

Smart Farming

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This is Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering.

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APPROVAL

This Project titled “**Smart farming,**” submitted by Mohaimenul, Id: 142-15-4133, Tofail Alam, Id: 142-15-4155 and Fahmida zaman, Id: 142-15-4132 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on May 6, 2018.

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Abstract

With modern technology and limited resources to satisfy the hunger of world population agriculture is becoming more developed and scientific. Each day new research result is coming out to improve the productivity and ensure the smooth growth of various type of crops. Farmer are also using modern way to cultivate different crops instead of traditional way .Bangladesh is being an agriculture country also driving towards the challenge of food production and food for all of her people . Only issue is that our farmers are not up-to-date with all the information that they should have to solve their problem. Neither our researchers as they as they are not connected all the time. In this kind of situation we need a way to establish communication tri-way that is with farmer, researcher and good officer who for the betterment of agriculture .Smart farming solution may come from a web or mobile based app which will help all these parties to communicate. This can also be used for the boosting business of farmer and shearing new inventions of cultivation and diseases related to it. Smart farming is just that kind of solution which can provide to all these problems.

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Chapter 1

Introduction

1.1 Introduction:

Created nations are utilizing Management Information System to help deferent assignment for their end clients or customers. Other than that creating nations need to give Information to their people groups who inspired by Economy. For that we require Information System to provide food them for different ways. This agrarian framework helps deferent clients as Planters, Importers Exporters Prospective speculators, and Researchers. Bangladesh in spite of having an agrarian based economy does not have a data arrangement of this nature.

1.2 Motivation:

Agriculture has seen numerous transformations, regardless of whether the training of creatures and plants a couple of thousand years back, the orderly utilization of yield pivots and different upgrades in cultivating practice a couple of hundred years prior, or the "green upheaval" with precise reproducing and the across the board utilization of man-made manures and pesticides a couple of decades back. We recommend that agribusiness is experiencing a fourth transformation activated by the exponentially expanding utilization of data and correspondence innovation (ICT) in horticulture. That is the reason we turn out with such a stage by which those individuals who related with agribusiness can speak with each other through web .so we can advance our farming together.

1.3 Objectives:

The fundamental target of this proposition is to present a farming data framework for the principle products of Bangladesh essentially rice, jute, and so forth. Remote access to this framework will be given through the web.

1.4 Expected Outcome

Individuals who are as of now include or intrigued by agribusiness ,they can without much of a stretch get data and support from this site .they can present ascertain horticulture and agri-showcase .Farmer can know effectively about the sicknesses of their products ,seeds, soil , manure with regarded farming officer . Savvy cultivating can make horticulture more productive for the agriculturist. Diminishing asset sources of info will spare the agriculturist cash and work, and expanded unwavering quality of spatially unequivocal information will decrease dangers.

Ideal, site-particular climate conjectures, yield projections, and likelihood maps for sicknesses and debacles in light of a thick system of climate and atmosphere information will permit development of harvests in an ideal way.

1.5 Report Layout

The entire project is composed six chapters. In the report layout section all the chapter is summarized. Discuss the summarized below:

Chapter 1:Gives an introduction about our project and its motivation. We also discuss our project objectives and expected outcomes.

Chapter 2:It will provide background about this kind of application and covers extensive literature reviews of related works of the project and discussion of the problem and challenges of the system.

Chapter3:Gives an overview of the system architecture and talks about the methodologies of all features of our project. Dataset development and concept of system implementations are also discussed in this chapter. In this chapter we highlight the implementation requirements.

Chapter4: Provides test result of our system. The screen shots of the output of different features are given and cover the presentation of dataset analysis and interpretation of system result.

Chapter5:Discussed about the conclusion and future scope or possible development of our project work.

Chapter 2

Background

2.1 Introduction

One of the objectives of "Smart Farming" was to build up a little scale model pilot framework to show the key highlights of the brilliant cultivating use case. For two sub-utilize cases "Keen Greenhouse" and "Shrewd Spraying", reasonable models were created. Along the acknowledgment of the applied models and their general appraisal, the sub-utilize case related functionalities were additionally assessed with end-clients and archived. This record conveys a general appraisal of these two theoretical models. The intended interest group are the task accomplices inside the Future Internet undertaking and chiefs, yet in addition end clients, for example, ranchers and create period of farming programming who need to know about future patterns. Horticulture, cultivating or farming is an imperative occupation since the historical backdrop of humankind is kept up. The name horticulture speaks to all substances that went under the straight grouping of connections of natural pecking order for individuals. As people are the most intelligent living species on this planet, so their brilliance dependably incites them to change and to enhance. This inciting has prompted creation of wheel, headways in expectations for everyday comforts and styles, dialects, life spending procedures and innumerable more accomplishments. The hidden idea for Smart Farming Technology (SFT) is accuracy agribusiness. The Smart firming venture is embarked to explore the part of SFT in the advancement of future horticulture and attempt to close the examination and development separate in the SFT division. Brilliant cultivating innovation can assist accomplish higher generation yields with less expenses in consistence with rural natural models.

2.2 Related Works

Every year millions of people who are cultivate crops they suffer many kinds of problem like flood, drought, fertilizer, Insects,lack of pure and resolute seeds, etc. It is not possible to fully overcome for them to use this site .But Smart farming is more informative site whether they will be overcome such kind of problem.

Making this project a successful and effective project we need some related work that is necessary for this project.

The Related work such as

1. Collecting all the data from different places.
2. Do some research and survey for which feature are most important.
3. There need some graphical work for make the site and app booth interactive.

2.3 Comparative Studies

There are many website or application to provide service for farmer in online. Therework in agriculture embarrassing the IOT version [1].Another good research in farming .They try to modify the farming what functionality should have need in future farm. That will be calculated by their research. Their project is FutureFarm[2].There are many project which try to The SmartAgriFood project is funded in the scope of the Future Internet Public Private Partnership[3].But we try to something new in bangla that will help the farmer in Bangladesh about climate change, detect diseases of their respective crops and many challenges that they face in their farming. We establish communication with tri-way that is with farmers, researchers and good officer who work for the betterment of agriculture.

2.4 Scope of the Problem

Basically our project is for farmer. Those who cultivate their land and face many problems for their old cultivation process and some unknown diseases .they can know new method of cultivation. This will reduce reliance on others. They will be able to return to work and can easily cultivate their land without dependency.

2.5 Challenges

Basically people are not familiar with this Smart farming site. So it became a challenge to learn and use them about this application. Earlier there are some work has been done in detecting diseases but we are going to get them together in one platform who are involve in agriculture from research table to firm land . So it's a challenge for us to make it together.

The main challenge of today's agri food sector is to meet the increasing food demand and at the same time reduce the ecological footprint of food production. The agri-food industry has also to provide more transparency to allow a better feedback on how the political, economic, social and health requirements are met. These targets can only be reached by a knowledge driven industry with ICT as a key factor. This document analyses how the Smart Farming sub-use cases can contribute to meet the challenges of future agri-food production.

Chapter 3 Requirement Specification

3.1 Business Process Modeling

A business procedure is an arrangement of sensibly related errands performed to accomplish a characterized business result. Business procedures can be subdivided into essential and supporting business forms. Primary Business Processes are those associated with the formation of the item, its advertising and conveyance to the purchaser. Supporting Business Processes encourage the improvement, arrangement and upkeep of assets required in essential procedures. The business procedures of cultivating essentially contrast between various kinds of generation, e.g. animals cultivating, arable cultivating and nursery development. A typical element is that agrarian creation is relying upon normal conditions, for example, atmosphere (day length and temperature), soil, irritations, infections and climate.

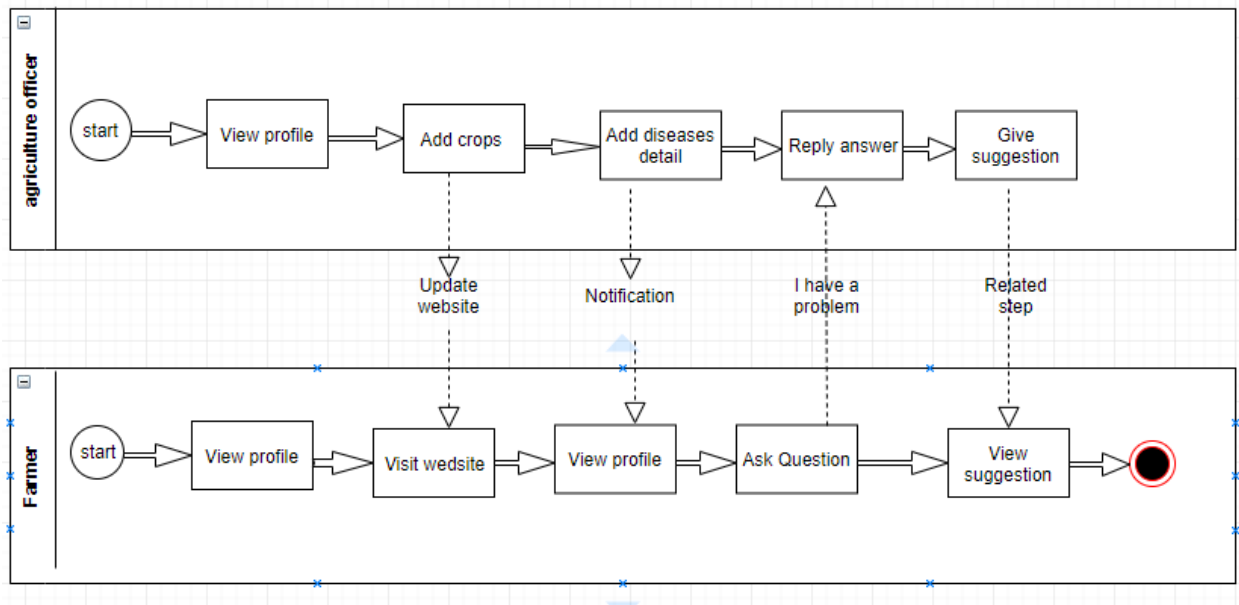


Figure 3.1.1: Smart farming BPM

3.2 Requirement Collection and Analysis

As a first step, a survey was designed to analysis the needs and requirements of farmers in ICT for electronic commerce. Then, a digital commerce strategy was established with mobile applications and the development priorities were established, thatconsidered the adoption factors.

3.2.1 Functional Requirements:

- Add, edit and deleteCrops category
- Add, edit and delete Crops detail
- Add, edit and delete Crops diseases detail
- Update suggestion from agriculture officer
- Ask question about suggestion
- Replay the answer

3.2.2 Non-Functional Requirements:

- System must be easy to use and navigate
- System should have a consistent interface

3.3 Use Case Modeling and Description

In our project there are two actor plays their role .Agriculture officer and farmer are the two actors. Agriculture officer and farmer both are visit website and get information. Agriculture officer must be register .they can add category, add crops detail, crops diseasesand suggested the farmer about their cultivation .Famer ask question for their problem that they face in their cultivation. Agriculture officer answer the problem.



Figure 3.3.1:Smart farming use case Diagram

User Description:

Table 3.3.1 Use Case for normal user

Use Case:	UC2
Actor:	Normal user
Pre-Requisite:	None
Internal Path:	<ol style="list-style-type: none">1.Normal people Visit website as farmer.2.They can get information about modern cultivation.3. User click on any item link in items for this crops list
External Path:	<ol style="list-style-type: none">1.1 Category not found2.1 Can't Log In3.1 Invalid phone number
Note:	User must have to complete Registration process on the site if He/she want get to more information and find problem

Farmer Description:

Table 3.3.2 Use Case for Farmer

Use Case: UC1
Actor: Farmer
Pre-Requisite: user must be connected with internet and login
Internal Path: <ol style="list-style-type: none">1. Normal people Visit website as farmer2. They can get information about modern cultivation3. After login they can ask question4. User click on any item link in items for this crops list
External Path: <ol style="list-style-type: none">1.1 Problem not found2.1 Failed to upload image
Note: The system allows user access

Farmers are the main target of this project. In this site farmer must be login. Then he has a profile. Here he can communicate with agri-officer about cultivation. He ask question, view profile, search information. Normal feature also include for her that can help them for their cultivation.

Agriculture Officer Description:

Table 3.3.3 Use Case for Agriculture officer

Use Case : UC3

Actor : Agriculture officer

Pre-Requisite: 1. Agriculture officer must be connected with internet

2. Agriculture officer must be by admin

Internal Path: 1. They have a profile that they can review the farmer about their cultivation

2. Reply question

3. They can give suggestion for specific crops or domestic animal diseases.

External Path: 1.1 Invalid user name

2.1 Invalid password

3.1 Can't Log In

Note: Agriculture officer answer the problem

Agri-officer is added by the admin. Their location will be included. They have a profile that can for review the farmer, their problem about cultivation. Farmer can ask question and agri-officer about their location are responsive to answer the question. They can give advance suggestion for specific crops or domestic animal diseases.

Admin Description:

Table 3.3.4 Use Case for Admin

Use Case : UC3

Actor : Admin

Pre-Requisite: Admin must be connected with internet and login

Internal Path: 1. Admin maintained the system

2. He can add admin member, add agriculture officer and add detail in modern farming

External Path: : 1.1 Invalid user name

2.1 Invalid password

3.1 Can't Log In

Note: N/A

3.4 Class Diagram:

The Class diagram for the application consists of the interfaces, methods, variables, and relationship between them. Figure 3.3 is the class diagram for Agriculture officer module which describes the major functionalities of the Agriculture officer like registering with the application, login authentication, checking inbox messages, sending messages to farmer, prescribing, adding and suggest farmer. Both registration and authentication are the common classes for Agriculture officer and farmer but the screens and functionalities vary based on the attribute role.

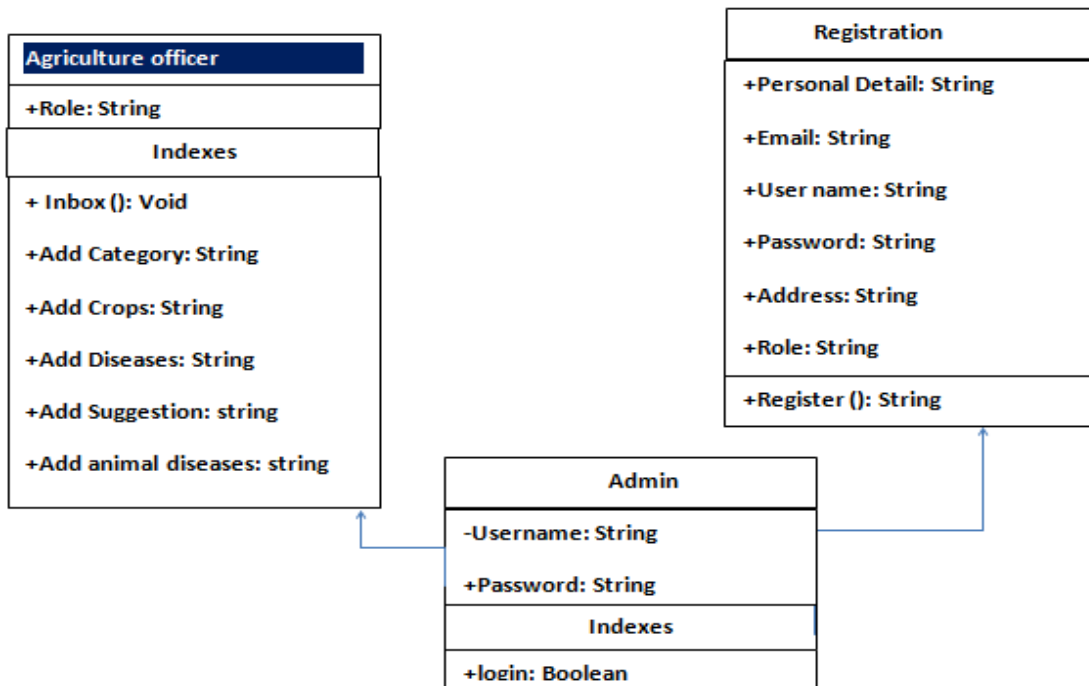


Figure 3.4.1: Smart farming agriculture officer Class diagram

Agri-officer is added by the admin. Their location will be included. They have a profile that can for review the farmer, their problem about cultivation. Farmer can ask question and agri-officer at their location are responsive to answer the question. They can give advance suggestion for specific crops or domestic animal diseases.

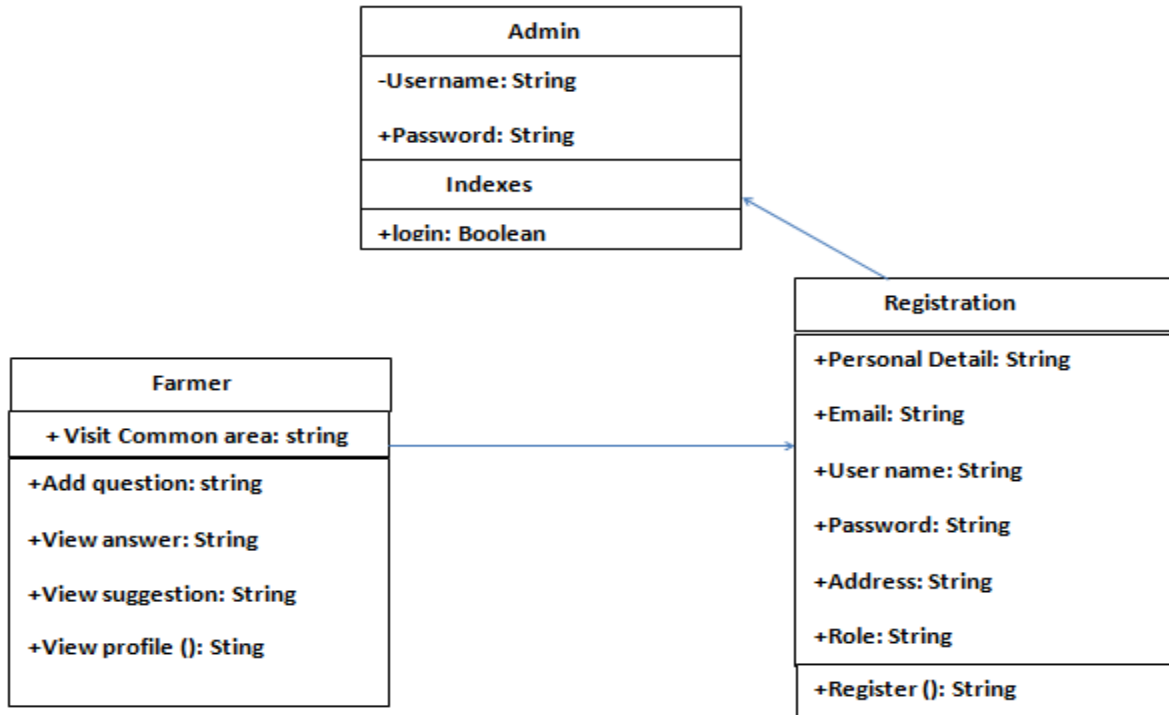


Figure 3.4.2:Smart farming farmerClass diagram

Farmer are the main target of this project. In this site farmer must be login. Then he has a profile. Here he can communicate with agri-officer about cultivation. He ask question, view profile, search information, get suggestion from Agriculture officer. Normal feature also include for them that can help them for their cultivation.

3.5 Design Requirements

The system administration association manages the conduct of the rancher and how it can be affected to achieve the business procedure destinations. For the take-up and encourage advancement of the applications, two associated viewpoints are viewed as pertinent: administration and plan of action. Administration includes the formal and casual courses of action that administer participation inside the rancher organize. Imperative game plans for the administration and incorporate concessions to information accessibility, information quality, access to information, security, obligation, risk, information possession, protection and appropriation of expenses. Three essential types of system administration can be recognized.

The system for investigation was produced from a chain organizes point of view with particular regard for horticulture officer and the agriculturist that are included. In future research it could likewise be significant to take a gander at this subject from a more extensive development point of view.

- ❖ User can visit website and get information.
- ❖ If user needs more information and dynamic service then he must be login as farmer.
- ❖ After registration each farmer has personal profile where he can communicate with agriculture officer about their cultivation.
- ❖ Admin manipulate agri-officer with their location and he can add agri-officer on the system.
- ❖ Agri-officer has a profile in this website. Through this profile he can post any suggestion, answer the question of the farmer and identify the diseases of crops or animal and its solution.

CHAPTER 4

DESIGN SPECIFICATION

Design Specification is a statement of how a design is developed. In the section of Design Specification, we try to show the front-end and back-end design of the Web application. Here also discussed about many tools and platforms, which we used to develop this application.

4.1 Front-end Design

Front-end is a most vital section for the development of web application. It is worked on presentation layer and user can directly interact with this. It is very important to develop a simple and easily understanding front-end or GUI for the user of the application. So we tried to keep our GUI as simple as possible and easily accessible for the user.

Login Screen

The screen will have a well-designed background image that will affect the user and will have one login button on it.

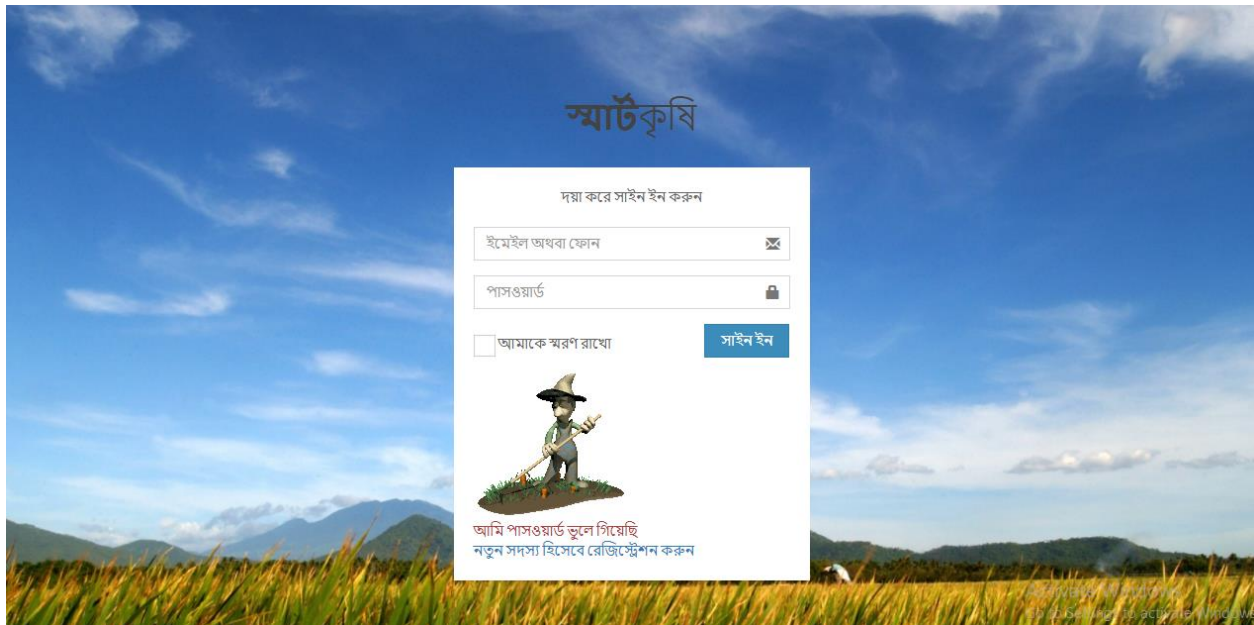
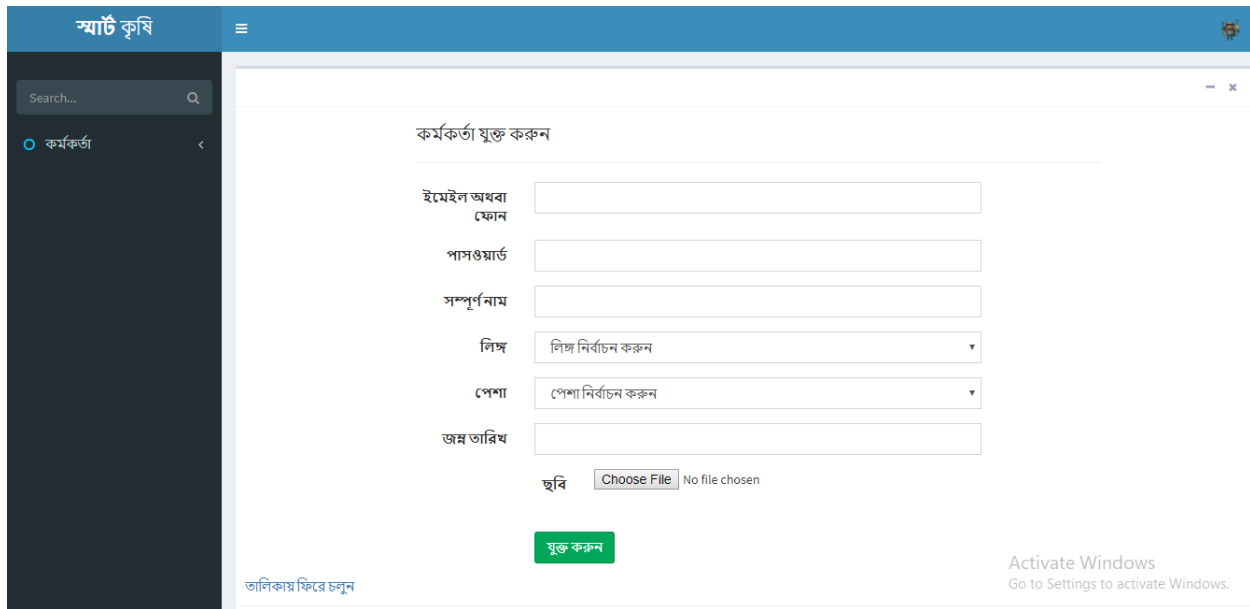


Figure4.1.1: Login Screen

Without normal user all actor of this website should be login. If user needs more information and dynamic service then he must be registration as farmer.

Admin Screen

This application has an admin page in which admin can add agriculture officers and admin itself. The admin can edit and delete an agriculture officers or admins account. Admin maintained the system. He can increase admin member, add agriculture officer, add detail in modern farming, and manipulate the system. Those pages are given bellow:



The screenshot shows a web application interface for adding a new user. The header is blue with the text 'স্মার্ট কৃষি' (Smart Kheti) and a search icon. A dark sidebar on the left contains a search bar and a menu item 'কর্মকর্তা' (Staff). The main content area is titled 'কর্মকর্তা যুক্ত করুন' (Add Staff) and contains a form with the following fields: 'ইমেইল অথবা ফোন' (Email or Phone), 'পাসওয়ার্ড' (Password), 'সম্পূর্ণ নাম' (Full Name), 'লিঙ্গ' (Gender) with a dropdown menu showing 'লিঙ্গ নির্বাচন করুন' (Select Gender), 'পেশা' (Profession) with a dropdown menu showing 'পেশা নির্বাচন করুন' (Select Profession), and 'জন্ম তারিখ' (Date of Birth). There is also a 'ছবি' (Image) field with a 'Choose File' button and 'No file chosen' text. A green 'যুক্ত করুন' (Add) button is at the bottom. The footer includes 'অলিকায় ফিরে চলুন' (Go back to the application) and 'Activate Windows' text.

Figure 4.1.2:Admin Screen

Agriculture officer's Screen

This application has an agriculture officer's page in which officer can add crops category, crops and diseases of those crops. The officer can edit and delete those crops, crops category and diseases. He can also give suggestions to the farmers and can answer those questions which asked by the farmers. Those pages are given bellow:

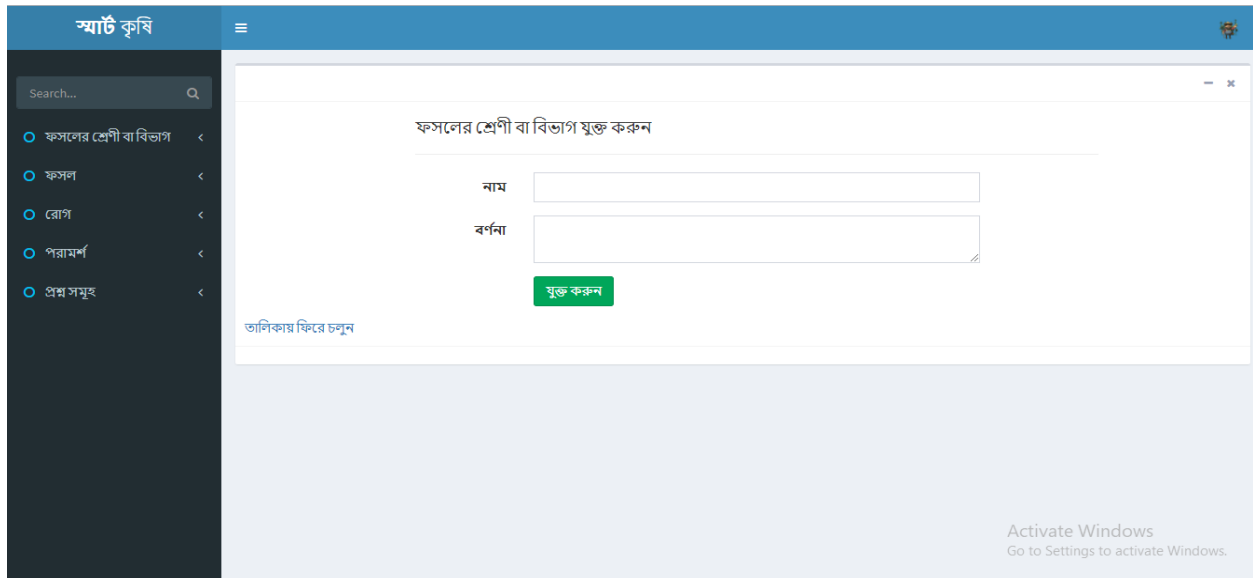


Figure 4.1.3: Agriculture officer's Screen

Agriculture officer can update, delete their post.: Agri-officer is added by the admin. Their location will be included. They have a profile that can for review the farmer, their problem about cultivation. Farmer can ask question and agri-officer about their location are responsive to answer the question. They can give advance suggestion for specific crops or domestic animal diseases.

Those pages are given bellow:

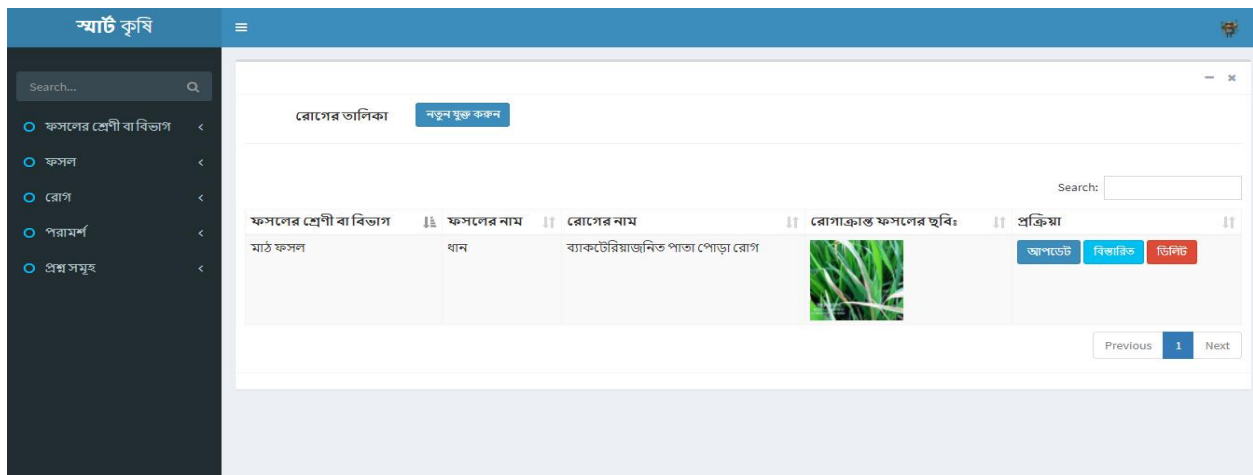


Figure 4.1.4: Agriculture officer's Screen

Farmer's Screen

This application has a farmer’s page in which farmer can see diseases related to their crops. He can also see suggestions given by the agriculture officers and can ask questions to the agriculture officers. Those pages are given below:

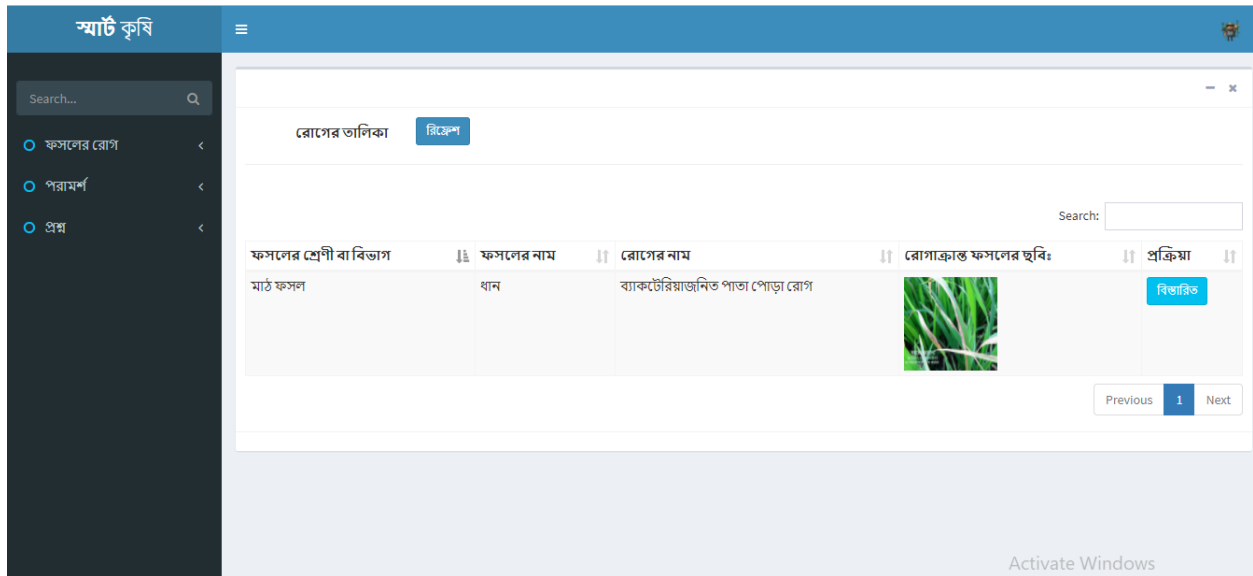


Figure4.1.5:Farmer’s Screen

In this site farmer must be login. Then he have a profile. Here he can communicate with agri-officer about cultivation. He ask question view profile, search information. Normal feature also include for her that can help them for their cultivation.

Pop-Up Dialog Bar

When the admin, officer or farmer wants to delete a component of their own then the layer of “confirmation delete” pops up and there confirm and cancel buttons are available to press.

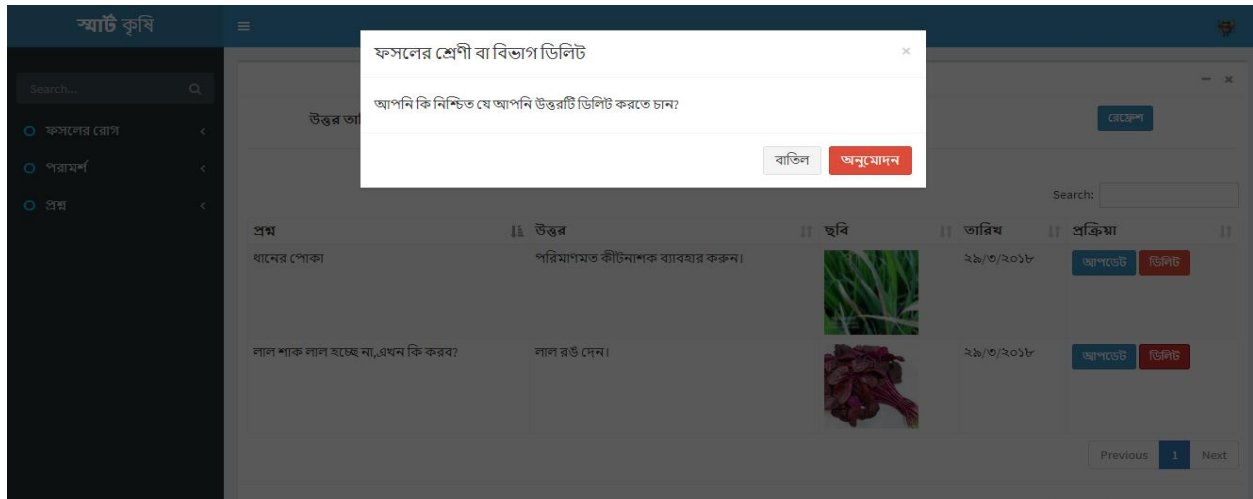


Figure 4.1.6: Pop-Up Dialog Bar

4.2 Back-end Design

Back-end means a section that is working behind the projects, but the user is unable of or can't allow seeing this. Back-end technology usually consists of programming languages as here JavaScript, C#, Html, CSS are used. Actually front-end design is only way to interact with the user but user can't watch and never imagined how the system is working. Back-end does everything that happens on the screen or behind the application.

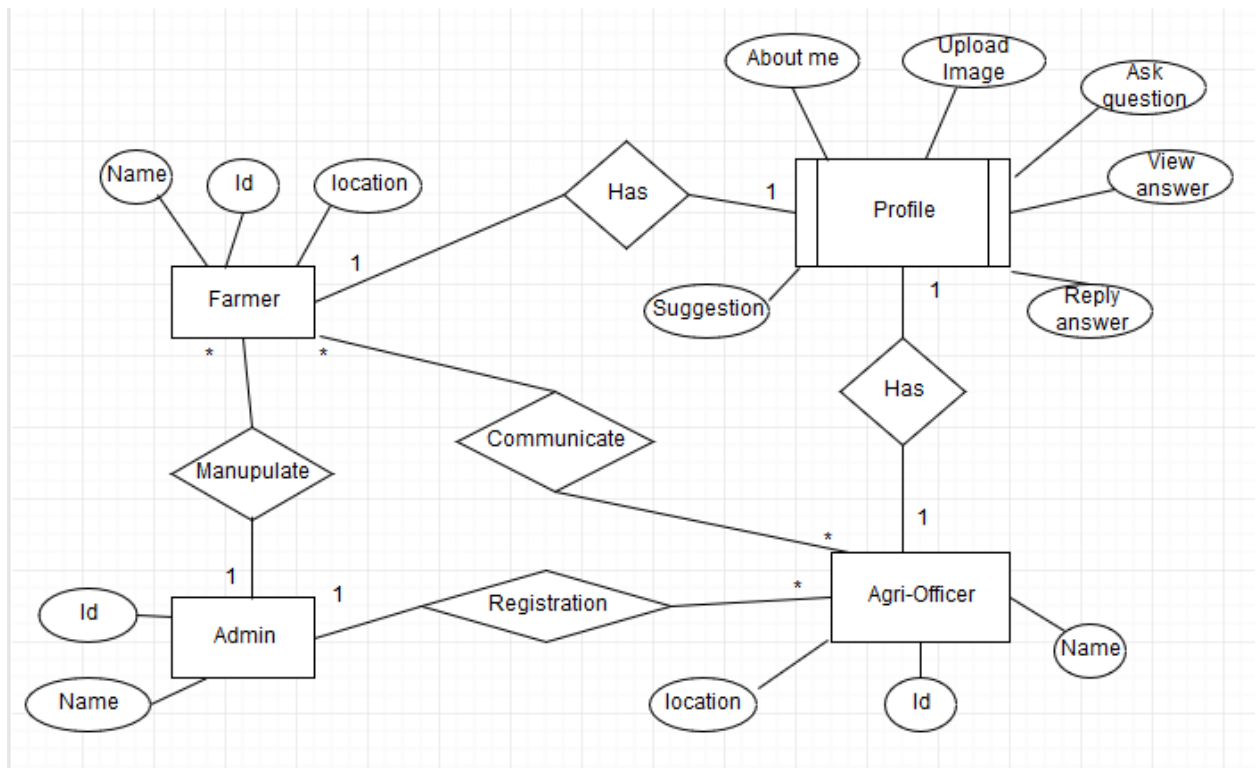
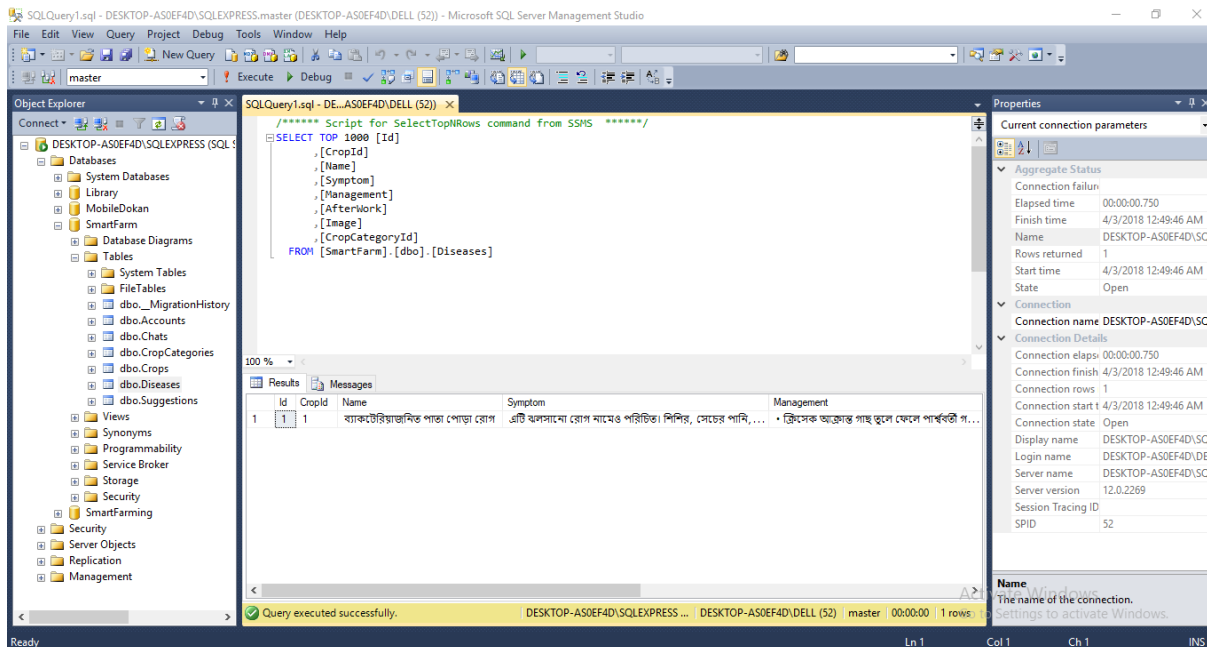


Figure4.2.1: E-R Diagram of Smart Farming

Farmer: Farmer are the main target of this project. In this site farmer must be login. Then he have a profile. Here he can communicate with agri-officer about cultivation. He ask question ,view profile, search information. Normal feature also include for her that can help them for their cultivation.

Profile: When a user register as farmer a profile will create automatically. Through this profile he can get advance service like search information, ask question, view answer. In this profile every question and answer will be show that he asks through profile with dateline. Agriculture officer also have a profile that they can reply answer, give suggestion, solution of diseases, etc.

Agriculture Officer: Agri-officer is added by the admin. Their location will be included. They have a profile that can for review the farmer, their problem about cultivation. Farmer can ask question and agri-officer about their location are responsive to answer the question. They can give advance suggestion for specific crops or domestic animal diseases.



4.2.2: Back-end Design SQL server 2014

For back-end design we use sql-server 2014 for database design. We design the website code fast approach in visual studio 2017

4.3 Interaction Design and UX

Web application design emphasizes on how rules and application components can be used to create Application environments that encourage and promote specific interaction. UX is a body of information and a sequence of formal processes. Interaction design is also included into UX. Mainly UX responsibilities divided into 4 key job and they are-

- ❖ User Experience Designer who make application and applying user friendly and so on.
- ❖ Application User Researcher doing research with real users and stimulating with running application test.
- ❖ Data Scientist who adopts user behavior through application analytics and evaluates for insight
- ❖ UX Leadership, a Director-level voice for user-centrism in process and studio culture

If we broke the issue of UX into layers then we can discover that we have to make sure that -

- ❖ User understands the application rules and core.

- ❖ Applications controls and the UI is supportive and easy to use.
- ❖ Pace, balance and challenge in the line with the intent and emotive.

4.4 Implementation Requirements

To develop this project, we used different type of tools, components and platforms. In Implementation Requirement section discussed about all those tools and platforms that we use to develop this application.

4.4.1 Resource Requirements

For the execution of this project some hardware and software is required and they are-

- ❖ Software:
 - Visual Studio 2017
 - SQL server 2014

- ❖ System Requirement:
 - Windows
 - 4 GB Ram or higher

- ❖ Human
- ❖ Tester for Usability testing

CHAPTER 5

5.1 TEST APPROACH

The test approach consists of some different tests. The primary aim of these tests is to certify that “Smart Farming” is an error free web application. Throughout the development, testers will test the mechanics and the pages of the application to confirm there are zero errors in the application. Besides, testers will also test the usefulness and give a report on the experience they have with “Smart Farming” and will give the team feedback on how to improve the application.

5.2 Test Levels

The test approach phase broken into three major phases and they are Module testing, integration testing and system testing. Besides, the system testing also provides two sub-phases and they are functional and usability testing.

Three major approaches explained below-

- ❖ Module testing will perform during coding by using debug messages to check that the written code produces wanted results. An important requirement is that the code will compile with zero bugs.
- ❖ Integration testing will implement after finish module testing in order to validate if each module can work fine with each other. Integration Test proves that system works as integrated unit when all the fixes are complete.
- ❖ System testing includes two phases: functional testing and usability testing. These will perform after the product reaches its final version. During functional test phase, the tester will test if the product meets the application requirements. The tester tests the requirements using the use cases listed below in Test Cases section. The usability test will perform to understand how easy it is to learn to use the application. Any person out of the team members will perform this test by using the web application.

5.3 Test Schedule

The table below provides information on the start and finish dates of test levels.

Table 5.3.1: Test Schedule

Test Approaches	Start Date	Finish Date
Module Testing March	February 26,2018	February 29,2018
Integration Testing	March 26,2018	March 28,2018
System Testing	March 29,2018	March 2,2018

5.4 TEST CASES

In this section, the use cases to be tested during functional testing are listed and testing steps and expected results are explained in detail.

Login Menu:

Table 5.4.1: Test Case for Login page

UseCaseID: 1
Precondition: none
Flow: 1-User wants to login 2-User runs application 3-Main Menu containing add, edit, delete crop category, crop, crop diseases and see those disease depending on whether the user is a farmer or agriculture officer.
Post condition: A user page is displayed.

Use Application:

Table 5.4.2: Test Case for Use Application Option

UseCaseID: 2
Precondition: Use Application
Flow: <ul style="list-style-type: none">• User wants to useapplication• User login• A common user page is displayed depending on the user category• User chooses “option” from menu item• User enters to the “Options” Screen• Choose any action to do(add, edit, delete)• Go to that page• Use application
Post condition: User enters to the new screen “options menus”

Delete Document:

Table 5.4.3: Test Case for delete appdocument

UseCaseID: 3.1
Precondition: delete menu bar displayed
Flow: <ul style="list-style-type: none">• Delete menu bar pops up• User choose confirm or cancel button• Document vanished from the its position
Post condition: Delete menu bar vanished

Sign Out:

Table 5.4.5: Test Case for sign out from application

UseCaseID: 4
Precondition: Sign Out Button displayed
Flow: <ul style="list-style-type: none">• 1-User wants to use the application• 2-User runs application• 3-User Menu pops up• 4-User decides to Sign out from the application• 5-User selects “Sign Out”
Post condition: User Sign out from the application.

5.5 Test Results and Reports

Test Report is needed to reflect testing results in a formal way, which gives an opportunity to estimate testing results quickly. It is a document that records data obtained from an evaluation experiment in an organized manner, describes the environmental or operating conditions, and shows the comparison of test results with test objectives.

Test report is very important and it is needed to know that the system is ready/ not ready for implementation? Data obtained from an evaluation experiment is recorded by this document. We need to run through many types of testing.

There are many types of testing:

- Functionality
- Regression
- Security
- Performance
- Scalability
- Usability
- System interoperability

- Localization
- Disaster recovery
- Installation/ upgrade.

If the system passes through all these types of testing it is finally ready to launch

Login page:

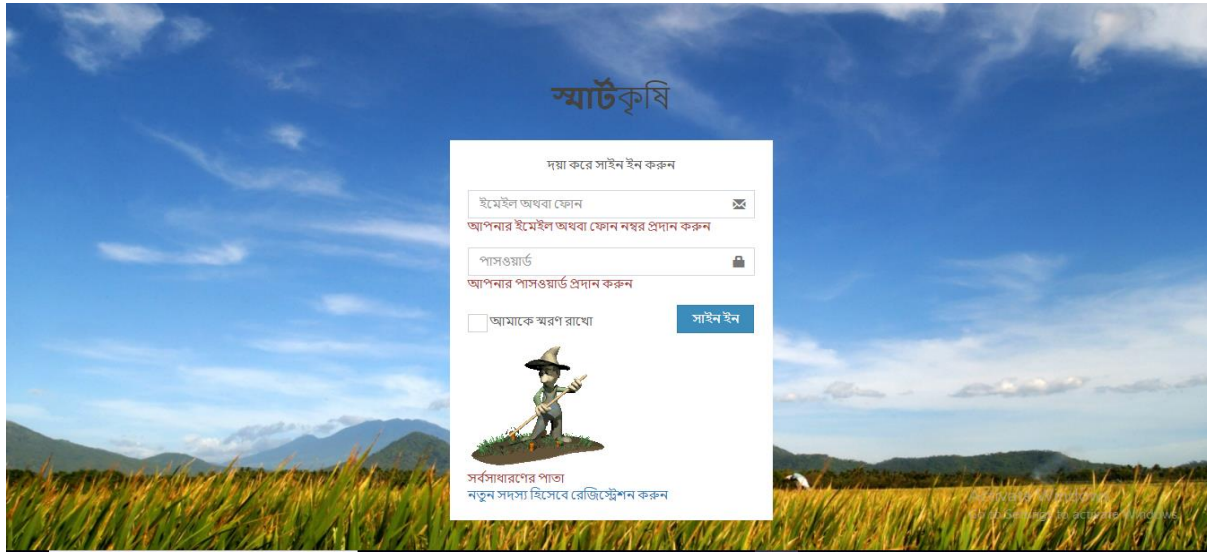


Figure5.5.1: Test Login page

If user want to login he must fill up the requirement. Otherwise he will get an Error message. It's a common login page for all user such admin, farmer and agriculture officer.

Registration page:

Figure5.5.2: Test Registration page

People visit this website without any registration. When he has any question about the given information then he must be registered as a farmer. He must be filling up the entire text field. Without fill up any text field then he get alert message.

Add diseases description feature:

In this feature agri-officer must fill up all the text field. If any text field does not required than alert message will show.

রোগ যুক্ত করুন

ফসলের ক্যাটাগরি: নির্বাচন করুন
ফসলের শ্রেণী বা বিভাগ এর নাম নির্বাচন করুন

ফসলের নাম: নির্বাচন করুন
ফসলের এর নাম নির্বাচন করুন

রোগের নাম:
রোগের এর নাম প্রদান করুন

লক্ষণ:
লক্ষণগুলো প্রদান করুন

ব্যবস্থাপনা:
ব্যবস্থাপনা সমূহ প্রদান করুন

পরবর্তীতে যা যা করবেন:
পরবর্তীতে করণীয় সমূহ প্রদান করুন

রোগাক্রান্ত ফসলের ছবি: No file chosen

Activate Windows
Go to Settings to activate Windows.

Figure 5.5.3: Test Add diseases description feature page

So at the end we can carry out the results as the benefits of usability testing.

- Good Quality of application.
- Application is more readily accepted by users.
- Easy to use for the new users.
- Better UI for interaction.

CHAPTER 6

Conclusion and Future Scope

6.1 Discussion and Conclusion:

In this paper a literature review on applications in Smart Farming was conducted. It was concluded that currently there are not many references in peer-reviewed scientific journals. Therefore, a reliable, quantitative analysis was not possible. Further-more, findings from grey literature may lack scientific rigor as can be expected from peer-reviewed journal articles. However, as articles from grey literature are publicly available, they can be seen as being subject to public scrutiny and therefore reasonably reliable. As such, we consider that the knowledge base was enriched by articles from grey literature. Besides, much effort was put into developing a framework for analysis that can be used for future reviews with a more quantitative approach.

6.2 Scope for Further Developments:

This application can be improved in the future by adding the following functionalities:

- ❖ Offering high-precision crop control, useful data collection, and automated farming techniques, there are clearly many advantages a networked farm has to offer.
- ❖ The technology is here today to make the farm of the future possible, where we can predict and prevent disease; where you can view data on soil and crop condition in near real-time.
- ❖ Businesses should aggressively focus on improving their operations for ensuring success, given the urgent requirement in the agri industry. IoT could provide a real advantage to those that embrace it by providing better quality information that aids better decision making.

6.3 Limitation:

There are some limitations of this project. Basically our main target is farmer. Those who cultivate their land and face many problems for their old cultivation process and some unknown diseases. They can know new method of cultivation. Our specific limitation given as bellow:

- Basically farmers are not familiar with this Smart farming site.
- Maintaining proper Internet connection for the farmer.
- Difficult to agree Agriculture officer to provide service.

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