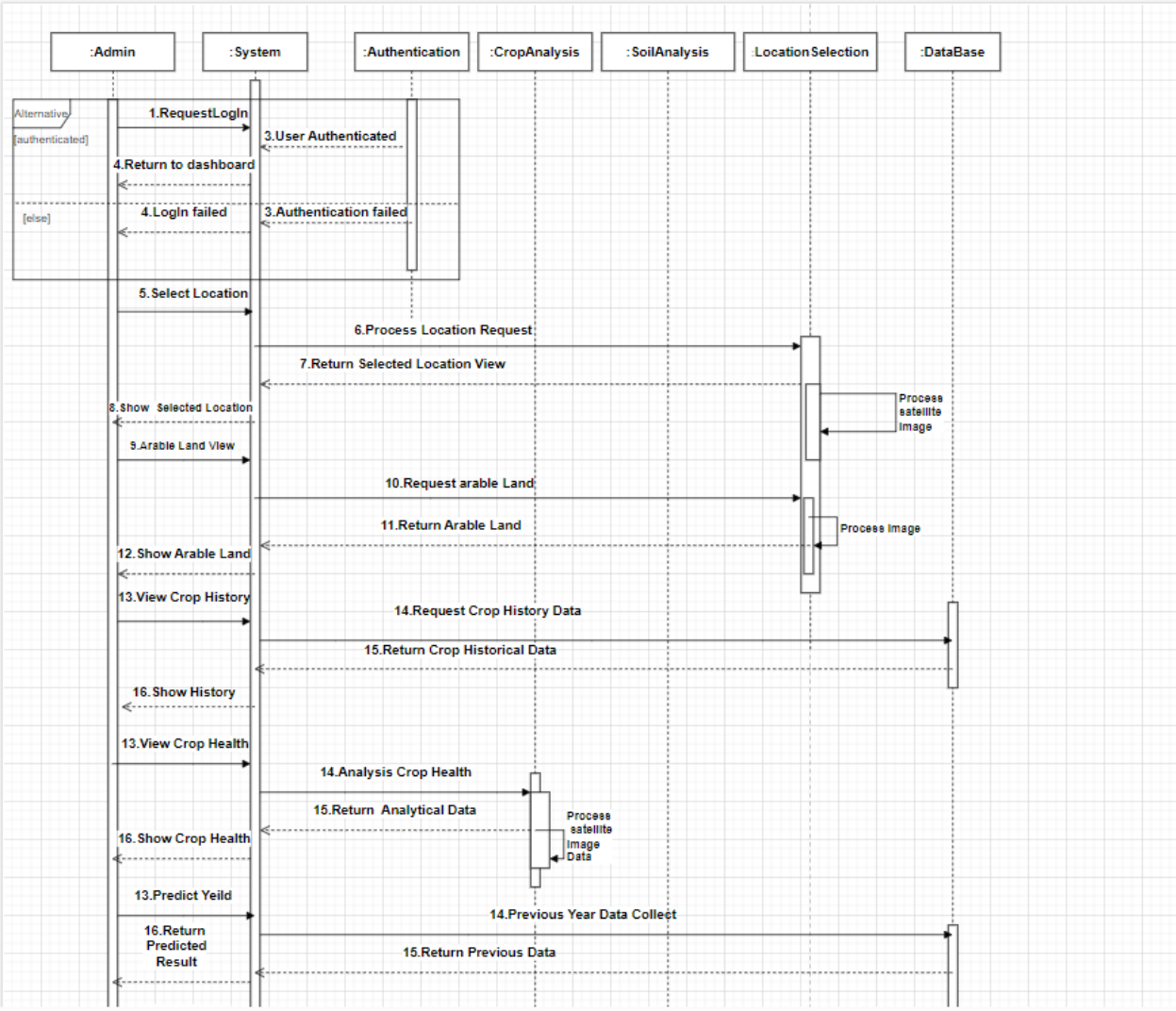
3.2 Class Diagram

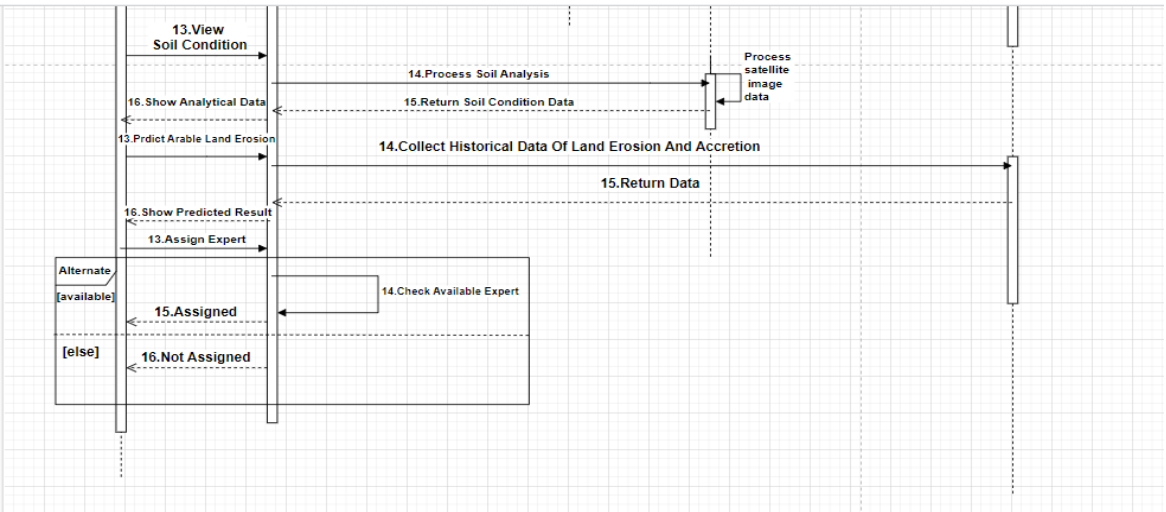


3.3 Activity Diagram:



3.4 Sequence Diagram:


:Admin
:System
:Authentication
:CropAnalysis
:SoilAnalysis
:LocationSelection
:DataBase
Alternative
[authenticated]
1.RequestLogIn
3.User Authenticated
4.Return to dashboard
[else]
4.LogIn failed
3.Authentication failed
5.Select Location
6.Process Location Request
7.Return Selected Location View
Process satellite image
8.Show Selected Location
9.Arable Land View
10.Request arable Land
11.Return Arable Land
Process Image
12.Show Arable Land
13.View Crop History
14.Request Crop History Data
15.Return Crop Historical Data
16.Show History
13.View Crop Health
14.Analysis Crop Health
15.Return Analytical Data
Process satellite Image Data
16.Show Crop Health
13.Predict Yeild
14.Previous Year Data Collect
16.Return Predicted Result
15.Return Previous Data


13.View Soil Condition
14.Process Soil Analysis
Process satellite image data
16.Show Analytical Data
15.Return Soil Condition Data
13.Prdict Arable Land Erosion
14.Collect Historical Data Of Land Erosion And Accretion
15.Return Data
16.Show Predicted Result
13.Assign Expert
Alternate
[available]
14.Check Available Expert
15.Assigned
[else]
16.Not Assigned

4. SOFTWARE DEVELOPMENT LIFE CYCLE

4.1 Process Model

Embarking on the development journey of land survey to trace cultivate land requires careful consideration of the most suitable process model to ensure the project's success. The unique challenges of spatial data analysis, crop health monitoring, and environmental impact assessment demand an approach that is not only efficient but also adaptable to the dynamic nature of agricultural landscapes. In this context, selecting an appropriate process model becomes a pivotal decision that shapes the entire development lifecycle. After thoughtful evaluation and consideration of various plan driven and Agile methodologies, the Scrum model has been chosen as the preferred process model for the development of our Agricultural Land Survey System. Recognizing the need for iterative and collaborative development, Scrum aligns seamlessly with the project's goals, emphasizing regular stakeholder involvement, clear role definitions, and the delivery of incremental, high-value increments.

Land survey to trace cultivate land is a new technology based on requirements that are not fully cleared to us. As a result, more new requirements are going to arrive as we complete a certain scope of the project. The functional requirements of the system highlight the need for flexibility, collaboration, and incremental development, which align well with the principles of the Scrum framework.

Iterative and Incremental Development: Scrum emphasizes iterative development with short, fixed-length cycles known as sprints, roughly one month each. This aligns with the need to continuously enhance and update the land survey to trace cultivate land system based on evolving user requirements and emerging technologies.

Flexibility to Adapt to Changing Requirements: The agricultural sector is dynamic, and requirements may change based on new technological advancements or shifts in the industry. Scrum allows for flexibility by accommodating changes in priorities, requirements, and features at the end of each sprint.

User Feedback Integration: After each sprint, the meeting with customers can provide feedback to early development process which ensures that the system meets the users' expectation.

Adaptation to Emerging Technologies: The system incorporates satellite image analysis, environmental impact analysis, and predictive modeling. Scrum's adaptability allows the development team to embrace emerging technologies and integrate them into the system as they become available or relevant.

Time-to-Market: The land survey to cultivate land system is likely to be time-sensitive due to its real-time data analysis and prediction features. Scrum's time-boxed sprints ensure a regular

cadence of releases, allowing the system to be delivered incrementally, and potentially providing value to users sooner.

While Scrum is chosen as suitable for land survey to trace cultivate land, there are other agile models that were not chosen for specific reasons. Such as:

Extreme Programming (XP): XP emphasizes technical excellence and frequent releases, but it might not provide enough structure for managing complex projects like the land survey to trace cultivate land system. XP also lacks specific roles which can hinder our dynamic development for our land survey to trace cultivate land system.

Feature-Driven Development (FDD): FDD is effective for large-scale projects with clear feature sets. However, the land survey to cultivate land system is preferable for small-scale team and working on any feature can take more than 2 weeks as we are working on new technologies.

Dynamic Systems Development Method (DSDM): DSDM focuses on delivering functionality quickly but might lack the flexibility needed for rapidly changing requirements. The like the land survey to cultivate land system requires adaptability due to the evolving nature of agricultural data analysis and technology.

In the plan-driven model, development relies on detailed well known requirements, and while we are in the development phase, we cannot change our requirements. That means plan-driven model is not flexible, after starting the development phases we cannot change our requirements. But in our Land survey project, we may need to change our requirements because our project works with advanced technologies, and we are not very clear about those advanced technologies very well. While implementing new technologies, our project requires frequent customer involvement and needs communication between project developers. This type of frequent customer involvement is not possible in plan plan-driven model. So, this is one of the reasons, we did not choose the plan-driven model. Plan driven model is a slow process model, with lengthy planning and design phases. Because of using advanced technologies, we may not be able to know every possible functional requirement and we cannot spend a lot of time on those unknown requirements. In this case, we need to complete those requirements that we know very well, and the agile scrum process model gives us this flexibility.

4.2 Project Role Identification and Responsibilities

In the context of the land survey to trace cultivate land system, the Scrum framework involves key roles that play distinct responsibilities throughout the development process. Such as:

Product Owner: The product owner represents the government officials of Bangladesh. They will define and prioritize features and functionalities based on the needs of government officials. They will also ensure that the development team understands the vision and goals of the system and

provide timely feedback on delivered increments after each sprint and approving or adjusting the work based on the changing requirements.

Scrum Master: The Scrum Master serves as a facilitator and ensures that the Scrum framework is followed effectively. He will remove impediments and obstacles that hinder the development team's progress and facilitate sprint planning, daily stand ups and sprint review.

Development Team: The development team is a cross-functional team responsible for designing, implementing, and testing the land survey to trace cultivate land system. They will collab with each other to deliver the increments during each spring and ensure that the product increment meets the definition of done by the end of each sprint.

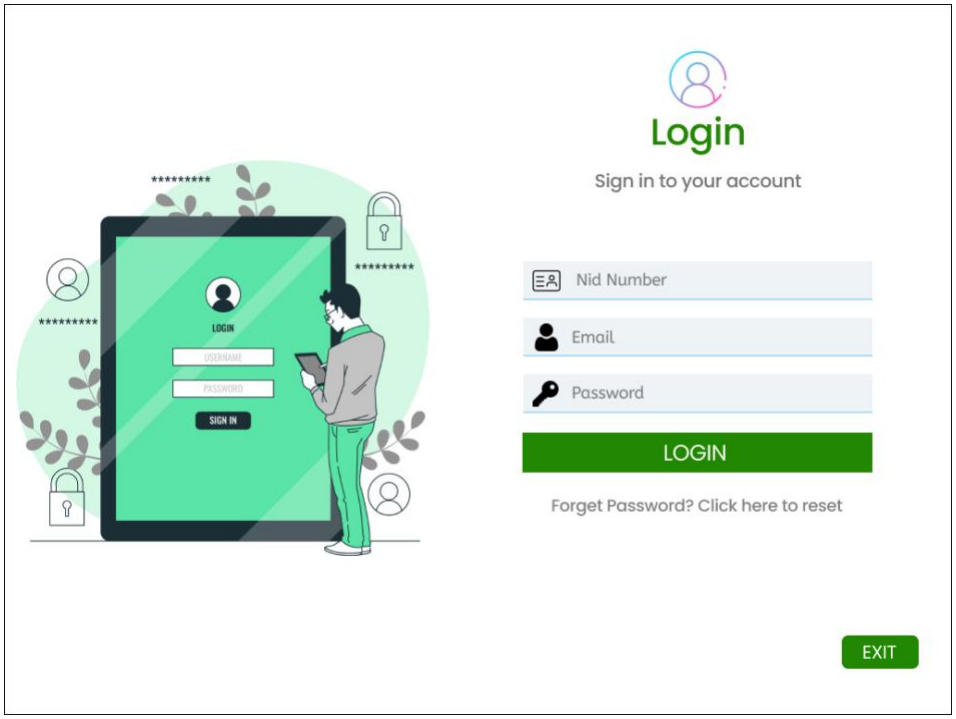
Management Team: Management team will oversee final decision making along with agreements, standards, and conventions to be followed in the project. They will also participate in the setting of goals and requirements.

Stakeholders: Stakeholders in this project include government officials (experts in agriculture, environmental impact), who are the users of the system. They will collaborate with the product owner to define and prioritize the features and provide feedback during sprint review to ensure the delivered increments meet their needs.

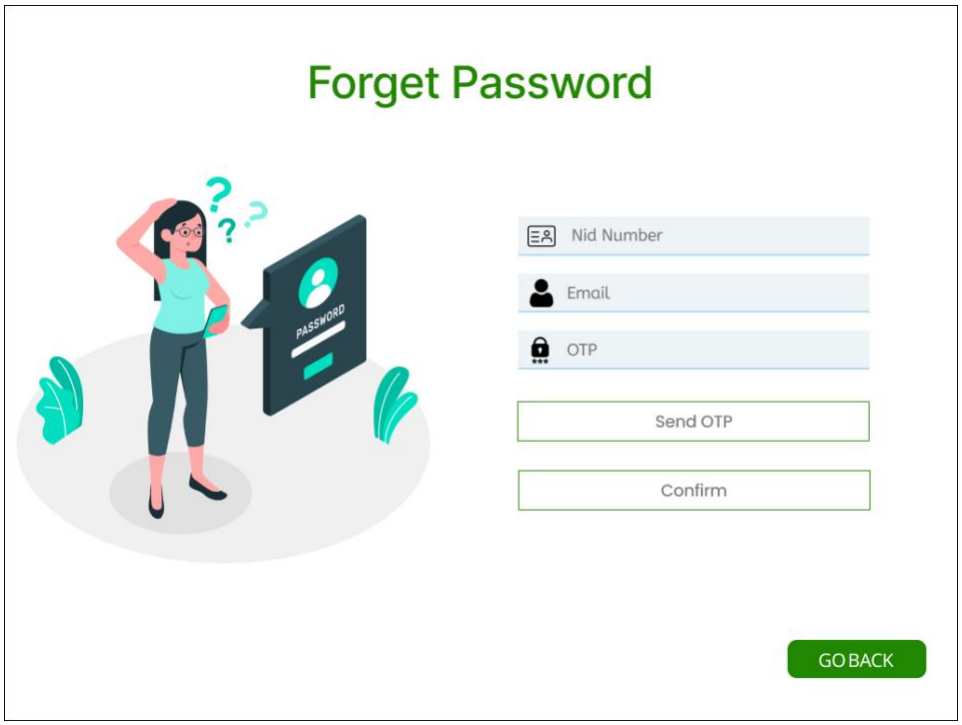
Effective communication and collaboration among these roles are essential for the success of the land survey to trace cultivate land system. The Scrum team works together to ensure that the product is developed incrementally, meeting stakeholder expectations and adapting to changing requirements as needed.

5.UI/UX Design

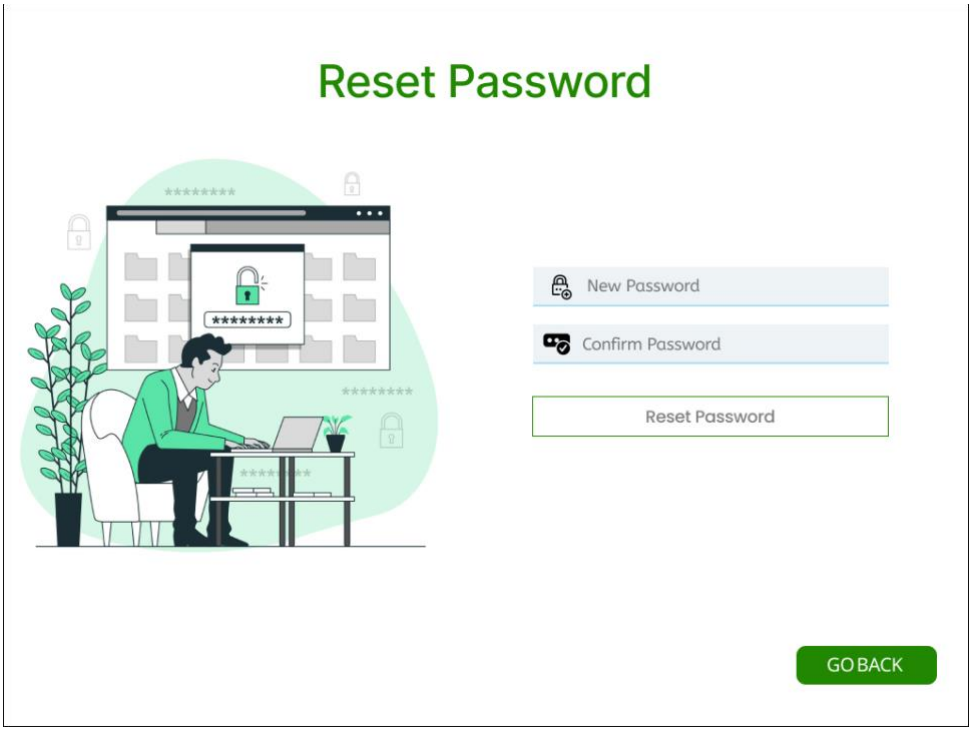
1. Login Page



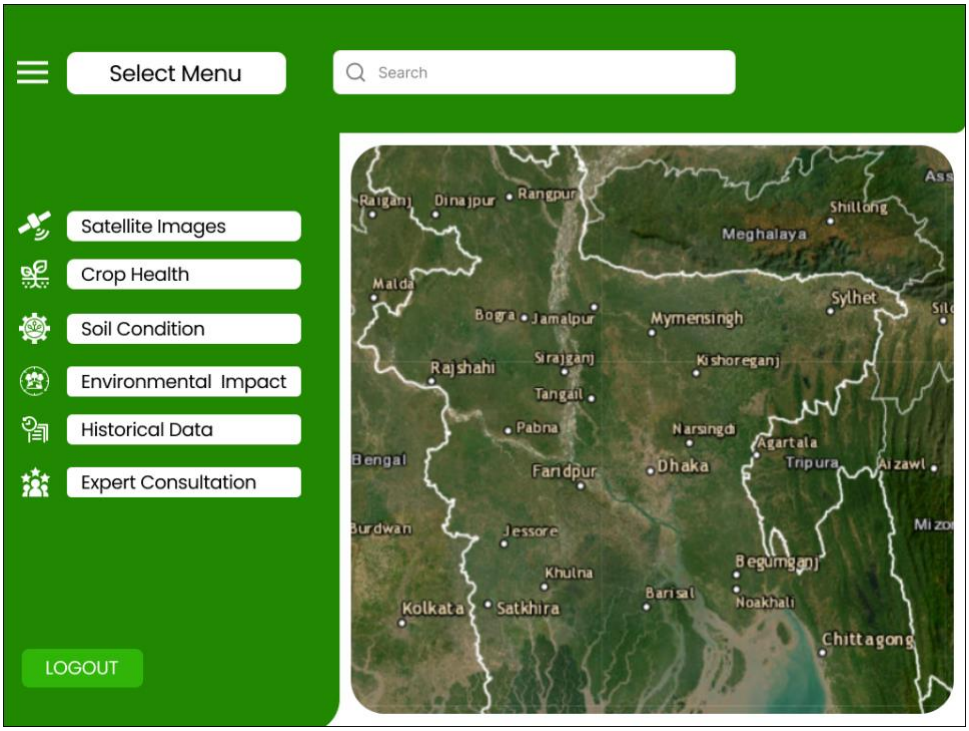
2. Forget Password



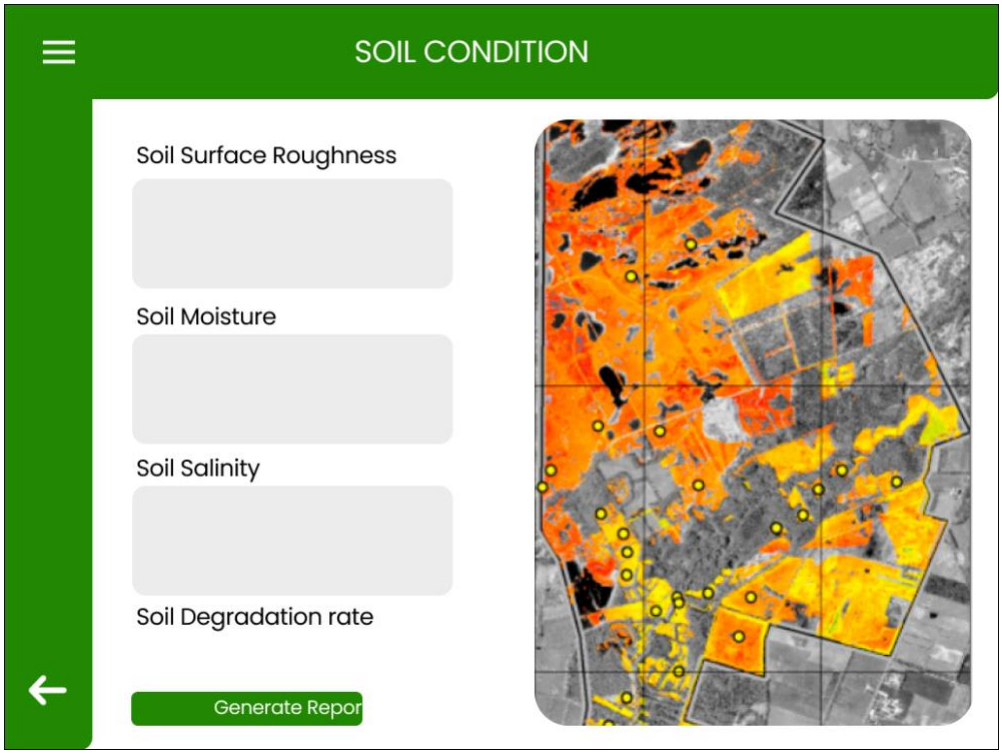
3. Reset Password



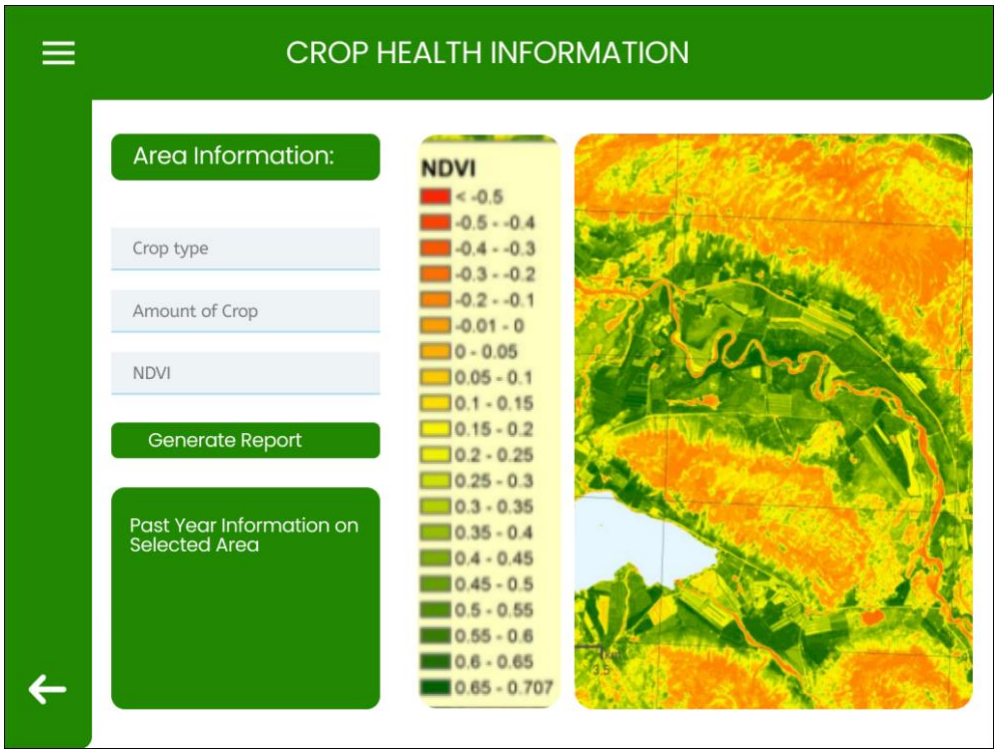
4. Dashboard



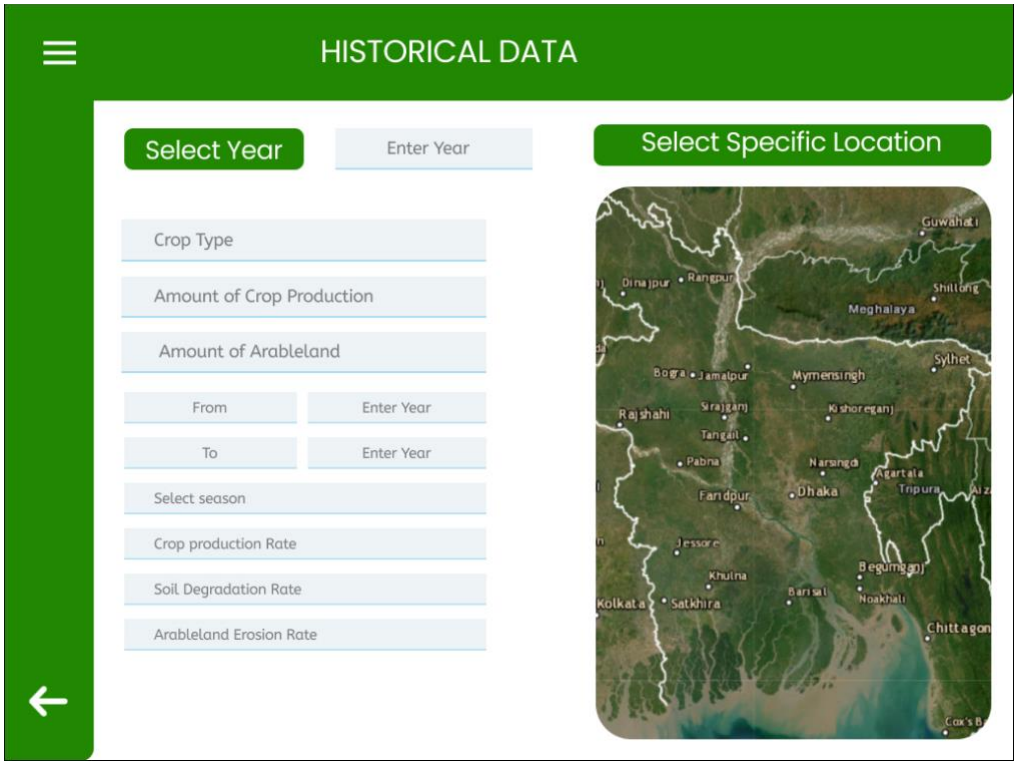
5. Soil Condition Analysis



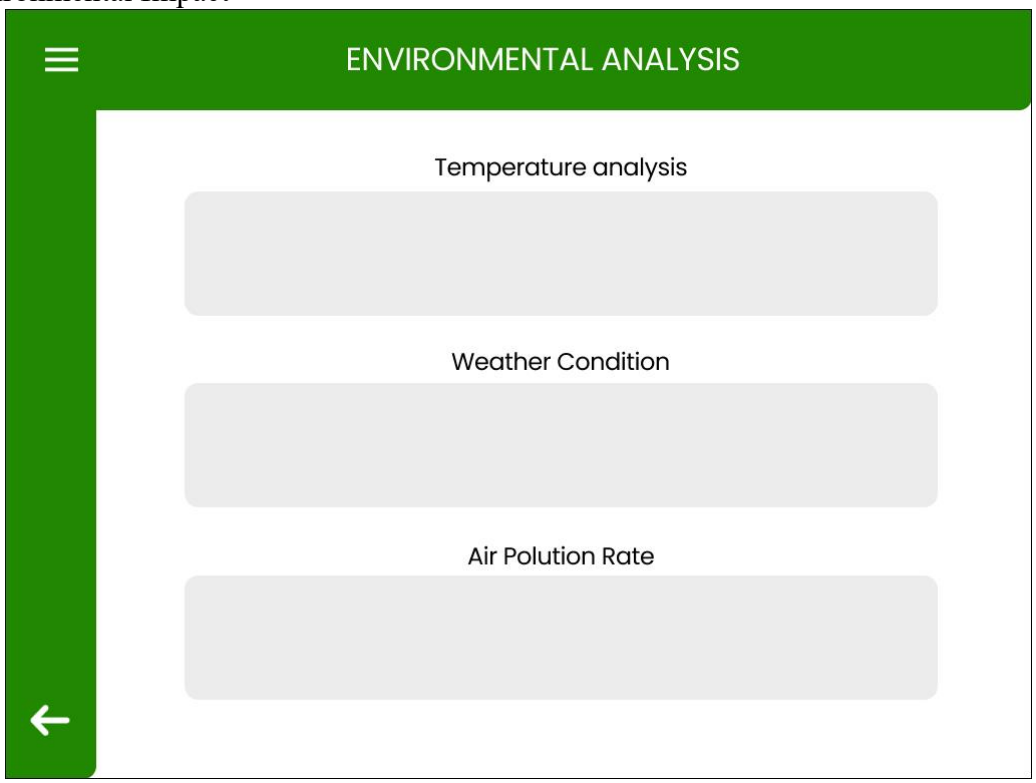
6. Crop Health Information



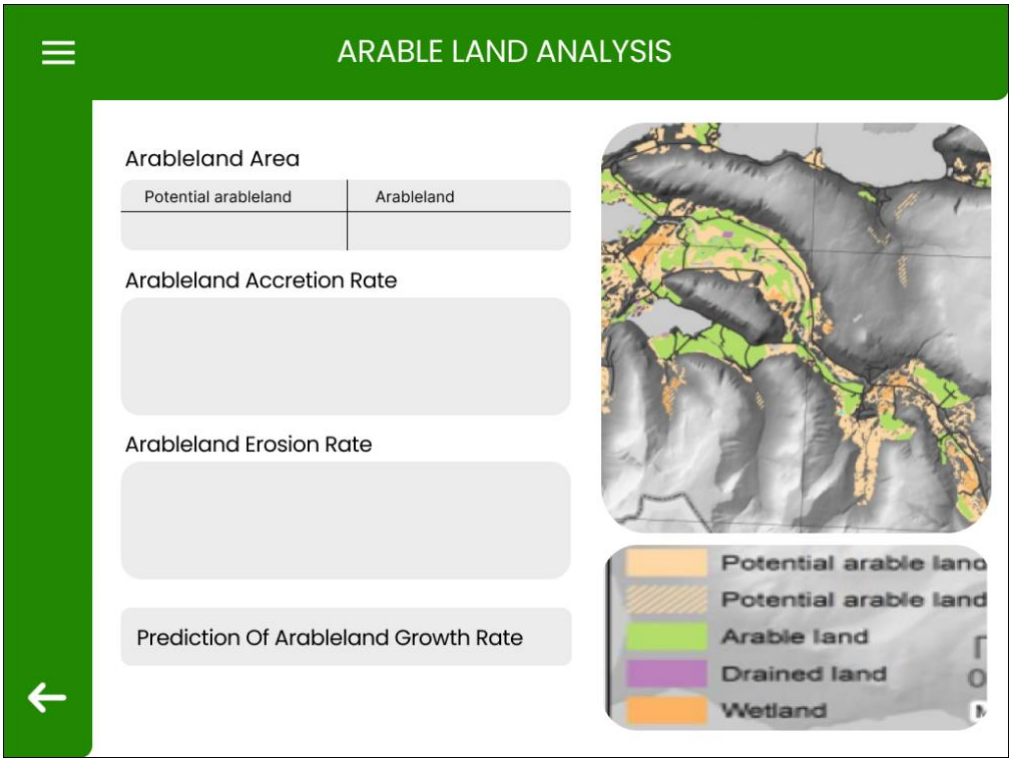
7. Historical Data



8. Environmental Impact

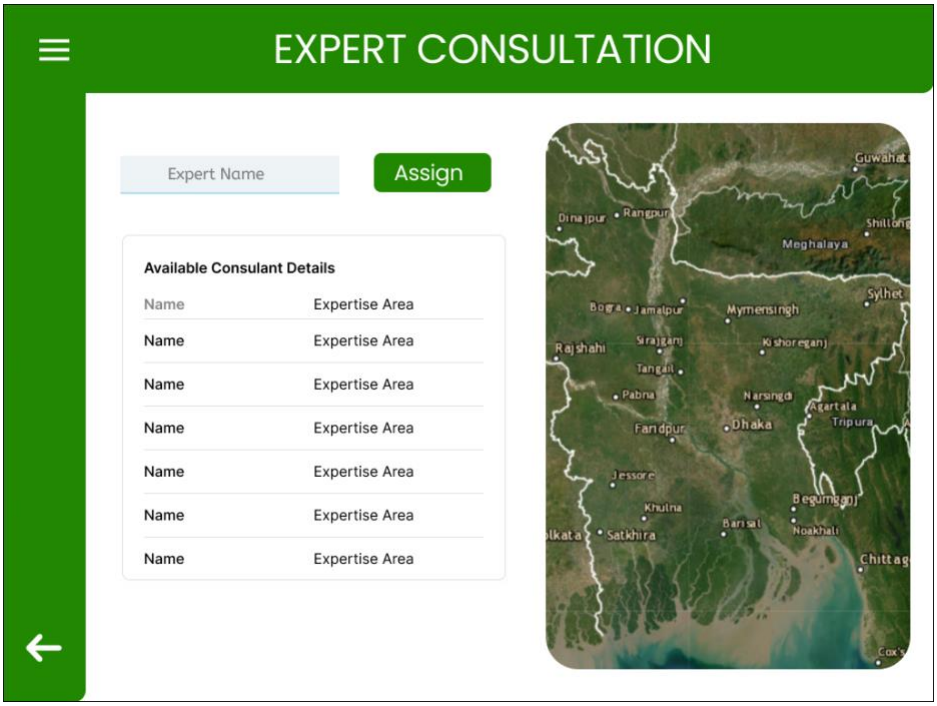


9. Arable Land Analysis



10. Report Generator

11. Expert Consultation.



6.Test Case:

Testing is the process of exercising a program with the specific intent of finding errors prior to delivery to the user end. Software testability is simply how easily a program can be tested.:

Required Tests:

Functionality Testing: We need to test the functionality of each unit after the completion of each sprint so that we can ensure our sprint has proper outcome.

Integration Testing: At the beginning of the post-game phase, we need to perform integration testing to ensure seamless interaction between different features and modules.

System Testing: We need to perform system testing to validate the entire system's compliance with specified requirements and its behavior under certain condition.

Acceptance Testing: Before release of the system, we need to perform acceptance testing to ensure the stakeholder's requirements are fulfilled.

Test Planning:

Our project requires three people for the development Andy, Charlie and Bill. The total development time is 29 weeks as per COCOMO calculation. The planning for the testing:

Functionality Testing:

- Reason to test: To check each function works properly.
- Tesh execution date: 8th ,9th,12th,13th,16th,17th,20th, 21th,24th and 25th week.
- Executed By: Charlie.
- Role: Developer

Integration Testing:

- Reason to test: Integration testing helps to identify issues that may arise when components are combined.
- Test Execution Date: 26th and 27th week.
- Executed By: Charlie
- Role: Tester

System Testing:

- Reason to Test: To ensure that the system meets its specifications and requirements.
- Test Execution Date: 26th and 27th week.
- Executed By: Andy.
- Role: Scrum Master.

Acceptance testing: Acceptance testing will be done by the users of the system on the 29th week.

1.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: JALAL UDDIN		
Test Case ID: FR01		Test Designed date:3/302024		
Test Priority (Low, Medium, High): High		Test Executed by:		
Module Name: Login Session		Test Execution date:		
Test Title: Verify Login				
Description: To verify if the user can properly login in the system or not				
Precondition (If any): User must have valid NID, Email and password				
Test Steps	Test Data	Expected Results	Actual Results	Status
1.Open the Website. 2. User Input Valid NID, email and password. 3. Click Login	NID: 99999999999 Email:abir123@gmail.com Password:123	User should login into the system after the NID, Email and password matches with the database.		
Post Condition: User has successfully login to the system.				

2.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: JALAL UDDIN		
Test Case ID: FR02		Test Designed date:3/30/2024		
Test Priority (Low, Medium, High): Medium.		Test Executed by:		
Module Name: Forget Password Session		Test Execution date:		
Test Title: OTP validation Test				
Description: To verify if the user can properly get OTP with valid NID and Email.				
Precondition (If any): User must have valid NID and Email				
Test Steps	Test Data	Expected Results	Actual Results	Status
1.Open the Website. 2. User Click forget password 3. User inputs valid NID and Email. 4. User clicks get OTP.	NID: 99999999999 Email:abir123@gmail.com	User should get valid OTP in his Email.		
Post Condition: User successfully gets the OTP.				

3.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: JALAL UDDIN		
Test Case ID: FR03		Test Designed date:3/30/2024		
Test Priority (Low, Medium, High): Medium.		Test Executed by:		
Module Name: Forget Password Session		Test Execution date:		
Test Title: Password Reset Test				
Description: To verify if the user can properly Change the password with valid NID, Email and OTP.				
Precondition (If any): User must have valid NID, Email and OTP.				
Test Steps	Test Data	Expected Results	Actual Results	Status
1.Open the Website. 2. User Click forget password 3. User inputs valid NID and Email. 4. User clicks get OTP and gets OTP. 5. User Inputs the OTP and clicks confirm. 6.User Inputs new password and confirm Password to update the password.	NID: 99999999999 Email:abir123@gmail.com OTP: 1223	User should be able to change his password.		
Post Condition: User successfully changes the password.				

4.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: TOUHID ALAM		
Test Case ID: FR04		Test Designed date:3/30/2024		
Test Priority (Low, Medium, High): Medium.		Test Executed by:		
Module Name: Satellite Imagery Session		Test Execution date:		
Test Title: Location Search Test				
Description: To verify if the user can properly search a location				
Precondition (If any): User must have valid location name.				
Test Steps	Test Data	Expected Results	Actual Results	Status
1.User login to the system. 2.In the dashboard, user search the location	Location Name: Madhabdi,Dhaka	The system should be able to find the proper location and suggest the location.		
Post Condition: User have successfully searched the location.				

5.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: TOUHID ALAM		
Test Case ID: FR05		Test Designed date:3/30/2024		
Test Priority (Low, Medium, High): Low.		Test Executed by:		
Module Name: Satellite Imagery Session		Test Execution date:		
Test Title: Suggested Location Test.				
Description: To verify if the system can give us valid map based on the input location.				
Precondition (If any): User should give any location name close to valid location name.				
Test Steps	Test Data	Expected Results	Actual Results	Status
1.User login to the system. 2.In the dashboard, user start searching for location. 3. User provide a specific location.	Location Name: Goripur,cumilla.	The system should suggest valid map based on the input.		
Post Condition: System have successfully given a map base on input.				

6.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: TOUHID ALAM		
Test Case ID: FR06		Test Designed date:3/30/2024		
Test Priority (Low, Medium, High): HIGH.		Test Executed by:		
Module Name: Crop Heath Information		Test Execution date:		
Test Title: Generated Information of Crop Health Analysis Test				
Description: To verify if the user can get valid information on crop health				
Precondition (If any): User must select valid specific location and select crop health analysis feature from menu.				
Test Steps	Test Data	Expected Results	Actual Results	Status
1.User login to the system. 2. In the dashboard, user select crop health analysis option. 3. User select specific area.	Location Name: chapainawabganj, Rajshahi	User will get information of crop health of selected location include crop amount,crop type, NDVI value.		
Post Condition: User have successfully got all the data of crop health.				

7.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by:MD. ABU SHIHAB HOSSAIN		
Test Case ID: FR07		Test Designed date:3/30/2024		
Test Priority (Low, Medium, High): Low.		Test Executed by:		
Module Name: Report Generator		Test Execution date:		
Test Title: Information of Crop Health Report Generator Test				
Description: To verify if the system generates valid information of crop health and give a precise report.				
Precondition (If any): User must have valid specific location and selected crop health from menu.				
Test Steps	Test Data	Expected Results	Actual Results	Status
1.User login to the system. 2.In the dashboard, user search the location 3. User select crop health analysis option. 4. User click on Generate Report button	Location Name: chapainawabganj, Rajshahi	System will generate information of crop health of selected location and also can generate report and can generate compared data different format (pdf).		
Post Condition: User have successfully got all the data of crop health in the form of a report				

8.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: FARZANA BINTE KAFIL		
Test Case ID: FR08		Test Designed date:3/30/2024		
Test Priority (Low, Medium, High): HIGH.		Test Executed by:		
Module Name: Soil Condition Analysis		Test Execution date:		
Test Title: Generated Information of Soil condition Analysis Test				
Description: To verify if the user can get valid information of soil condition				
Precondition (If any): User must have valid location and selected soil condition from menu.				
Test Steps	Test Data	Expected Results	Actual Results	Status
1.User login to the system. 2.In the dashboard, user search the location 3. User select the soil condition option 4. User try to view the analysis data.	Location Name: Madhabdi	User will get information of soil conditions including soil roughness, soil mosture,soil salinity, and soil degradation rate.		
Post Condition: User have successfully got all the data of soil condition				

9.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: MD. ABU SHIHAB HOSSAIN		
Test Case ID: FR09		Test Designed date:3/30/2024		
Test Priority (Low, Medium, High): Low.		Test Executed by:		
Module Name: Report Generator		Test Execution date:		
Test Title: Soil Condition Report Generator Test				
Description: To verify if the system generates valid information on soil condition and provides a valid report.				
Precondition (If any): User must have valid location and selected soil condition from menu.				
Test Steps	Test Data	Expected Results	Actual Results	Status
1.User login to the system. 2.In the dashboard, user search the location 3. In the soil condition analysis session, user can ask for report generate	Location Name: Madhabdi	System will generate information of soil condition of selected location and also can generate report and can generate compared data in different formats (pdf) .		
Post Condition: User have successfully got all the data of soil condition in form of a report and provided the report.				

10.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: FARZANA BINTE KAFIL		
Test Case ID: FR10		Test Designed date: 3/30/2024		
Test Priority (Low, Medium, High): HIGH.		Test Executed by:		
Module Name: Environmental Impact		Test Execution date:		
Test Title: Test the validity of environmental impact				
Description: To verify the impact of environment				
Precondition (If any): User must have valid location and selected environmental impact from menu.				
Test Steps	Test Data	Expected Results	Actual Results	Status
1.User login to the system. 2.In the dashboard, user search the location 3. User select the environmental analysis.	Location Name: Mipur ,Dhaka	users can view information on arable land loss due to river erosion and the rate of erosion, current temperature and air pollution rate. Ensure accurate representation of environmental impact factors.		
Post Condition: User have successfully obtained all the data on the environmental impact of arable land.				

11.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: FARZANA BINTE KAFIL		
Test Case ID: FR11		Test Designed date: 3/30/2024		
Test Priority (Low, Medium, High): High		Test Executed by:		
Module Name: Arable Land Analysis		Test Execution date:		
Test Title: Detect Arable Land				
Description: To Detect Arable Land, the system should give how much arable land is present in that selected area.				
Precondition (If any): The user Should Select an area.				
Test Steps	Test Data	Expected Results	Actual Results	Status
1. User log in to the system 2. User click the Arable land analysis option from the menu bar. 3. The user selects the specific area.	Location:Amin bazar, Dhaka.	The system shows the total amount of arable land on a selected area.		
Post Condition: The user successfully calculated the total amount of arable land in the selected area.				

12.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: MD MAHMUDUR RAHMAN		
Test Case ID: FR12		Test Designed date:3/30/2024		
Test Priority (Low, Medium, High): Medium		Test Executed by:		
Module Name: Expert Consultation		Test Execution date:		
Test Title: To assign expert in a particular problematic area.				
Description: User try to assign expert in a particular region.				
Precondition (If any): User find out the problematic areas and selects those areas for expert consultation.				
Test Steps	Test Data	Expected Results	Actual Results	Status
1. User log in to the system 2. User find out problematic area. 3. User views the available expert in that particular area.	Location: Gabtoli, Dhaka	User successfully assign expert in that particular area.		
Post Condition: User Successfully assigned expert.				

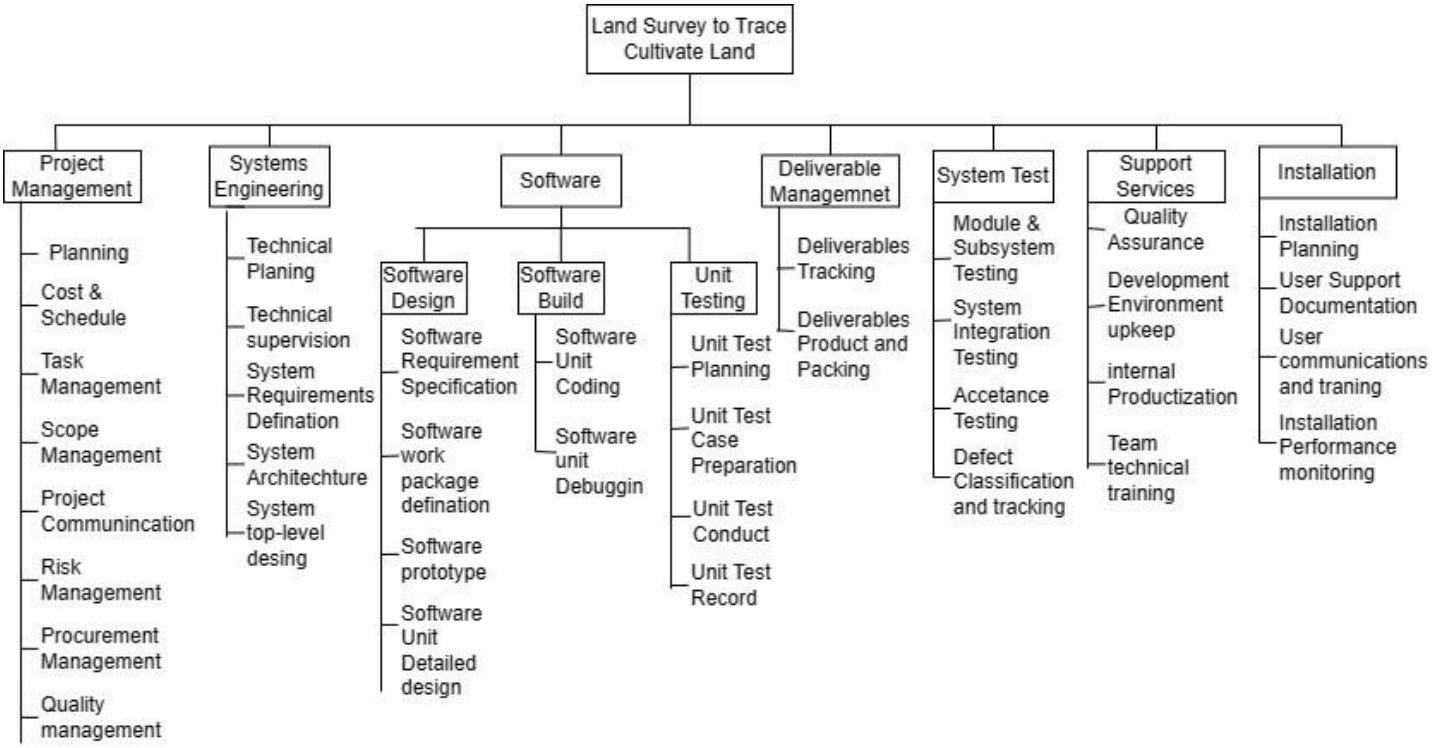
13.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: MD MAHMUDUR RAHMAN		
Test Case ID: FR13		Test Designed date:3/30/2024		
Test Priority (Low, Medium, High): High		Test Executed by:		
Module Name: Historical Data preservation		Test Execution date:		
Test Title: System shows proper historical data in a particular year.				
Description: User try to view historical data in a year for a specific arable land. Where user can view total arable land, total amount of crop produced by those land,soil erosion and accretion rate.				
Precondition (If any): User must select an area and a specific year to see historical data.				
Test Steps	Test Data	Expected Results	Actual Results	Status
1. User log in to the system 2. User select an area. 3. User select a year. 4. User enter to view historical data.	Location: Goripur, Cumilla. Year: 2015	The system shows all the data include total amount of arable land,arable land accretion and erosion rate ,amount of crop production, soil condition in a particular year.		
Post Condition: The user successfully got all the historical data for that particular land in a specific year.				

14.

Project Name: ***Land Survey to Trace Cultivate Lands.***		Test Designed by: MD MAHMUDUR RAHMAN		
Test Case ID: FR14		Test Designed date: 3/30/2024		
Test Priority (Low, Medium, High): High.		Test Executed by:		
Module Name: Prediction of Arable land erosion.		Test Execution date:		
Test Title: System predicts accurately land erosion rate in the next year.				
Description: User try to see how much arable land will be lost in the next year.				
Precondition (If any): User must select an area and also find out the total amount of arable land.				
Test Steps	Test Data	Expected Results	Actual Results	Status
1. User log in to the system 2. User select an area. 3. System find out total arable land. 4. System predict arable land loss in the next year.	Location: Goripur, Cumilla. And system collect previous data.	The system accurately give the erosion rate which might be happen in the next year.		
Post Condition: The user successfully got the erosion rate which might occur in the next year for a particular area.				

7.Work Breakdown Structure (WBS)



8.Effort Estimation:

Our project is a relatively small, simple software project in which a small team with good application experience work in software development. As a result, the project is considered organic.

Constructive Cost Model (COCOMO):

Let's assume our SLOC (Source Line of Code) is 6000

For Organic,

Coefficient=2.4

P=1.05

T=0.38

So, Effort = PM= Coefficient*(SLOC/1000) ^{P}

$=2.4*(6000/1000)^{1.05}$

= 15.75 months

Development Time = DM = 2.5*(PM)^{T}

$= 2.5*15.75^{0.38}$

=7.12 months

Requirement Number of People=ST =PM/DM

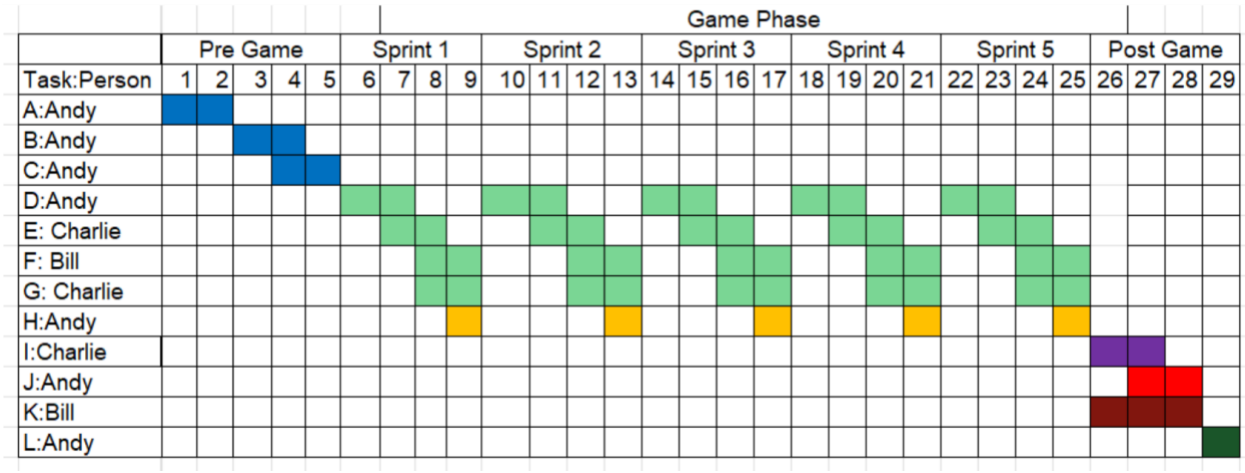
= 15.75/7.12

= 2.212

=3 people

So, the Required Development time for our 7.12 month or almost 29 weeks and requires 3 people for the development of the project.

Scrum Development timeline:



A: Planning

B: Specification

C: High Level Architecture Design

D: Analysis

E: Design

F: Coding

G: Functional Testing

H: Product Backlog Update

I: Integration

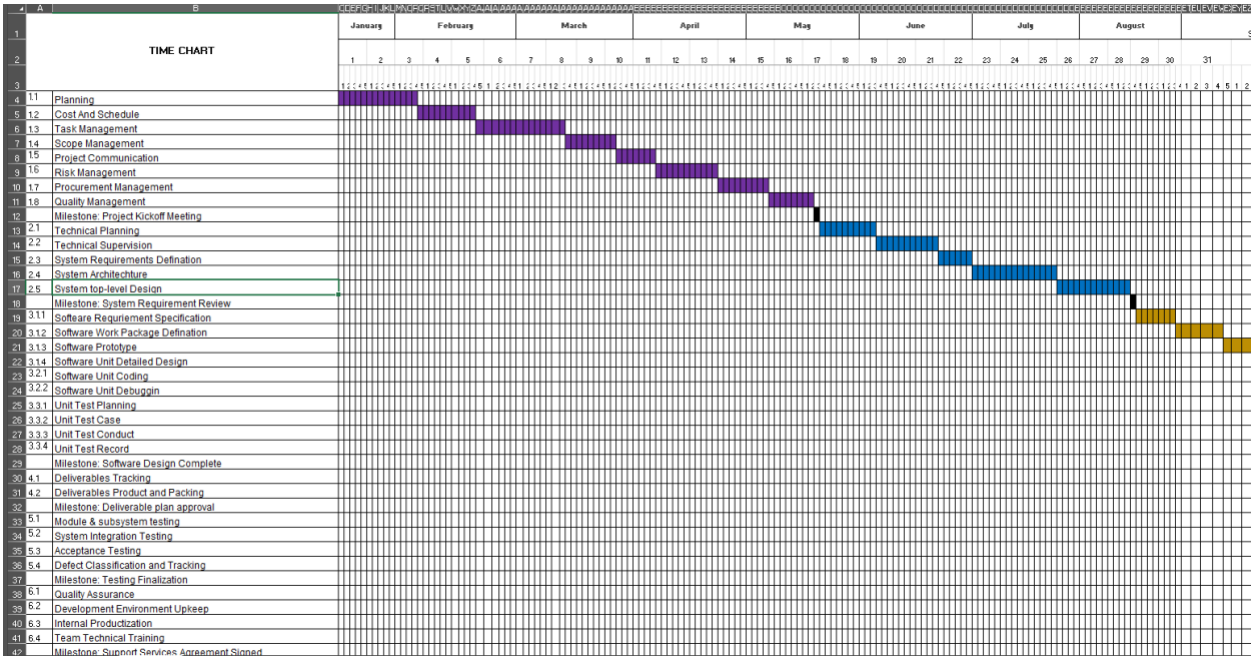
J: System Testing

K: Documentation

L: Release

9.Earned Value Analysis (EVA)

Link of the Timeline: [Project Timeline (WBS).xlsx - Google Sheets]



Total Working days = PM*20

= 15.75*20

= 315 days

Let's assume a total of 8 tasks have been completed from the planned 37 tasks for our project where the project schedule indicates that 12 tasks should have been completed.

The following schedule data is available.

Task	Planned Effort	Actual Effort
1	14	16
2	10	12
3	14	12
4	9	10
5	5	6
6	11	9
7	8	9
8	8	7
9	10	
10	11	
11	6	
12	15	

So, BCWP = 14+10+14+9+5+11+8+8 = 79

BCWS = 14+10+14+9+5+11+8+8+10+11+6+15 = 121

ACWP = 16+12+12+10+6+9+9+7+7 = 88

And BAC = 315

So, SPI = BCWP/BCWS = 79/121 = 0.65

SV = BCWP-BCWS = 79-121 = - 42 Working days

CPI = BCWP/ACWP = 79/88 = 0.90

CV= BCWP-ACWP = 79-88 = -9 Person days

% Schedule for Completion = BCWS/BAC = 121/315 = 0.38%

% Schedule Completed = BCWP/BAC = 79/315 = 0.25%

Here,

BAC is the budgeted cost of work scheduled.

SPI is schedule performance index,

SV is schedule variance,

CPI is cost performance index,

CV is cost variance.

BCWP is the sum of BCWS for all work tasks that has been completed by a point of time.

BCWS effort planned for each task.

ACWP is the actual cost of work performed.

10.Risk Management:

Risk Table:

Risk	Category	Probability	Impact
Size estimate may be significantly low	PS	60%	2
Larger number of users than planned	PS	30%	3
Less reuse than planned	PS	70%	2
Customer will change requirements	PS	80%	2
End users resist system	BU	40%	3
Aggressive deadline	BU	50%	2
Budget issue	BU	40%	1
Technology will not meet expectations	TE	30%	1
Lack of training on tools	DE	60%	3
Staff inexperienced	ST	30%	2
Staff turnover	ST	60%	2
Components developed separately cannot be integrated easily, requires redesigning	DE	25%	3
Key personnel are not always available	ST	20%	4
Security vulnerabilities in technology	TE	20%	2
Inadequate backup and recovery procedures	TE	25%	3
Insufficient testing	DE	30%	2
Improper Development Environment	DE	20%	2
Low productivity	DE	30%	2
Inadequate Project Management	ST	20%	2

Risk Reduction:

Risk	**Risk Reduction Technique**
Size estimate may be significantly low	Assign experts, breaks down the project, analyze the task
Larger number of users than planned	Scalability planning, capacity planning, performance testing,
Less reuse than planned	Design the module correctly, develop component libraries, and develop architectural guidelines.
Customer will change requirements	Requirement prioritization, agile methodologies, prototyping, regular reviews with the customer.
End users resist the system	Consistent communication with end users, user involvement, implement a structured change management process.
Aggressive deadline	Fixed time periods for specific tasks, allocate time effectively, develop the highest prioritized product first, build buffer time.
Budget issue	Improve the accuracy of cost estimation, resource optimization
Technology will not meet expectations	Evaluate technology against specific tasks or criteria, analyze technical specifications.
Lack of training on tools	Training sessions, develop a training plan, encourage peer learning where pair experienced team members with newcomers and assign a mentor.
Staff inexperienced	Staffing with top talent; job matching; teambuilding; training and career development; early scheduling of key personnel
Staff turnover	Offering good salaries and benefits, providing opportunities for career growth, rewarding the employees, and developing a supportive work environment.
Components developed separately cannot be integrated easily, and require redesigning	Design components with reusability, identify dependencies between components.
Key personnel are not always available	Assign backup personnel, trained team members, invest in skill development, provide workshops, and mentor.

Security vulnerabilities in technology	Apply a proactive security patch management process, implement access control mechanism to restrict access, encrypt sensitive data, regular testing to identify weaknesses in technology.
Inadequate backup	Implement automated backup solutions, maintain redundant backup storage infrastructure, implement a monitoring mechanism to track backup status.
Insufficient testing	Develop comprehensive test planning, implement test automation frameworks, prioritize testing efforts, create a test plan, and conduct peer reviews and inspections of test plans and test cases.
Improper Development Environment	Establish a standardized development environment, and secure access controls, create developer guides, and assist developers in navigating the development environment.
Low productivity	Regular monitoring, rewarding team member for their contributions, training the team members, and continuous monitoring.
Inadequate Project Management	Assign an experienced project manager, Performance monitoring, and establish a change management process, develop a comprehensive project management plan.

Rubric for Project Assessment (CO3)

Criteria	Marks distribution (Max 4X5= 20)				Acquired Marks
	Missing/ Incorrect (0-1)	Inadequate (2)	Satisfactory (3-4)	Excellent (5)	
Selection of Software Engineering Models	Does not articulate a position or argument of choosing appropriate model. Does not present any evidence to support the arguments for the choice of the model.	Articulates a position or argument for choosing models that is unfocused or ambiguous. Presents incomplete/vague evidence to support argument for model choice.	Articulates a position or argument of choosing models that is limited in scope. Does not present enough evidence to support the argument for the choice of the model	Clearly articulates a position or argument for the choosing software engineering models. Presents sufficient evidence to support argument for the model selection	
Role identification and Responsibility Allocation	The project has poor project management plans for identifying roles and assigning the responsibilities	Identify few roles in the project management where some of the roles are left alone with any project responsibilities	Identify most of the roles in the project management and assign their responsibilities	Well planned project with proper role identification and responsibility allocation in the project management activities	
Impact identification	Student vaguely discuss the impact of societal, health, safety, legal, cultural, or environmental issues in their project	Student provided with partial relevance to the impact of societal, health, safety, legal, cultural, or environmental issues in their project	Student fairly provided the analysis to the impact of societal, health, safety, legal, cultural, or environmental issues in their project	Student comprehensively provided the analysis to the impact of societal, health, safety, legal, cultural, or environmental issues in their project	
Formatting and Submission	Project report is not complete and Several errors in spelling and grammar. Present a Confusing organization of concepts, supporting arguments, and real-life example. Sentences rambling, and details are repeated.	Some errors in spelling and grammar. Some problems of organizing the answer in a logical order of defining, elaborating, and providing real-life examples.	Few errors in spelling and grammar. Presents most of the details in a logical flow of organization in definition, details, and example.	Project report is complete and No errors in spelling and grammar. Consistently presents a logical and effective organization of definition, details, and real-life example of the topic.	

Acquired marks:	
CO Pass / Fail:	

Rubric for Project Assessment (CO4)

Marking Criteria	Marks Distribution (Maximum 3X5=15)				Acquired Marks
	Missing/ Incorrect (0-1)	**Inadequate (2)**	**Satisfactory (3-4)**	**Excellent (5)**	
Project Planning	Missing or incorrect project plan;	Insufficient project plan provided: project team, project tasks, goals etc. stated poorly.	Sufficient information provided : project team members, their tasks, project plan discussed in details.	Thorough and relevant project plan is provided; project plan is clear and easy to follow.	
Effort Estimation and Scheduling	Missing or incorrect effort estimation or schedules based on available project resources	Insufficient or poorly stated effort estimation or schedules based on available project resources	Correct or sufficient technique used for effort estimation or schedules based on available project resources	Project estimation was described using proper effort estimation or schedules based on available project resources	
Risk Management	Risk analysis activities were missing or inappropriate for the specific project: unidentified risks or wrongly categorized risks or not prioritized properly.	Risks are partially identified(insufficient) and not properly categorized or not prioritized properly.	Sufficient and critical risks are identified(insufficient) and properly categorized but not prioritized properly.	Sufficient and appropiate risks are identified, analyzed, and properly categorized or prioritized.	
				Acquired Marks:	
				CO Pass / Fail:	