



## A Web Based Application for Agriculture : “Smart Farming System”

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### ABSTRACT

Bangladesh is predominantly an agricultural country, where agriculture sector plays a vital role in accelerating the economic growth. Agriculture remains the most important sector of Bangladeshi economy, contributing 19.6 percent to the national GDP and providing employment for 63 percent of the population. A National Agricultural Census report has said Bangladesh is currently home to 16.5 million farmer families. The report also highlighted the fact that there over four million landless farmers, with near 6.8 million farmers cultivating other people's land. To help the farmers and improve in agricultural sector, we design and develop a web based application "Smart Farming System". Farmers of Bangladesh can learn and share various knowledge and problem facing during farming through this system. Farmers can acquire information around various diseases and resolver on their problems. They can get support in various agricultural activities, by the help of the consultants and doctors through the "Smart Farming System". To develop this system we used HTML5, CSS, Bootstrap, and JavaScript. In addition, the PHP framework is used to manage the MySQL database. In testing phase, we tested it with a community based social media on Facebook and its work great with expecting output, peoples are expecting these services to be interesting.

**Key words:** Smart Farming, Agriculture, Web Application, MySQL, JavaScript

### 1. INTRODUCTION

The time has come for modern living. Farmers in our country usually use the weather and weather information to harvest

plants and crops. But now, with the help of technology, anyone get all of the information related to agriculture. At present, new technology and smart systems are very populate in Bangladesh ([1],[2]). With the recent development and promotion of affordable technological equipment [3], both large and small farmers are getting new and more precise equipment for less and more production. Fortunately, farmers worldwide are facing technological advancements that can help them grow more food and market it at a much more reasonable price. Opportunities for more precise cultivation can increase yields and profits and reduce the use of valuable water and fertilizers. So, we believe that the “Smart Farming System” will lead to the advancement of scientific and modern farming. In summary, this system will help the farmers involve farming in every smart way, in one single platform.

Cultivation takes skill. A farmer need to know when to plant, when to irrigate, when to fertilize, and when to harvest. Also they need to know how to protect ourselves from pesticides and from harvesting after harvest. A time before, in the season of farming, various pathogens in the crops grown on land, but could not find a proper way to protect the crops produced from those diseases, farmers used to go to the market pesticides shopkeepers, they always suggest about primary medicine and most of them. Therefore most of the time crop damage is often done due to a lack of proper treatment on time. After analyzed these issues, we started working with this online web application “Smart Farming System”, basically from all those hardships of the farmers. And the present age is the age of technology ([4],[5]). Most people now use smartphones and use the Internet. Fortunately, farmers around the world are now facing technological advances that will help them grow more food and collaborate to bring it to market at a much more reasonable price. Opportunities for more precise cultivation

can increase yields and profits and reduce the use of valuable water and fertilizers. If we think of a developing country like Bangladesh [6], we will see that our farmers are not advanced enough in technology and agriculture. So, we believe that the “Smart Farming System” project will lead to the advancement of scientific and modern farming.

According to the FAO's forecast that 20 million people are living on this planet, agriculture faces enormous challenges: food production must increase by 70% and yet must be achieved with limited availability of arable land, rising saltwater requirements and other less predictable factors, such as the impact of climate change, among other things as well as the life cycle of plants and animals. We can solve many of these problems very easily through the smart farming system.

- The Smart Farming System project plays a key role in determining the farmers' early diagnosis of the crop.
- Through the Doctor's Directory system, farmers can easily contact agricultural consultants.
- Anyone can ask any question about agriculture at any time by registering at our smart farming system web site.

Farmers will be benefited by the Agriculture Consultant or any other registered member if they have any questions by registering on the “Smart Farming System” web site to solve their problems. Anyone can get help from blogs on various issues of farming for the benefit of the farmers. With the help of the Disease Prediction Blog, farmers will be able to identify different pathogens on their own crops. Farmers can easily contact the agricultural consultants for advice on their agriculture. And students who study agriculture in Bangladesh can register as freelancers by registering on our website. This will open a way to solve their unemployment problems.

## 2. LITERATURE REVIEW

The present era is the modern age. And information technology has made a huge contribution in this modern age. Most people in the world now rely on information online. And Bangladesh is the main country of agriculture. Most people in our country now depend on agriculture. In the past, people in our country used to grow crops based on information available from TV and radio, but now they do not want to wait for TV or radio. And the Internet is now in the hands of people, which is why many people now want to know about agriculture online, and they want to plan accordingly. And most of the information centers on agriculture online in Bangladesh cannot provide all the information about agriculture most of the time. The smart farming system should be used so that the farmers can easily get all the information from the farm. Farmers will be able to access all agriculture-related information from the smart farming system, not just from any part of Bangladesh. We talked to ordinary farmers and

agricultural entrepreneurs about the art farming system and they welcome the initiative, and with this welcome, we think we have achieved success in the primary.

We have found several websites about agriculture, most of them are informative. Another two websites sell a variety of agricultural products. But if anyone ask anything about agriculture online, there are no live answer options. And it is easy to talk directly to a consultant on agriculture and there are no live contact option with the admins, but the system is doing this unique task. The following is a description of some agriculture-based website

### 2.1 Ajkerkrishi.com

Farmers in our country are doing farming for us through various problems and adversities. Their agricultural crops are disrupted due to a lack of proper information and advice at the right time. Various diseases cause crop damage, but farmers of all levels are being deprived of the right price of their products under the influence of middlemen. Therefore, this is the initiative of "today's agriculture" to utilize the technology based on the needs of the era to deliver all the right information at the right time [7].



Figure 1: Ajkerkrishi.com

### 2.2 Krishibangla.com

KrishiBangla site has been made with the specialized help of the Department of Agriculture Extension. Over the most recent 20 years, the Initiative for Total Reform (ITR) propelled the biggest farming site in Bangla in the private area for the quick extension of present-day rural innovation and simple access to horticulture for all worried about the utilization of data correspondence innovation (ICT) for the advancement of agribusiness in the nation. Green savers are directing different humanitarian exercises for the advancement of the condition and urban agribusiness in the nation. Toward the start of the new year, 'KrishiBangla.com' has developed as a manageable site giving data, innovation,

and administrations identified with farming and the earth in the bigger school. Activity for Total Reform (ITR) and Green Savers are mutually working 'Agribusiness Bangla.com'.



Figure 2: Krishibangla.com

### 2.3 Krishi.gov.bd

Through this website, the government of Bangladesh distributes agricultural based news to the people of the country.

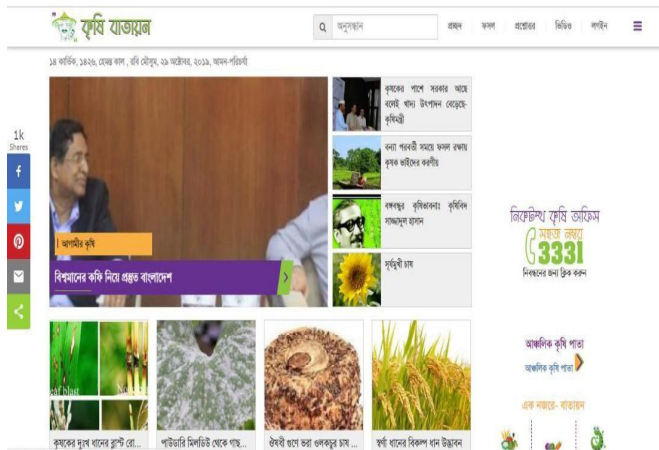


Figure 3: Krishi.gov.bd

There are some issues with our smart farming system project too but hopefully, in the future we will recover all the problems with a great solution. We have already improved it a lot. Frankly, we've got some issues that are still going on. We like to mention them for clarity. Hopefully, in the near future, our developers and business owners will be able to find great solutions to this problem. This system requires humanitarian assistance to ensure all processes are correct. Web-based systems are not fully secure. We will strengthen security to protect our website so that hackers cannot cyber-attack our site

### 3. METHODOLOGY

Before starting to plan for this project, we did a variety of surveys of the agriculture sector. Our project is based primarily online. We study a few related projects where it seems to be visible in the online world as well. We just can't startup by judging a service online. So we first have an opinion from the students of Daffodil International University, and later we go to the villages and get feedback from the farmers. At present, the agricultural-based sites in Bangladesh sell most of the blogs and some agricultural products. But our project will be able to answer live questions and answers online as well as anyone and one and a half farming consultants. More importantly, farmers can hire agricultural consultants as they wish. And the information on our website will be classified according to the category of the agricultural consultant. If you want a farmer, you can easily contact the nearest union, UPAZILA agriculture officials through our website. So we can say that the Smart Farming System project will play a leading role in advancing the agriculture sector of Bangladesh.

We know that, our project is mainly to develop Bangladeshi people. So they have to do a lot of hard work to believe in online service.

Some significant challenges that need to consider in this task will be talked about in this segment.

- Collection of agricultural data.
- It is very difficult to make a money deal with a consultant.
- Storing information is very difficult.
- The issue of tax is the acute headache of online business. No one can really tell the amount they are going to charge you.
- Saving time.
- Quickly response farmer and doctor.

#### 3.1 Business Process Modeling

These day web clients of Bangladesh are developing quickly and countless of them are excitedly sitting tight for smooth and secure assistance for bringing items from the worldwide market. It's entirely conceivable to get the business opportunity and fabricate a major help on the off chance that it is conceivable to shape a decent plan of action. We tried and found that it's conceivable to make a benefit in a decent range. Individuals like to pay on the off chance that anybody gives them legitimate help on how they like to get it. It will make the extent of work in our nation. The representative, as well as related administrations, will be profited by this like the doctor, farmer, and so forth. Actualizing this task may make huge business [8].

We already developed its mobile version. It will open the new world of business. This business model will able to turn a big community to their potential customer. Everyone has a smartphone now, so it will be easy to provide service for Android users too. Promoting this business will be also easy than the other business.

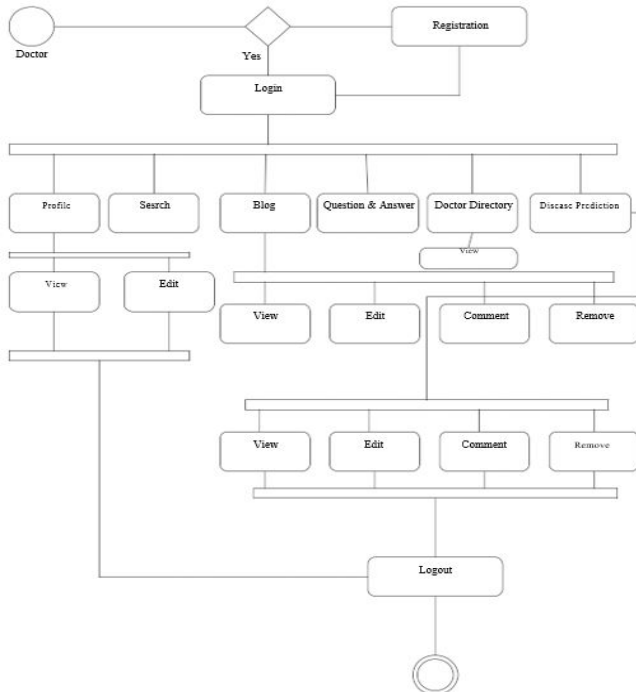


Figure 4: Business process model for doctor.

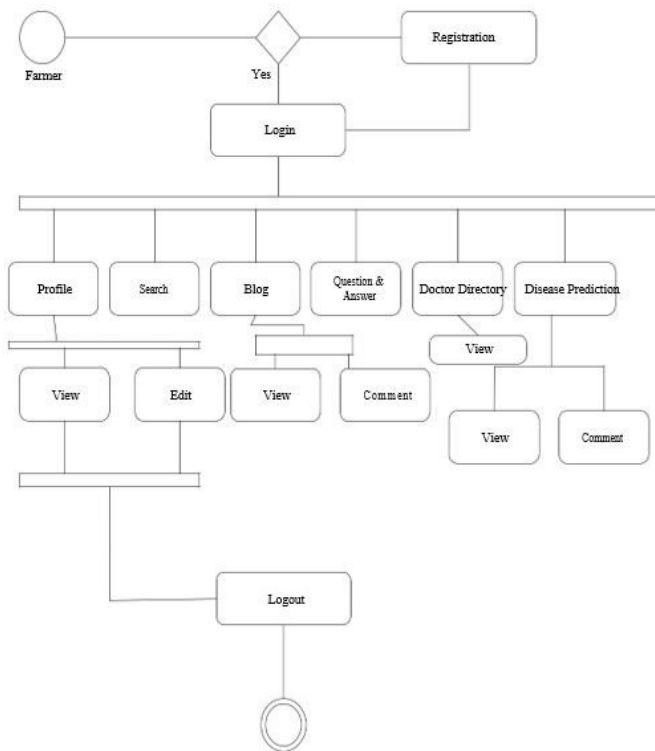


Figure 5: Business process model for farmer.

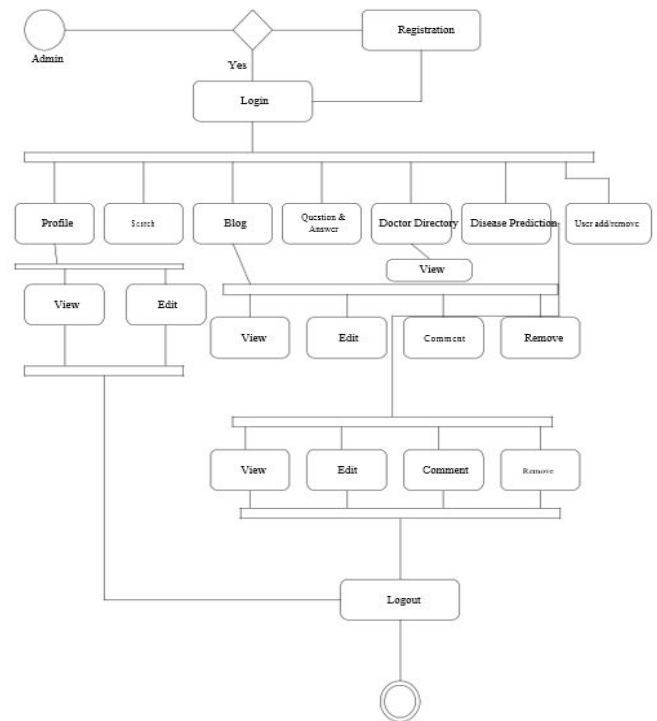


Figure 6: Business process model for admin.

### 3.2 Requirement Collection and Analysis

Here some requirements that we need in this "Smart Farming System" project.

Requirements are like:

- If users want to avail of any service, they need to be registered on our website first and after completing the registration they will be able to get service of their choice.
- Need to provide all right information then properly benefited doctor directory services.

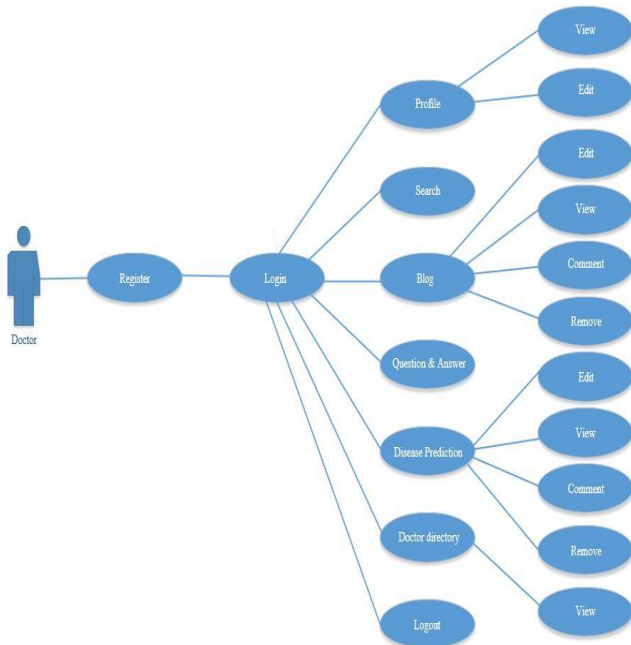
Analytically, if farmers and agronomists want to get any services from the "smart farming system" he must first provide information. You will be able to access the service if you are registered.

### 3.3. Use Case Modeling

Here is the Use Case chart shows what the role and activity of a doctor, farmer, and admin of this framework. It just shows what they can do and what they can't do. Use case charts, for the most part, are utilized to assemble the means and phases of necessities of a framework both interior and outside impacts.

#### 3.3.1. Use case scenario for farmer

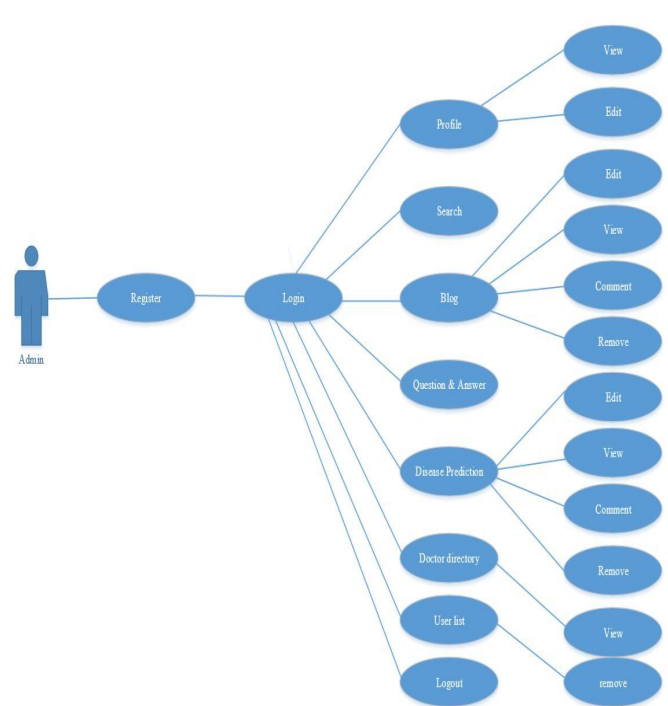
The farmer who likes to take our service, he needs to go first with choosing won helping service. Now he needs to get registered on the website



**Figure 7:** Use case diagram for Doctor.

### 3.3.2. Use case scenario for doctor

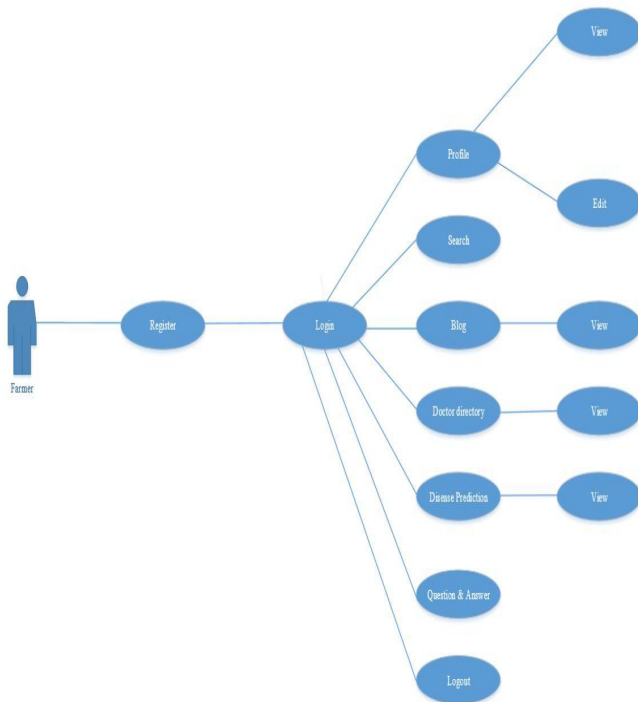
The doctor who likes to take us service, he needs to go first with picking won helping benefits. Presently he needs to get enrolled on the site.



**Figure 9:** Use case diagram for Admin.

### 3.4 Logical Data Model

Continuously a logical data model; another name logical schema is a full information model of the particular issue area that communicated autonomously of a specific stockpiling innovation or database the executive's item. Here, in our legitimate information demonstrating shows the way toward speaking to the information design and association in an alluring graphical manner with no respect to the physical usage. The logical data model really gives all the accumulated data about the activities of different substances and the specialized connections between the elements present in the database [9].



**Figure 8:** Use case diagram for Farmer.

### 3.3.3. Use case scenario for admin

An Admin is expected to sign in with the authoritative secret password. At that point, he can get to the site. Presently, He can include any new doctor and farmer affirmation of this site.

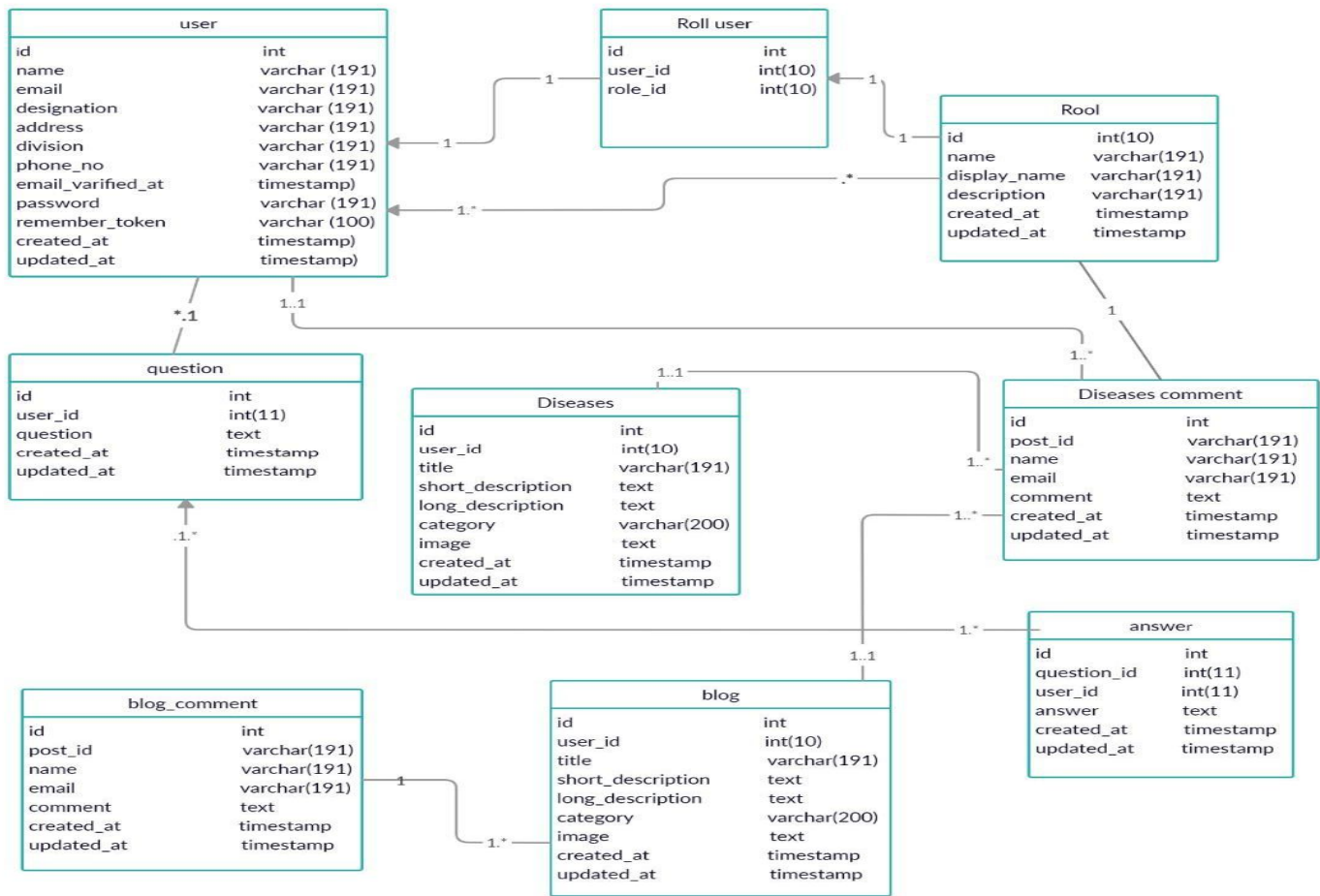


Figure 10: Data Model.

### 3.5 Design Specification

#### 3.5.1 Design Requirements

Continuously for planning a framework, it needs some data and necessities. This task additionally has this. Our framework will contain three types of roles: admin, doctor, and farmer. Here we attempted to make reference to it shortly.

Requirements are given below:

- A farmer will be profited by this administration. Furthermore, they are going to take our administration. Along these lines, he needs to pick won assistance. Presently he needs to get enrolled on the site.
- A doctor who will be profited by this administration. What's more, they are going to take our administration. In this way, they need to pick won profited. Presently they need to get enlisted on the site.
- An administrator is a controller for everything being equal. The administrator can sign in with the managerial secret word and afterward get to this site. They can acknowledge or dismiss any solicitation.

#### 3.5.2 Front-end Design

Without an easy to use interface, it's unrealistic to make them alright with the site. In this way, we pay attention to the front end structure. Our top specialists' affirmed that the interface of the front end is super easy to use and we checked it once more. We took the assistance of HTML, CSS, Bootstrap, and JavaScript, and so on for structuring the front-end. The necessity of essential planning was satisfied by utilizing crude HTML and bootstrap, furthermore this to give some extraordinary things we have utilized JavaScript. The shading direction was finished by utilizing CSS and shading direction code. We tried sincerely and utilized vital soldiers for affirming a super easy to understand interface and expectation we made it noticeable.

##### 3.4.2.1. HTML: Hyper Text Markup Language

It is a mainstream markup language. Fundamentally everybody utilizes this for making their website pages and web application. In this venture, we have utilized HTML for making adapted writings, tables, and different components that can't be spoken to in plain content [10].

### 3.5.2.2. CSS framework or Bootstrap

In the wake of finishing markup, cascading style sheets are designed. It, for the most part, clarifies how HTML components will show. There are three different ways to compose templates. One internal CSS, another is external CSS. Also, the last one is inline CSS. Be that as it may, more often than not external CSS is utilized. Since, by utilizing external CSS, all CSS information can be kept in various records. Be that as it may, these days the CSS structure is by all accounts exceptionally mainstream. In our application, I have utilized the Twitter Bootstrap structure. This system is grown essentially for CSS and JavaScript. It is a free and open-source front-end structure. This system is profoundly utilized for planning sites and web applications too. This system bolsters pretty much every program. Like Google Chrome, Mozilla Firefox, Opera, Safari, Internet Explorer, and so on. Bootstrap likewise gives media question which highlights responsive design for various gadgets with various screen size. Bootstrap gives a lot of certain documents which contain templates which gives fundamental definition. Bootstrap additionally gives some JavaScript parts too. There are some worked in segments like JQuery UI. By utilizing the Bootstrap system, we get both CSS and JavaScript offices with a solitary stage. Be that as it may, before start planning an application interface with Bootstrap, one may have some essential information about this system. It will expand productivity [11].

### 3.5.2.3. JQuery UI

JQuery UI is the name of the library which uses JavaScript as a center programming language. It improves codes of a programming language named JavaScript. For the most part, it collaborates with a Graphical User Interface (GUI). It additionally gives special visualizations liveliness. It can likewise abrogate falling templates. It additionally gives AJAX usefulness which stands to Asynchronous JavaScript and XML. It is additionally a subset of JavaScript. By utilizing AJAX no page reloading is required. It is additionally perfect with any program like Google Chrome, Mozilla Firefox, Opera, Safari, Internet Explorer and so forth.

### 3.5.2.4. Back-end Design

The back-end configuration characterizes how to functions with a site. Another name of the Back-end is the server site. The back-end side isn't unmistakable from the client end, just noticeable by the administrators. The individual who works to build up the back-end is known as an engineer or developer. For building up our venture we worked with these referenced beneath.

- PHP (LARAVEL Framework): It is essentially an administrator interface for applications. By utilizing this it is anything but difficult to alter/include or erase information for the site. It fills in as a media director for the records. Not just that, the PHP structure LARAVEL

finishes numerous other authoritative undertakings for designers [12].

- Database Server: For developing our whole project, we have pursued the Relational Database Management System or RDBMS. What's more, we find that MYSQL gives the element of RDBMS. So we ought not to have any issue to utilize the MYSQL database. It is additionally extremely simple to utilize. It can also ensure security, scalability, high performance and many things.

### 3.5.3. Interaction Design and UX

We have subtleties of the cooperation structure of our task. We are giving them part by parts like the farmer, doctor and admin panel. The administrator and the board segment will just approach the control board.

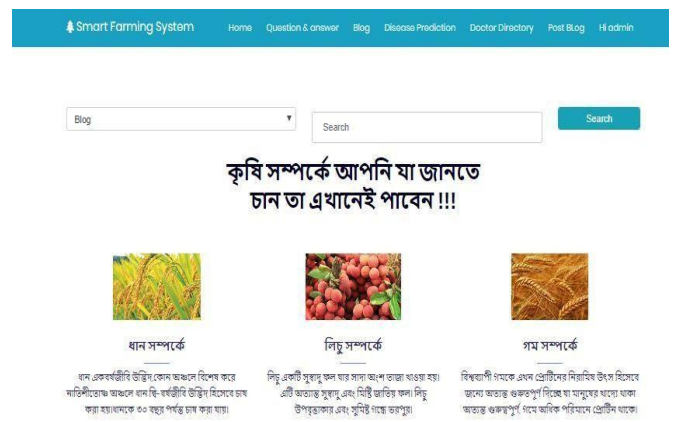


Figure 11: View of a home page.

### 3.5.4. Implementation Requirements

As an unpredictable and utilitarian work, the usage of our task may require numerous things. From the start for taking care of and controlling the database is expected to utilize PHP code and clearly, the stage is MYSQL. Here the MYSQL is a database the board framework, which could make simple to alter site database. To make any class or new database we can do it in PHP, my administrator. It's only for instance. Along these lines can erase or embed our database in it. Something critical is, while users go for executing the PHP records, simply need to keep the documents into c-drive that is for where really the XAAMP document has. Presently, Into XAAMP document, htdocs a record we have to put our PHP documents into that envelope. At that stage, need to make localhost. When we execute our records we should need to type localhost then the document area into URL. Presently just that, we additionally have a couple of programming prerequisites as well, which is given underneath with short subtleties.

### 3.5.5. Software Requirements

In order to implement this project, we need a few software requirements for some essential tasked to be done like coding,

controlling and maintaining.

- Sublime Text: (It's a code editor. We actually prefer it to smart coding. To implement the project a code editor is essential. All HTML, CSS, PHP, Bootstrap, jQuery or JavaScript code need to write in this type of platform).
- Chrome: (It's the most part software we need to implement our projects. Users need to add our extension on the chrome browser to get the interface of Smart Farming System).
- XAAMP: (It needed for creating the local web server which is essential for testing and deployment of the changes in every stage) [13].

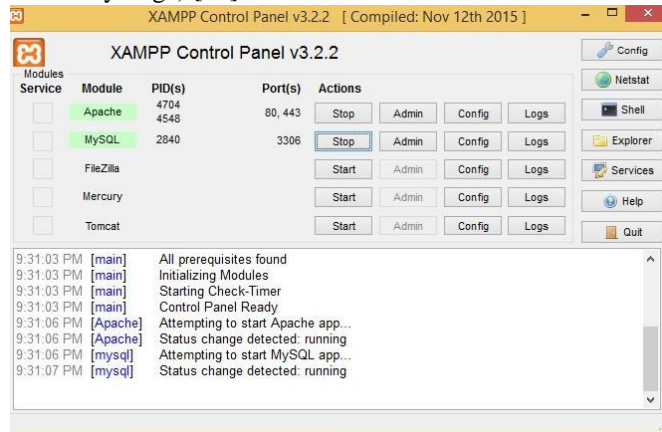


Figure 12: XAMPP Control Panel.

## 4. IMPLEMENTATION AND TESTING

### 4.1 Implementation of Database

Our project is really made dependent on web innovation and dependent on this stage as well. So the principal thing first. We have to structure a database to actualize this. At that point, execute the database adequately by utilizing the PHP code. Other than this, we took care of the database is MYSQL. Here utilized capacities for SQL questions for the activity database. Exploiting PHP, for this task we planned various sorts of information tables that portray the characteristics, substance, and information type as well. In this way, in database when the client signs in or register it checked from the database and afterward required activity from this database. Figures underneath show subtleties of all tables of our database [14].

Parameters of database table of doctor registration:

1. Id
2. Name
3. Email
4. Mobile
5. Designation
6. Address
7. Division
8. Password

Parameters of database table of farmer registration:

1. Id
2. Name
3. Email
4. Mobile
5. Designation
6. Address
7. Division
8. Password

Parameters of database table of admin registration:

1. Id
2. Name
3. Password

### 4.2 Implementation of Front-End Design

It's a fundamental and significant piece of any site or undertaking. We likewise take the Front-End structure as a momentous piece of a venture. In the event that the UI looks basic to the guest or appears to be uneasy things, a great deal at that point individuals will overlook it. Here another issue is site stacking. On the off chance that the site takes stacking time than the normal, individuals will be exhausted and accordingly, disregard it. So we attempted to structure an uncommon look UI with a slick and clean face other than that it's simple for any client as well. It is very easy to use and responsive also. In these days individuals have cell phones and they like to utilize them for each reason and kept it in information and made a responsive site that can utilize this site easily.

#### 4.2.1 Register Account

If anyone want to be a user they need to register first. User should have valid information for completing registration. So, user go into the homepage>login>signup, Then the register page will appear. Provide the screenshot of register page below:

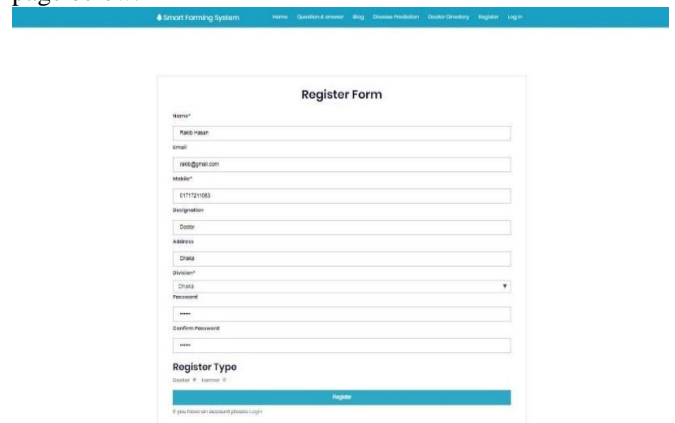


Figure 13: User Registration Page

#### 4.2.2 Login Page

User need to login for post blog, post question, doctor directory etc. But before that they need to be authenticated the



system. First of all, they need to enter into the login page and fill up the required information. After that they will get access. In figure 14 shown the screenshot of login page below:

Figure 14: Login page

#### 4.2.3 User Updated Profile

After complete registration and login user must be complete company profile. Then any information adding and canceling. Now I will provide some screenshots for your better understanding.

Figure 15: User updated profile

#### 4.2.4 Blog post page

Only doctors and admins can post blogs, update, and remove. In figure 16 shown screenshot of the blog post page.

Figure 16: Blog post page.

#### 4.2.5 Disease Prediction Page

Only doctors and admins can post blogs, Update, and Remove. In figure 17 shown the picture of disease prediction

page of the system.

Figure 17: Disease Prediction Page.

#### 4.2.6 Doctor Directory page

Doctor Directory page view any valid register and doctor profile update can be doctor. In figure 18 shown the picture of doctor directory page of the system.

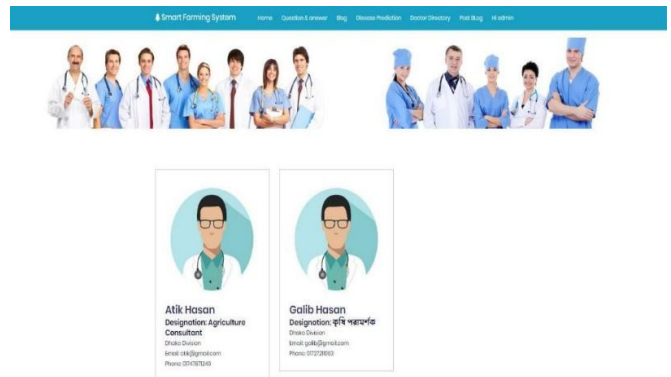


Figure 18: Doctor Directory Page.

#### 4.2.7 Question & Answer Page

Question and answer can be any valid register and admin.

Figure 19: Question & Answer Page.

### 4.2.8 Question & Answer Page

Admin can remove any user.

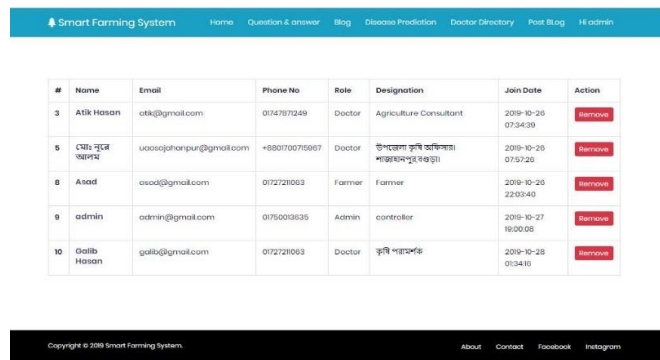


Figure 20: Admin control page.

### 4.2.9 Doctor control page

Doctor can edit, update and remove post.

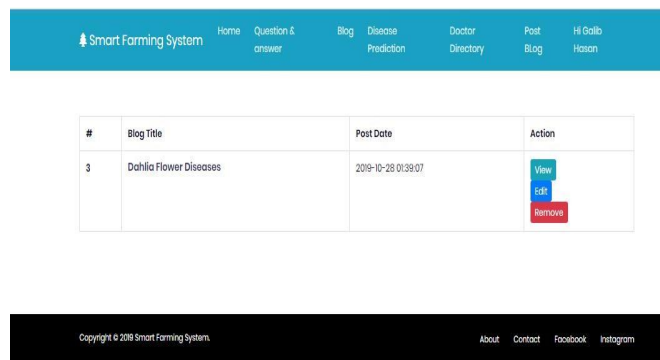


Figure 21: Doctor control page.

### 4.2.10 About page



Figure 22: About page

### 4.2.11 Contact page

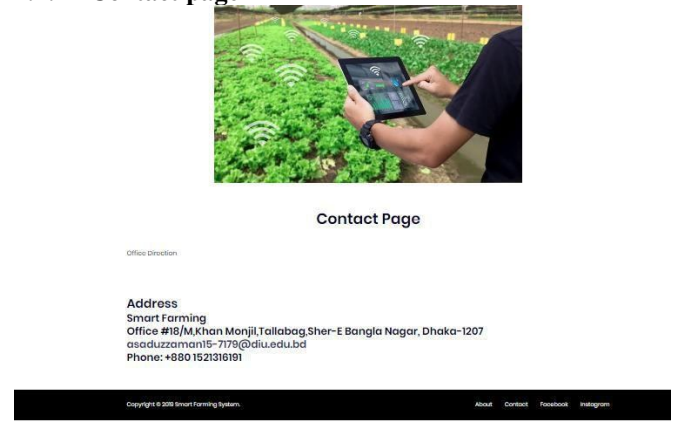


Figure 23: Contact page.

### 4.2.12 Mobile Version



Figure 24: Mobile Version.

### 4.3 Implementation Interactions

In the wake of finishing, we execute the framework to the "smart farming system" and again we fixed issues to guarantee the easy to use administration. In this way, individuals preferred this UI and utilized it easily. At that point, we take a basic notice framework which ready to snatch senders or the recipient's consideration and input rapidly. At long last, we make every one of the alternatives beginning to affirm conveyance with computerized contact and correspondence among collector and framework administrator. Expectations could change the item shopping world in another shape [15].

### 4.4. Testing implementation

An experiment is a report (Table 1), which has a lot of test information, preconditions, anticipated outcomes, and post-conditions, created for a specific test situation so as to confirm consistency against a particular prerequisite [16].

**Table 1:** Test Case: Testing of the Implementation Project.

Test Case	Test Input	Expected Outcome	Obtain Outcome	Pass/Fail
Doctor Register	Doctor can add profile Smart Farming System	Register Successfully done	Login Successfully done	Pass
Farmer Register	Farmer can add profile Smart Farming System	Register Successfully done	Login Successfully done	Pass
Admin	Admin can login into the system for manage the system	Successfully done	Successfully done	Pass
Question	Doctor, Farmer and Admin can add question	Successfully done	Successfully done	Pass
Answer	Doctor, Farmer and Admin can add answer	Successfully done	Successfully done	Pass
Blog	Doctor and Admin can add post	Successfully done	Successfully done	Pass
Blog Comment	Farmer, Doctor and admin can add comment	Successfully done	Successfully done	Pass
Disease Prediction	Just Doctor and Admin can add post	Successfully done	Successfully done	Pass
Disease Prediction Comment	Farmer, Doctor and admin can add comment	Successfully done	Successfully done	Pass
Doctor Directory	Doctor directory profile create can doctor	Successfully done	Successfully done	Pass

**4.5 Test Results and Reports**

Nothing can be affirmed without genuine testing. Along these lines, after finishing the full undertaking we began to attempt the execution in numerous fields, previously checked the tests for affirmation. It's important to know how the undertaking functioning. Is it prepared or not? Since it's significant for each creating task and engineer as well. Of Course! This kind of result shows the natural state of any framework. In this way, we attempted to test a couple of times in various manners. No doubt! It works adroitly. The report (Table 2) paper can really portray the test outcome unhesitatingly.

**Table 2:** Test Report

Number of Unit Test Case	100% Success in first iteration	Less than 100%	Total Succession %
Total: 10	8	2	80%
Total: 10	10	0	100%

**5. CONCLUSION**

The application is planned so that future changes can be effectively done. The following conclusion can be accepted

from the improvement of the project. Automation of the whole application improves the great association. It delivers a well friendly graphical UI and gives proper access to approved users depending upon their approvals. It successfully overcomes the delay in communications. Refreshing information turns out to be simpler. Application security, information security, and reliability are striking features. The System has a tolerable extension for adjustment later on in the event that it is basic. The System has a passable scope for modification in the future if it is essential.

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