

# **Rooftop into a Thriving Garden with Innovative Web Platform**

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Submitted in partial fulfillment of the requirements for the degree of  
Bachelor of Science in Computer Science and Engineering



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING  
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# APPROVAL

The project titled “**Rooftop into a Thriving Garden with Innovative Web Platform**” submitted by Ayesha Siddiqa (CSE1901016132) Mst. Ayesha Siddiqa (CSE1901016122) Sonia Akter (CSE1901016185) and Fowzia Fariha Taj (CSE1901016025) to the Department of Computer Science and Engineering, Sonargaon University (SU), 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.

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# DECLARATION

We, hereby, declare that the work presented in this report is the outcome of the investigation performed by us under the supervision of **Ahmed Shafkat, Lecturer**, Department of Computer Science and Engineering, Sonargaon University, Dhaka, Bangladesh. We reaffirm that no part of this project has been or is being submitted elsewhere for the award of any degree or diploma.

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# ABSTRACT

A rooftop garden is a type of green space that is built on the roof of a building. It can range from small container gardens to large, fully landscaped areas, providing numerous benefits to both the building and the environment. Rooftop gardens can help to mitigate urban heat island effects, improve air quality, and reduce storm water runoff. They can also provide food and recreational space for building residents or employees. To create a rooftop garden, various factors such as weight capacity, water and electricity availability, and plant selection need to be considered. Proper installation and maintenance are also critical to ensure the safety and longevity of the rooftop garden. Overall, rooftop gardens are a valuable addition to urban landscapes and can offer significant benefits to the community and the environment. The Rooftop Garden web project aims to provide an innovative platform that connects house owners and customers who are interested in rooftop gardening.

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# LIST OF ABBREVIATIONS

CSS	Cascading Style Sheets
HTML	Hyper Text Markup Language
IDE	Integrated Development Environment
MERN	MongoDB, Express, React, Node
VS Code	Visual Studio Code

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## CHAPTER 1

# INTRODUCTION OF ROOFTOP GARDEN

---

### 1.1 Introduction

A rooftop garden is a type of green space that is constructed on the roof of a building, whether it be residential, commercial, or industrial. The garden can vary in size and complexity, ranging from small container gardens to large, fully landscaped areas. Rooftop gardens provide many benefits, both to the building and the environment. They help to reduce urban heat island effects, improve air quality, and reduce storm water runoff. Additionally, they can provide food and recreational space for residents or employees of the building. To create a rooftop garden, several factors need to be considered, such as the weight capacity of the roof, the availability of water and electricity, and the type of plants that will thrive in the rooftop environment. Proper installation and maintenance are also crucial to ensure the safety and longevity of the rooftop garden. Overall, rooftop gardens are a valuable addition to urban landscapes and can provide numerous benefits to the community and the environment.

### 1.2 Objective

The objective of a rooftop garden can vary depending on the specific needs and goals of the building or community where it is located. However, some common objectives of rooftop gardens include:

1. Environmental benefits: Rooftop gardens can help to mitigate the impacts of urbanization by reducing the urban heat island effect, improving air quality, and reducing storm water runoff.
2. Increased green space: In urban areas where space is limited, rooftop gardens provide an opportunity to increase green space and provide residents or employees with access to nature.
3. Food production: Rooftop gardens can be used to grow fruits, vegetables, and herbs, providing a source of fresh produce for building residents or employees.
4. Recreation: Rooftop gardens can provide a space for relaxation, exercise, and socialization, enhancing the quality of life for building residents or employees.
5. Aesthetic improvement: Rooftop gardens can improve the appearance of a building, adding beauty and visual interest to the surrounding urban landscape.

Ultimately, the objective of a rooftop garden is to create a sustainable, green space that provides benefits to the building, community, and the environment.

### **1.3 Purpose**

The world is facing many problems nowadays, including a growing number of people living in cities, many of whom often do not have easy access to fresh food. To solve this problem, it is necessary to develop a new kind of agriculture that provides city residents with food security while also protecting the environment. Rooftop agriculture could be a solution. Rooftop agriculture is a type of urban agriculture, in which food is grown on the tops of buildings. Rooftop agriculture can have many benefits. For example, it can reduce the extreme heat in the city during summer, it can help to decrease urban poverty, and it can help people to socialize more. In addition, rooftop agriculture can even benefit the buildings themselves. Rooftop agriculture is becoming more popular across the world, thanks to these benefits. We hope it will become an important part of the sustainable cities of the future.

### **1.4 Benefit**

Rooftop gardens are becoming increasingly popular in urban areas, and for good reason. Here are some benefits of having a rooftop garden:

- Environmental benefits.
- Improved insulation.
- Increased biodiversity.
- Food production.
- Aesthetics and relaxation.
- Community benefits.

Rooftop gardens offer numerous benefits for both individuals and the environment, making them a worthwhile investment for those interested in sustainable living and urban greening.

### **1.5 Comforts Way**

There are many ways to create a comfortable rooftop garden. Here are a few ideas:

1. Provide seating: Comfortable seating areas are essential for enjoying your rooftop garden. Consider adding benches, chairs, or a cozy outdoor sofa.
2. Add shade: Rooftop gardens can get very hot, especially during the summer months. Provide shade by adding umbrellas, awnings, or pergolas.
3. Use comfortable flooring: Choose a flooring material that is comfortable underfoot, such as soft grass, outdoor carpet, or interlocking rubber tiles.
4. Incorporate water features: The sound of water can be very soothing and relaxing. Consider adding a small fountain, pond, or water feature to your rooftop garden.
5. Provide lighting: Adequate lighting is important for safety and comfort, especially if you plan to use your rooftop garden in the evening. Add string lights, lanterns, or solar-powered lighting to create a cozy atmosphere.
6. Consider wind protection: Rooftop gardens can be exposed to high winds, which can make it uncomfortable to spend time outdoors. Use windbreaks such as trellises, screens, or planting hedges to protect your rooftop garden from gusts of wind.

By incorporating these elements into your rooftop garden design, you can create a comfortable and inviting outdoor space that you'll love to spend time in.

Environmental quality in urban areas are getting worse by the minute. Green spaces are taken out to make way for concrete structures. Without enough verdant areas, cities and towns will have a hard time alleviating the urban heat island phenomenon and reducing air and noise pollution. The need to control the negative effects of development has pushed new-generation builders, landscape architects, and urban planners to come up with solutions to preserve the optimum quality of the environment. And one option that they recommend is building a rooftop garden or roof garden.

A roof garden is essentially a garden on the rooftop of a building, man-made green spaces on the topmost level of residential and commercial structures. Consisting of different plants, these verdant areas help improve a building's aesthetics. Rooftop gardens have been in existence for a long time now. The people of ancient Mesopotamia have grown trees and shrubs atop ziggurats. Some European homes in the olden days had roofs made with turf. And the Hanging Gardens of Babylon, one of the Seven Wonders of the Ancient World, are known to have tiered gardens with lots of vegetation. Until the 20th century, having a rooftop garden equated to novelty and wealth. By the 1970s, the first green roofs were manufactured and installed in homes and commercial establishments. Due to today's urban landscapes, which is congested and has less green space, more residential owners and building architects opt to develop rooftop gardens. Question is, what roof garden ideas are ideal for a particular structure?

### **1.6 Aim of Project**

The aim of a rooftop garden web project would depend on the specific goals of the project, but some potential aims could include:

- Educating people about the benefits of rooftop gardens: A rooftop garden web project could aim to raise awareness about the environmental, social, and health benefits of rooftop gardens, and encourage more people to create them.
- Providing resources for creating rooftop gardens: The project could provide information and resources for people who want to create their own rooftop gardens, such as design ideas, planting tips, and maintenance advice.
- Showcasing successful rooftop garden projects: The web project could feature case studies of successful rooftop garden projects, highlighting the positive impact they have had on their communities and the environment.
- Encouraging community involvement: The project could aim to encourage community involvement in creating and maintaining rooftop gardens, by organizing events, workshops, and volunteer opportunities.
- Promoting sustainable living: A rooftop garden web project could be part of a larger initiative to promote sustainable living and reduce the environmental impact of urban areas.
- Homeowners can advertise their rooftop for rent
- Customers can rent rooftops of their choice for gardening

The aim of a rooftop garden web project would be to promote the benefits of rooftop gardens and encourage more people to create them, with the goal of improving the health and well-being of individuals and communities, and creating a more sustainable urban environment.

### **1.7 Overview**

A rooftop garden web project could be a website or online platform dedicated to promoting and educating people about the benefits of rooftop gardens. The website could include information and resources for creating and maintaining rooftop gardens, showcasing successful rooftop garden projects, and encouraging community involvement in rooftop gardening.

The website could feature educational content such as articles, videos, and info graphics explaining the benefits of rooftop gardens, the different types of rooftop gardens, and how to design and maintain them. It could also include a directory of suppliers, contractors, and designers who specialize in rooftop gardens.

The website could also feature case studies of successful rooftop garden projects from around the world, showcasing the positive impact they have had on their communities and the environment. This could include interviews with the project owners and designers, before and after photos, and data on the environmental and social benefits of the projects.

The web project could also encourage community involvement in rooftop gardening, by organizing events, workshops, and volunteer opportunities. This could include rooftop garden tours, gardening workshops, and volunteer days to help maintain community rooftop gardens.

A rooftop garden web project would be a valuable resource for anyone interested in rooftop gardening, promoting the benefits of rooftop gardens, and encouraging more people to create them to improve the health and well-being of individuals and communities, and create a more sustainable urban environment

## CHAPTER 2

### BACKGROUND STUDY

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#### 2.1 Discussion with Client

Before making this project we had to discuss with some teachers that what is their requirement? Why they need this site, what are the feature they only want? Good client communication often involves actively listening to your customers to interpret their emotions and better cater to their needs Being transparent with a client helps facilitate trust Customers may appreciate learning more about the production process so they can shop consciously



Fig 2.1 : Discuss with client

We did this thing only because there are so many Website at the market for sell but those are may have more feature that for the school of suburb area and those will cost them much more where they don't want to invest Client communication is important because it establishes and maintains trust between the client and the business

When customers trust a brand, they may be more likely to remain loyal Open client communication can also help limit misunderstandings, lead to greater customer satisfaction and make clients more likely to recommend a business to others So this was crucial for us to take this project though this had been created before so many time Having adaptable solutions for communicating can strengthen the relationship between the client and us When a change occurs, flexibility helps both parties continue to communicate

The clients are eager to implement this system at their schools for save time management if it costs in a budget range like 20 to 30 thousands BDT Also they want this thing in a very simple way that they can use So This step of work were fruitful for this project

## 2.2 Discussion with Supervisor

Effective communication with supervisor is a key element of your eventual success in the workplace. Therefore, it is important that you feel comfortable and prepared to approach your supervisor in a timely manner to discuss concerns, request assistance, or report work progress. As we have got an amazing supervisor to our group we had discuss with him about our simple concept he is good at communication he is clear to him speech, and never did underestimate us he offered us by brief discussion. By that way we were able to take our decision. Through some discussion we were able to keep this as our final proposal. We didn't choose any thesis like project because

1. We never created a complete project before
2. We had some lack of study at before
3. We had not our semester courses during this period

With all of the obstacle our supervisor **Ahmed Shafkat**, lecturer of Sonargaon University helped us to do the at least job which is in front of us now he is really an amazing man as he never scolded us rather she did inspire all of us to do at least basic of the job as this is our first project.

## 2.3 Google Search



Fig 2.2 : Google Search

Searching through website is very important now a day. In the web there is almost everything. Every project build with three or more Technology. There need more than one language and a server need to connect there. So, as we mentioned earlier that we had the lack of knowledge to build a complete website. So we had to see some website and inspected here code from browser. After this we had to see some tutorials from youtube how they do the job for a project and read some content from some site.



## 2.4 Using MERN Stack

The MERN Stack is a popular open-source technology stack for building full-stack web applications. It consists of four main technologies

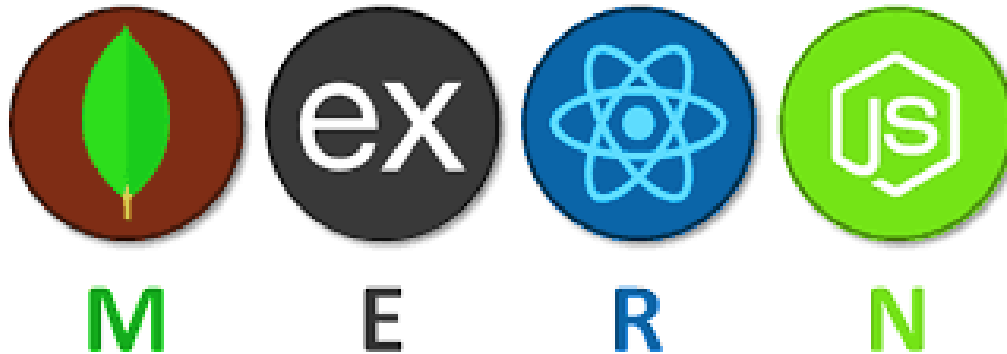


Fig 2.3 : MERN STACK

MongoDB: A document-oriented NoSQL database used for storing and managing data in a flexible and scalable way. Express: A web application framework for Node.js used for building back-end web applications and APIs. React: A JavaScript library for building user interfaces (UI) and user experience (UX) components for front-end web applications. Node.js: A JavaScript runtime environment used for building scalable and high-performance web applications. Together, these four technologies provide developers with a powerful and flexible toolset for building full-stack web applications with a modern, component-based architecture. The MERN stack is widely used by developers and companies of all sizes for building a wide range of web applications, including social networks, e-commerce platforms, and more.

MEAN is a free and open-source JavaScript software stack for building dynamic web sites and web applications. A variation known as MERN replaces Angular with React. is a collection of technologies that enables faster application development. It is used by developers worldwide. The main purpose of using MERN stack is to develop apps using JavaScript only. This is because the four technologies that make up the technology stack are all JS-based. Thus, if one knows JavaScript (and JSON), the backend, frontend, and database can be operated easily.

### 2.4 Why we Choose MERN Stack

MERN stack is a popular choice for web development, especially for building dynamic and responsive web applications. It consists of four technologies - MongoDB, Express, React, and Node.js - that work together to create a full-stack web development framework. Here are some reasons why MERN stack would be a good choice for a rooftop garden web project:

1. **Scalability:** The MERN stack is designed to be highly scalable, allowing for the easy addition of new features and the handling of large amounts of data. This is important for a rooftop garden web project that may grow in scope and complexity over time.

2. Flexibility: The MERN stack is highly flexible, allowing developers to easily customize and configure the technology to meet the specific needs of the project.
3. Speed: The MERN stack is known for its speed and performance, allowing for quick and responsive user interactions, which is important for a web application like a rooftop garden project that may require real-time updates and data.
4. Community support: The MERN stack has a large and active community of developers and users who contribute to the development and improvement of the technology, and provide support and resources for new users.
5. JavaScript-based: All components of the MERN stack are based on JavaScript, making it easy for developers to work with and integrate different parts of the project.

The MERN stack is a great choice for a rooftop garden web project because it provides a flexible, scalable, and fast web development framework that is well-suited to building dynamic and responsive web applications.

## CHAPTER 3

### METHODOLOGY

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#### 3.1 Objective

Methodology refers to the overarching strategy and rationale of your research project. It involves studying the methods used in your field and the theories or principles behind them, in order to develop an approach that matches your objectives.

The methodology is the general research strategy that outlines the way in which research is to be undertaken and, among other things, identifies the methods to be used in it. These methods, described in the methodology, define the means or modes of data collection or, sometimes, how a specific result is to be calculated.

Methodology does not define specific methods, even though much attention is given to the nature and kinds of processes to be followed in a particular procedure or to attain an objective.

A methodology does not set out to provide solutions; it is therefore, not the same as a method. Instead, a methodology offers the theoretical underpinning for understanding which method, set of methods, or best practices can be applied to a specific case, for example, to calculate a specific result.

There are various types of methodology. In Online, however, we choose to use the Agile method for our project, Rooftop Garden.

The methodology objectives for a rooftop garden web project would depend on the specific goals of the project, but here are some potential objectives:

1. **User-centered design:** The project could use a user-centered design methodology, which focuses on understanding the needs and preferences of the end-users to create a web application that meets their needs and is easy to use.
2. **Agile development:** The project could use an agile development methodology, which emphasizes flexibility and collaboration among team members to deliver working software in short iterations.
3. **Test-driven development:** The project could use a test-driven development methodology, which involves writing automated tests for software features before writing the code, to ensure that the features meet the requirements and are bug-free.
4. **Continuous integration and deployment:** The project could use a continuous integration and deployment methodology, which involves automating the process of building, testing, and deploying software, to ensure that changes are integrated and tested frequently and quickly.
5. **Collaborative development:** The project could use a collaborative development methodology, which involves working in teams and using tools such as version control and issue tracking to manage development tasks and ensure that everyone is working towards the same goals.

### **3.2 System Analysis**

The system analysis objectives for a rooftop garden web project would be to identify the requirements and constraints of the project and to determine how the web application will meet the needs of its users. Here are some potential objectives for system analysis in a rooftop garden web project:

1. Identify user requirements: The system analysis should involve identifying the needs and preferences of the web application's users, such as gardeners, landscapers, and community organizations, and translating those needs into specific requirements for the web application.
2. Determine system constraints: The system analysis should identify any technical, financial, or other constraints that may affect the development or deployment of the web application, such as server capacity, budget limitations, or regulatory requirements.
3. Define system architecture: The system analysis should determine the overall architecture of the web application, including the components, modules, and interfaces that will be required, and the technologies that will be used.
4. Develop use cases: The system analysis should identify the different ways that users will interact with the web application and develop use cases to describe these interactions.
5. Evaluate feasibility: The system analysis should evaluate the feasibility of the project, considering factors such as technical, economic, and environmental feasibility, to determine if the project is viable.

### **3.3 About Agile**

Agile is an iterative and incremental approach to project management and software development that emphasizes flexibility, collaboration, and rapid response to change. It is an alternative to traditional project management methods that rely on detailed planning and linear execution.

Agile methodologies are based on the Agile Manifesto, a set of guiding principles for software development that prioritize customer satisfaction, working software, and responding to change. Some of the key features of Agile methodologies include:

1. Continuous feedback and iteration: Agile development involves constant collaboration and feedback between the development team and the stakeholders, allowing for rapid iteration and continuous improvement.
2. Adaptive planning: Agile development plans are flexible and adaptable, allowing for changes to be made in response to changing requirements or customer needs.
3. Self-organizing teams: Agile teams are self-organizing and cross-functional, with team members working together to complete tasks and solve problems.
4. Emphasis on working software: Agile methodologies prioritize delivering working software in small increments, rather than detailed plans or documentation.

5. Incremental and iterative development: Agile development involves breaking down projects into small, manageable pieces, with each iteration building on the previous one.

Agile methodologies have become popular in software development, as they allow for greater flexibility, collaboration, and responsiveness to change. However, they can also be applied to other areas of project management, such as marketing, sales, and product development.

### **3.4 Values, Principles**

Agile methodology is based on the Agile Manifesto, a set of values and principles for software development. Here are the four core values and twelve principles of the Agile Manifesto:

#### **Values:**

1. Individuals and interactions over processes and tools.
2. Working software over comprehensive documentation.
3. Customer collaboration over contract negotiation.
4. Responding to change over following a plan.

#### **Principles:**

1. Customer satisfaction through early and continuous delivery of working software.
2. Welcome changing requirements, even in late development.
3. Deliver working software frequently, with a preference for shorter timescales.
4. Collaborate with customers and stakeholders throughout the project.
5. Build projects around motivated individuals and give them the support and trust they need.
6. Use face-to-face communication as much as possible.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development.
9. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
10. Continuous attention to technical excellence and good design enhances agility.
11. Simplicity is essential.
12. Self-organizing teams are the most effective way of delivering projects.
13. At regular intervals, the team reflects on how to become more effective and adjusts accordingly.

These values and principles emphasize the importance of collaboration, flexibility, and rapid response to change. They prioritize delivering working software that meets the needs of customers and stakeholders, while also promoting sustainable development practices and technical excellence. Agile methodology encourages teams to work closely together, communicate frequently, and continuously reflect on their processes to improve their effectiveness.



Fig 3.1 : Agile Model

Agile methodologies have become popular in software development, as they allow for greater flexibility, collaboration, and responsiveness to change. However, they can also be applied to other areas of project management, such as marketing, sales, and product development.

### 3.5 Reason of Using Agile Methodology

Agile methodology can be beneficial for the rooftop garden web project for several reasons, including:

1. Collaboration and communication: Agile methodology emphasizes collaboration and communication between the development team, stakeholders, and customers. For the rooftop garden web project, this would allow for close interaction with the client and ensure that the web application is meeting their needs and requirements.
2. Flexibility and adaptability: The requirements for the rooftop garden web project may change throughout the development process, and agile methodology allows for flexibility and adaptability in response to these changes. The team can adjust the development plan and priorities based on feedback and customer needs, allowing for a more customized end product.
3. Faster time to market: By delivering working software in small increments, agile methodology enables faster time-to-market. This approach allows for the web application to be launched in phases and each phase can be tested and evaluated for feedback, making changes as needed.

4. Improved product quality: Agile methodology emphasizes frequent testing and feedback, which allows for early detection of issues and defects. This helps to ensure that the final product meets customer requirements and is of high quality.
5. Customer satisfaction: Agile methodology is focused on delivering value to customers, which leads to higher customer satisfaction. By prioritizing customer feedback and delivering a customized, high-quality web application, the rooftop garden project is more likely to meet the client's needs and expectations.

The use of agile methodology can help ensure the success of the rooftop garden web project by allowing for close collaboration and communication with the client, adapting to changing requirements, and delivering a high-quality product that meets customer needs and expectations.

### **3.6 Advantages of Agile Method**

Agile methodology offers several advantages, including:

1. Flexibility: Agile methodology allows for flexibility and adaptability in project development. It recognizes that requirements and priorities can change throughout the project, and allows for adjustments to be made in real-time.
2. Collaboration: Agile methodology emphasizes collaboration and communication between team members, stakeholders, and customers. It encourages frequent feedback, transparency, and close interaction, which helps to build trust and ensure that everyone is working towards a common goal.
3. Faster time to market: By delivering working software in small increments, agile methodology enables faster time-to-market. This approach allows for the product to be launched in phases and each phase can be tested and evaluated for feedback, making changes as needed.
4. Cost savings: Agile methodology reduces the risk of project failure, as frequent feedback and testing allow for early detection of issues and defects. This helps to avoid costly rework and ensures that the final product meets customer requirements.
5. Improved product quality: Agile methodology emphasizes frequent testing and feedback, which allows for early detection of issues and defects. This helps to ensure that the final product meets customer requirements and is of high quality.
6. Customer satisfaction: Agile methodology is focused on delivering value to customers, which leads to higher customer satisfaction. By prioritizing customer feedback and delivering working software early and often, the final product is more likely to meet customer needs and expectations.
7. Empowerment of team members: Agile methodology encourages self-organizing teams, where team members take ownership and responsibility for their work. This leads to higher motivation and empowerment, and can result in more innovative solutions.

The use of agile methodology can lead to better project outcomes, higher quality products, improved team collaboration and communication, and higher customer satisfaction.

### **3.7 Disadvantages of Agile Model**

While the Agile model offers many advantages, there are also some potential disadvantages to consider when using it in the context of a rooftop garden web project:

1. **Lack of predictability:** Agile methodology allows for flexibility and adaptability, which can make it difficult to predict when the project will be completed or how much it will cost.
2. **Scope creep:** Agile methodology allows for changes to be made throughout the project, but this can also lead to scope creep - where the project gradually expands beyond its original scope, leading to longer timelines and increased costs.
3. **Need for constant communication:** Agile methodology requires frequent communication and collaboration between team members, stakeholders, and customers. This can be challenging if team members are in different time zones or if there are language or cultural barriers.
4. **Difficulty in documentation:** Agile methodology places less emphasis on documentation, which can make it difficult to track changes and ensure that everyone is on the same page.
5. **High level of dependency on team members:** Agile methodology requires a high level of participation and engagement from all team members, and the absence of a key team member can lead to delays and setbacks.
6. **Lack of formal structure:** Agile methodology is less structured than traditional project management methodologies, which can be challenging for teams who are used to a more formal approach.

It is important to note that these disadvantages can be mitigated through proper planning, communication, and execution. The success of an Agile project ultimately depends on the skill and experience of the team, as well as the ability to effectively manage and communicate changes throughout the project.



## CHAPTER 4

### SYSTEM DESIGN

---

#### 4.1 Requirement Specification

Here are some high-level requirements that could be included in the specification for a rooftop garden web project:

1. **User registration and login:** Allow users to register an account and log in to access the platform's features.
2. **Integration with social media:** Integrate with social media platforms to allow users to share their garden's progress and connect with other rooftop gardeners.
3. **Integration with e-commerce:** Allow users to purchase seeds, plants, and gardening supplies directly from the platform, or provide links to online marketplaces where they can do so.
4. **Resource sharing:** Enable users to share resources, such as tools and equipment, to reduce costs and promote sustainability.
5. **Design and planning tools:** Provide users with tools to design and plan their rooftop garden, such as a drag-and-drop interface for placing plants, a tool for creating a virtual 3D model of the garden, and the ability to upload and view photos of their rooftop.
6. **Knowledge base:** Offer a knowledge base that covers various topics related to rooftop gardening, such as soil preparation, irrigation, pest control, and plant selection. The knowledge base should include detailed information, images, and videos.
7. **Community features:** Include features that allow users to connect with each other, share tips and resources, and ask questions, such as forums, chat rooms, and user profiles.
8. **Resource directory:** Create a directory of resources for users to find gardening tools, supplies, and plants, such as nearby nurseries and hardware stores.
9. **Mobile responsiveness:** Ensure that the platform is responsive and accessible on mobile devices, as many users may access it from their smart phones.
10. **Accessibility:** Ensure that the platform is accessible to users with disabilities, such as by including keyboard navigation, alternative text for images, and appropriate color contrast.
11. **Success stories:** Feature success stories of other rooftop gardeners to inspire and motivate users to start their own gardens.
12. **Security:** Implement appropriate security measures, such as encryption of user data, secure password storage, and regular security audits.
13. **Performance:** Optimize the platform's performance to ensure that it loads quickly and is responsive to user interactions.

These requirements aim to provide value to the audience by offering a comprehensive and engaging platform that helps them design, plan, and maintain their rooftop gardens.

## 4.2 System Flowchart

### Customers Flow:

By using customer flow we can see the flow of customer. The gust can see some pages of our web project but to buy a rooftop the gust must create an account.

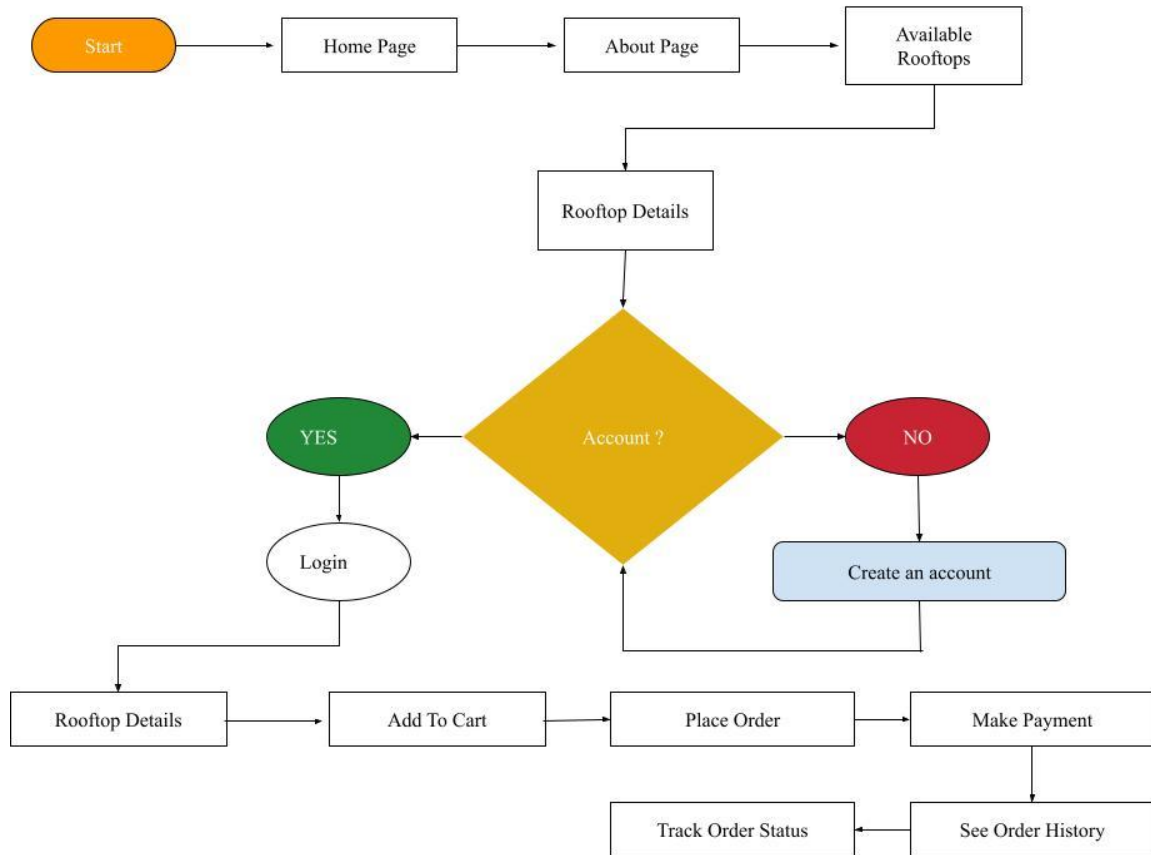


Fig 4.1 : Customer Flow

### House Owners Flow:

To add new rooftop the house owners must create an account and upload the details information of rooftop. After selling the rooftop the house owners can delete their rooftop or can delete any time they want.

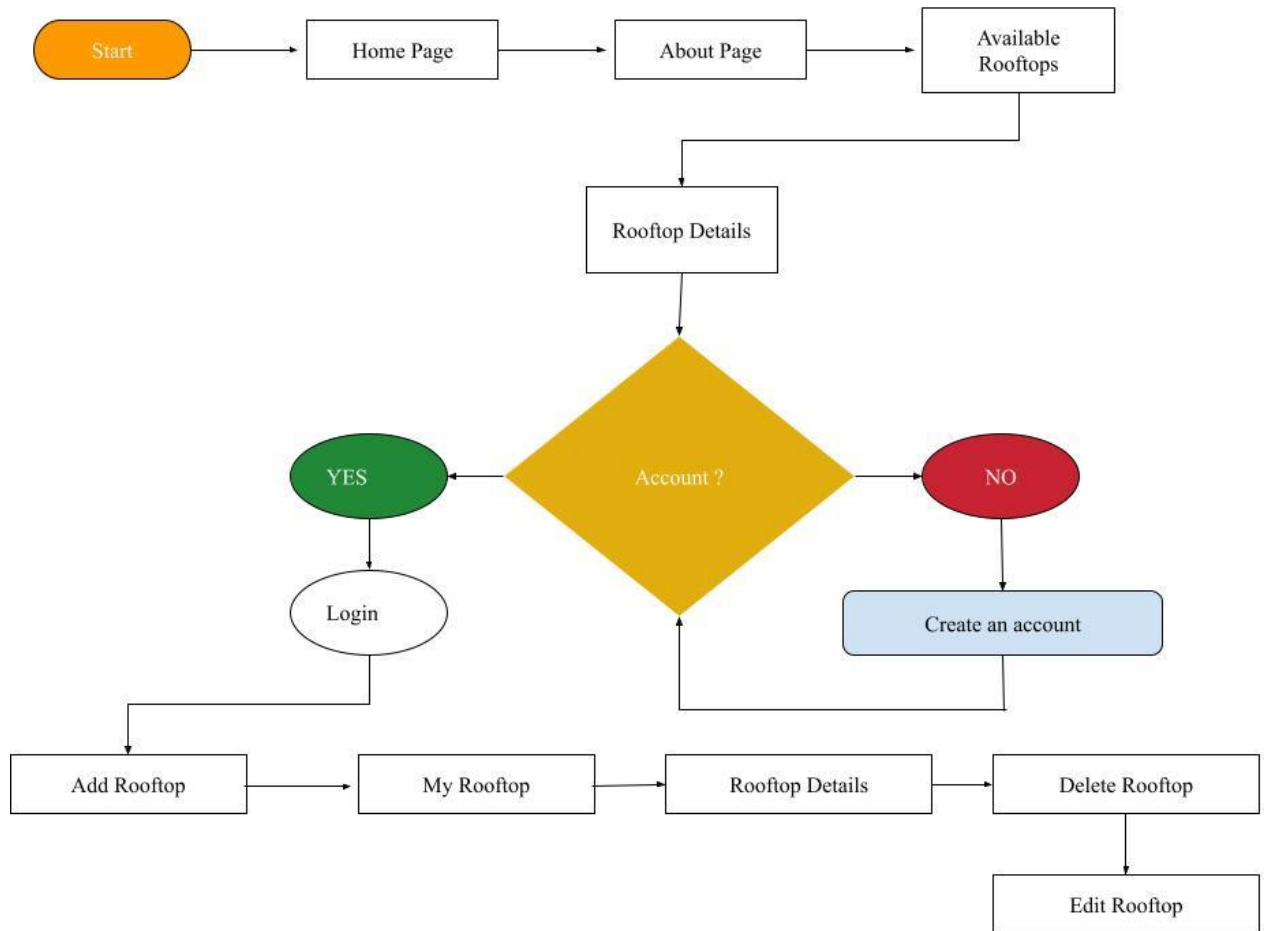


Fig 4.2 : House Owners Flow

### Admin Flow:

Admin can control full system. Some of them are the admin can verify the payment and the admin can delete any rooftop and show the information of the users of the system.

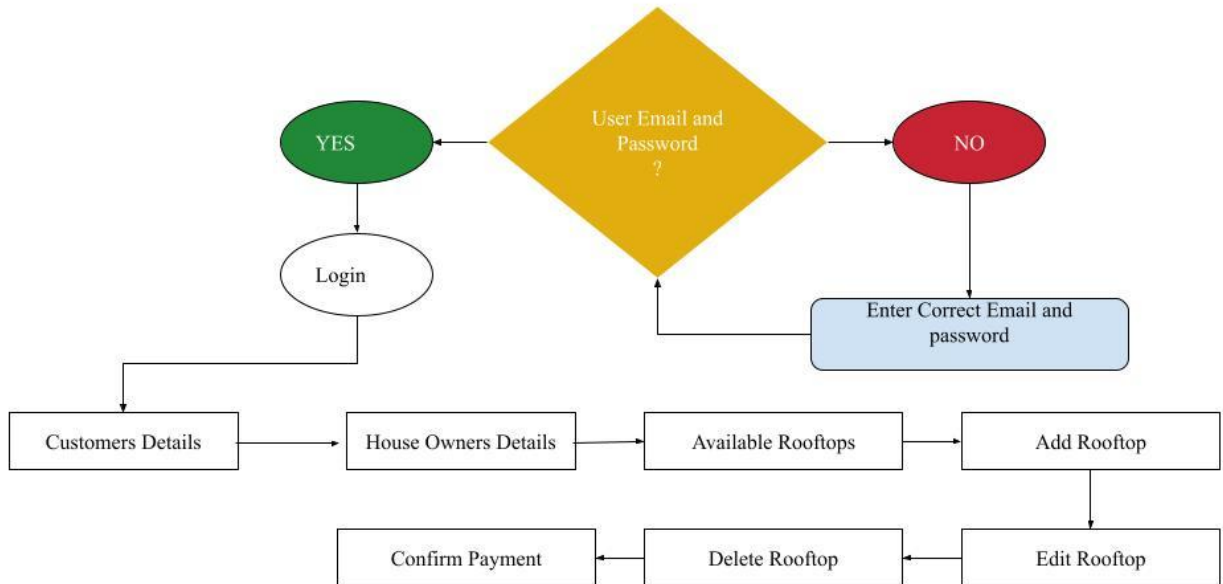


Fig 4.3 : Admin Flow

### 4.3 Use Case Modeling and Description

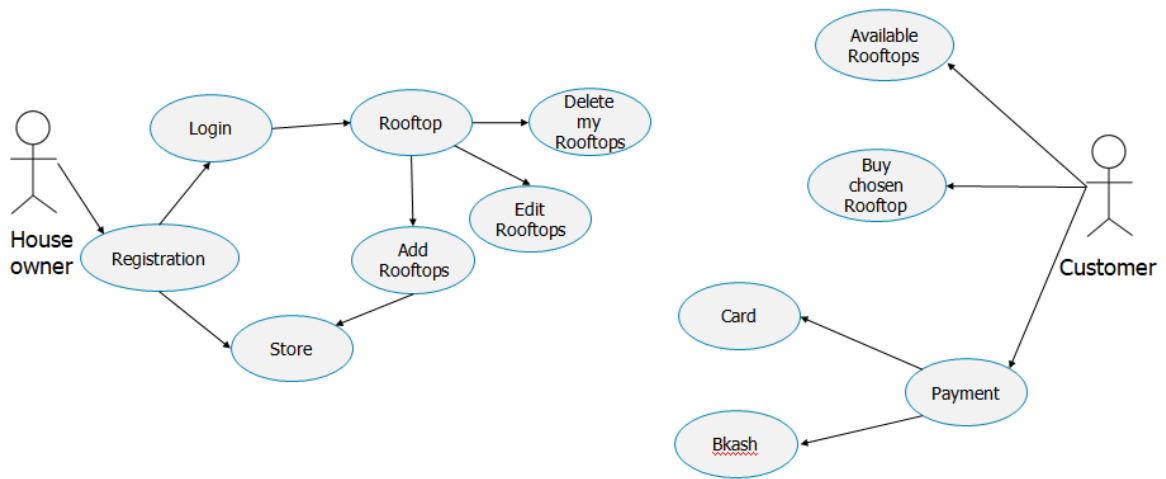


Fig 4.4 : Use Case Diagram of House Owner and Customers

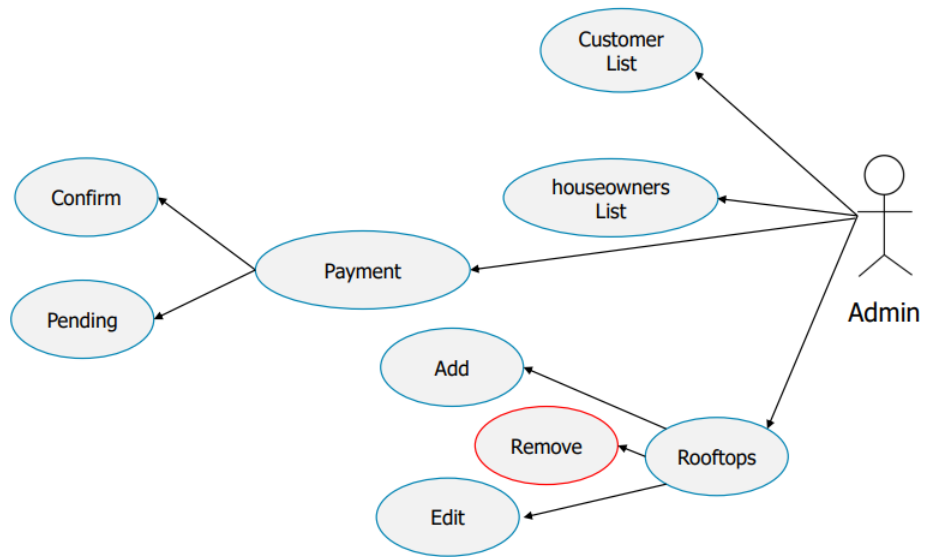


Fig 4.5 : Use Case Diagram of Admin

## CHAPTER 5

### IMPLEMENTATION AND OUTCOME

---

#### 5.1 Tools Used for Development

A project management tool gives you the ability to quickly set a hierarchy of tasks for efficient and completion. It also allows you to indicate which actions are sequential and which tasks are dependent on one another. In turn, this makes it easier for the team to do their task.

This chapter provides an elaborate discussion on the tools and technology used in this project. This includes different types of software used to build the website. This is very important to take the write tools for any types of development.

The choice of tools for developing a rooftop garden web project may vary depending on the specific needs and requirements of the project. However, we used tools for developing web applications using the MERN stack:

1. **Text editors/IDEs:** Text editors or Integrated Development Environments (IDEs) are used for writing and editing code. Some commonly used options include Visual Studio Code, Sublime Text, and Atom. But we use Visual Studio Code to develop this project.
2. **Version control:** Version control systems such as Git and Github are essential for managing changes to the codebase and collaborating with other developers.
3. **Node.js:** Node.js is a JavaScript runtime environment that allows developers to run JavaScript on the server-side. It is used to build scalable and high-performance web applications.
4. **React:** React is a JavaScript library for building user interfaces. It allows developers to create reusable UI components and render them efficiently.
5. **MongoDB:** MongoDB is a NoSQL database that is often used with Node.js applications. It allows developers to store and retrieve data in a flexible and scalable way.
6. **Express:** Express is a web application framework for Node.js. It provides a set of tools and utilities for building web applications, including middleware for handling requests and responses.
7. **Redux:** Redux is a state management library that is often used with React. It allows developers to manage application state in a predictable and scalable way.
8. **Bootstrap:** Bootstrap is a popular CSS framework that provides a set of pre-built UI components and styles. It allows developers to quickly and easily create responsive and mobile-first web applications.

We used these tools for developing a rooftop garden web project. The specific tools and technologies used will depend on the project requirements and the preferences of the development team. There are different types of module also needed to install in those software. So it is very important to take the correct options for development.

## 5.2 Software

The operating system used for the development of this application is Microsoft Windows 10 professional The IDE that is used for coding is Visual Studio code (community version) The programming language used for the development of this application is Javascript For the structure of this project there used JSX and External CSS

Software	Used For	Version
Microsoft Windows 10 pro	Operating System	10
Visual Studio code	Developing Software Applications	
Node Js	To Build Scalable And High-Performance Applications	14.15.1
CSS	Styling Web Site	CSS3
Google chrome	Browser	110.0. 5481.178
NPM	Node	6.14.8
MongoDb	Database	6.0
Git	Manage Version	2.32.0.windows.2
Postman	testing and interacting with APIs	10.10.9
Bootstrap	create responsive, mobile-first web applications	5.0.2

Table 5.1 : Software Used For Development

## 5.3 Hardware

The hardware used for the development of this application is shown in the table below Processor used for this development is Intel Core i5 10<sup>th</sup> generation Total 8GB of memory is used to run the necessary software for the development of this application other hardware components that have been used are shown in the table below:

Hardware	Description
Processor	Intel Core i3 4th Gen Processor
Memory	HP 4GB DDR3 1333 MHz RAM
Motherboard	Intel(4) H81 Express Chipset
Storage	Western Digital 128GB SSD
Display	Dell 155 inch inspirtion 15 laptop display

Table 5.2 : Hardware Used For Development

## 5.4 Database Service

In our project we use MongoDB database. We use cloud storage for developing this project. MongoDB is a popular NoSQL document database service that is used for storing and retrieving large volumes of unstructured data. Unlike traditional SQL databases, MongoDB is designed to be flexible and scalable, making it ideal for use in modern web applications. Some of the key features of MongoDB include:

1. **Flexible data model:** MongoDB uses a document data model that allows developers to store and retrieve data in a way that makes sense for their specific application. This flexible data model makes it easy to add or modify data without having to restructure the entire database.
2. **Scalability:** MongoDB is designed to be horizontally scalable, which means it can easily handle large volumes of data and high levels of traffic. This makes it ideal for use in modern web applications that need to handle large amounts of user-generated content.
3. **Performance:** MongoDB is optimized for performance, with features like automatic sharding and index support that help to ensure fast and efficient query processing.
4. **Cloud integration:** MongoDB is designed to work seamlessly with cloud-based services like AWS and Azure, making it easy to deploy and manage MongoDB databases in the cloud.
5. **Active community:** MongoDB has a large and active community of developers, which means there are plenty of resources and support available for developers who are new to the platform.

MongoDB is a powerful and flexible database service that is well-suited for use in the rooftop garden web project. Its scalability, flexibility, and performance make it an ideal choice for storing and managing large volumes of data in modern web applications.

## 5.5 Implementation

The implementation of a rooftop garden web project involves several stages, including:

1. **Planning:** In this stage, the project team will define the project scope, objectives, and deliverables. They will also identify the project stakeholders, set a timeline for the project, and allocate resources.
2. **Design:** During the design stage, the project team will create wireframes and mockups of the web application, design the user interface, and define the database schema.
3. **Development:** The development stage involves writing code and building the web application. The project team will use tools like Visual Studio Code, Node.js, and MongoDB to build the application.
4. **Testing:** In the testing stage, the project team will test the web application to ensure that it is functioning properly and meets the project requirements. They will use tools



like Postman to test the API endpoints and ensure that the data is being stored and retrieved correctly.

5. Deployment: Once the web application has been tested and approved, it can be deployed to a production environment. The project team will use cloud services like AWS or Azure to deploy the application, ensuring that it is secure and accessible to users.
6. Maintenance: After the web application has been deployed, the project team will continue to maintain it, making updates and improvements as needed. They will monitor the application for bugs and performance issues, and make updates to the code and database schema as necessary.

The implementation of a rooftop garden web project requires careful planning, design, development, testing, deployment, and maintenance. By following a structured approach, the project team can ensure that the web application is high-quality, functional, and meets the needs of its intended audience

## 5.6 Web View

### 5.6.1 Public View

About Page:

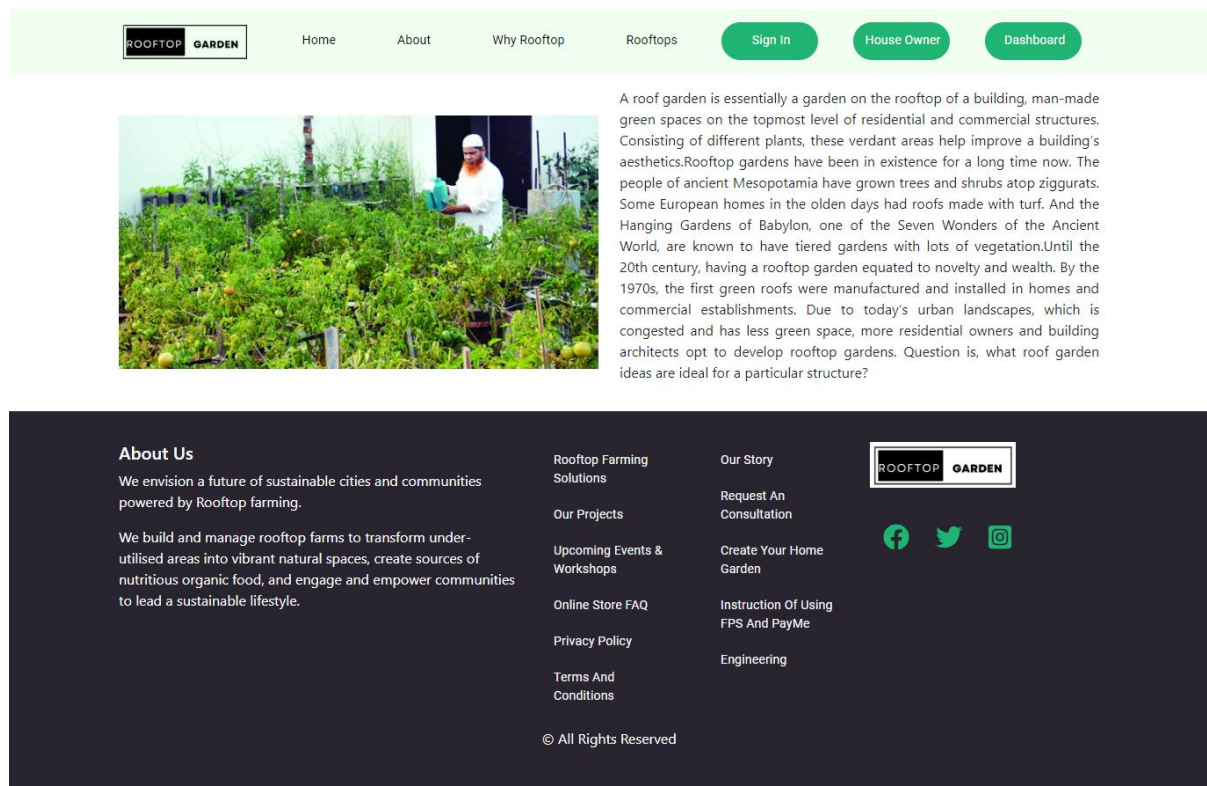


Fig 5.1 : About Page

# Home Page:


The screenshot shows the home page of the Rooftop Garden website. At the top, there is a navigation bar with the logo 'ROOFTOP GARDEN' and links for Home, About, Why Rooftop, Rooftops, Sign In, House Owner, and Dashboard. Below the navigation bar is a large hero image of a rooftop garden with wooden planters and a picnic table. Underneath the hero image are four statistics cards: 2500+ Users, 1500+ House Owners, 1000+ Active Customer, and 1500+ Active User. A section titled 'WHY ROOFTOP FARMING' features an image of a rooftop garden and a text block explaining the benefits of rooftop agriculture, such as insulation and pollution reduction. Below this is a 'Show All' button. The 'Available Rooftops' section displays four rooftop listings with details like location, size, and price, each with an 'Add To Cart' and 'Email' button. The footer contains an 'About Us' section, a list of links (Rooftop Farming Solutions, Our Projects, etc.), social media icons, and the company logo.

Fig 5.2 : Home Page

## Why Rooftop Page:

**ROOFTOP GARDEN** Home About Why Rooftop Rooftops [Sign In](#) [House Owner](#) [Dashboard](#)

### What is Rooftop Garden




A roof garden is essentially a garden on the rooftop of a building, man-made green spaces on the topmost level of residential and commercial structures. Consisting of different plants, these verdant areas help improve a building's aesthetics. Rooftop gardens have been in existence for a long time now. The people of ancient Mesopotamia have grown trees and shrubs atop ziggurats. Some European homes in the olden days had roofs made with turf. And the Hanging Gardens of Babylon, one of the Seven Wonders of the Ancient World, are known to have tiered gardens with lots of vegetation. Until the 20th century, having a rooftop garden equated to novelty and wealth. By the 1970s, the first green roofs were manufactured and installed in homes and commercial establishments. Due to today's urban landscapes, which is congested and has less green space, more residential owners and building architects opt to develop rooftop gardens. Question is, what roof garden ideas are ideal for a particular structure?

[Ask More](#)


### Reasons Rooftop Farming Is a Fantastic Idea

The world is facing many problems nowadays, including a growing number of people living in cities, many of whom often do not have easy access to fresh food. To solve this problem, it is necessary to develop a new kind of agriculture that provides city residents with food security while also protecting the environment. Rooftop agriculture could be a solution. Rooftop agriculture is a type of urban agriculture, in which food is grown on the tops of buildings. Rooftop agriculture can have many benefits. For example, it can reduce the extreme heat in the city during summer, it can help to decrease urban poverty, and it can help people to socialize more. In addition, rooftop agriculture can even benefit the buildings themselves. Rooftop agriculture is becoming more popular across the world, thanks to these benefits. We hope it will become an important part of the sustainable cities of the future.



[Ask More Questions](#)

### Why Rooftop Farming Is The Best Solution For Smart Urban Agriculture



Rooftop agriculture can be good for the buildings, too. For example, plants can help to insulate buildings from extreme temperatures, thereby reducing the amount of energy needed for heat and air conditioning, as well as the pollution produced by the heating and cooling processes. This also lowers the costs to heat or cool the building. Rooftop agriculture can also reduce noise pollution from the city and protect the roof from sun, rain, and wind.

[Ask More](#)

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We envision a future of sustainable cities and communities powered by Rooftop farming.  
We build and manage rooftop farms to transform under-utilised areas into vibrant natural spaces, create sources of nutritious organic food, and engage and empower communities to lead a sustainable lifestyle.

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Fig 5.3 : Why Rooftop Page


## Available Rooftop Page:


**ROOFTOP GARDEN** Home About Why Rooftop Rooftops Sign In House Owner Dashboard

### Available Rooftops

- 

📍 Rerum ea modi et et  
🏠 5 sqft  
💰 81 Tk BDT  
[Add To Cart](#) [Email](#)
- 

📍 Dolorem ad ipsam lab  
🏠 14 sqft  
💰 55 Tk BDT  
[Add To Cart](#) [Email](#)
- 

📍 Voluptatum aut aut q  
🏠 48 sqft  
💰 16 Tk BDT  
[Add To Cart](#) [Email](#)
- 

📍 Farmgate  
🏠 45 sqft  
💰 34345 Tk BDT  
[Add To Cart](#) [Email](#)

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Fig 5.4 : Available Rooftop Page

## Register Page:

**ROOFTOP GARDEN** Home About Why Rooftop Rooftops Sign In House Owner Dashboard

### Register

Your Name

Your Email

Your Pet Name

Your First School Name

Your Password

Re-enter Password

Register

or

Login

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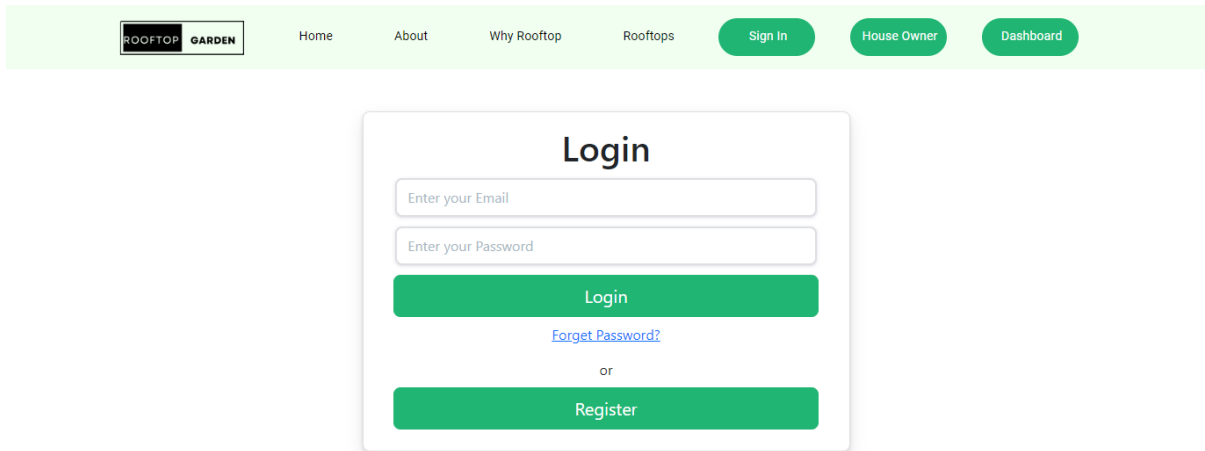
**ROOFTOP GARDEN**

Facebook Twitter Instagram

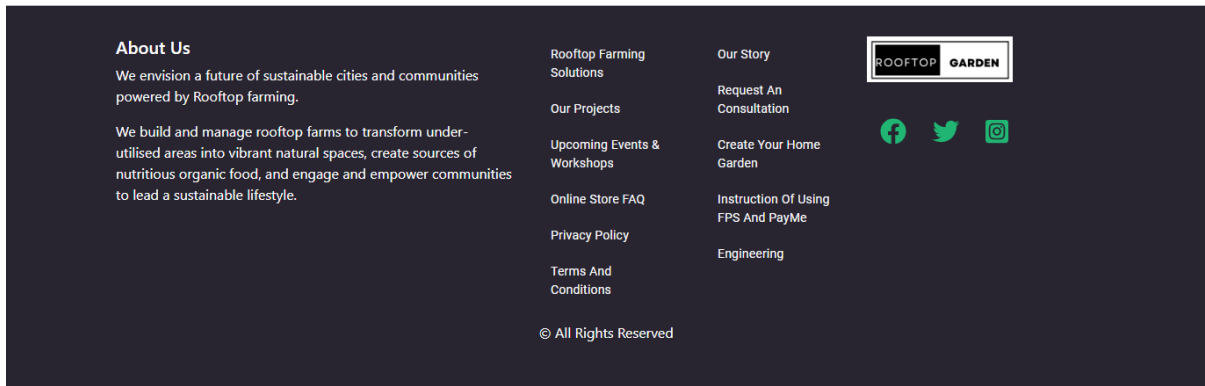
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Fig 5.5 : Register Page

## Login Page:



The screenshot shows the main login page for Rooftop Garden. At the top, there is a navigation bar with the logo on the left and links for Home, About, Why Rooftop, Rooftops, Sign In, House Owner, and Dashboard. The central focus is a white login form with the title "Login". It contains two input fields: "Enter your Email" and "Enter your Password". Below these fields is a prominent green "Login" button. A blue link for "Forgot Password?" is positioned below the login button. Underneath the link is the word "or" and a second green "Register" button.



The screenshot displays the footer of the website. On the left, there is an "About Us" section with two paragraphs of text. To the right, there are several columns of links: "Rooftop Farming Solutions", "Our Projects", "Upcoming Events & Workshops", "Online Store FAQ", "Privacy Policy", "Terms And Conditions", "Our Story", "Request An Consultation", "Create Your Home Garden", "Instruction Of Using FPS And PayMe", and "Engineering". The Rooftop Garden logo is positioned in the top right corner of the footer area, along with social media icons for Facebook, Twitter, and Instagram. At the bottom center, there is a copyright notice: "© All Rights Reserved".

Fig 5.6 : Login Page

## Admin Login Page:

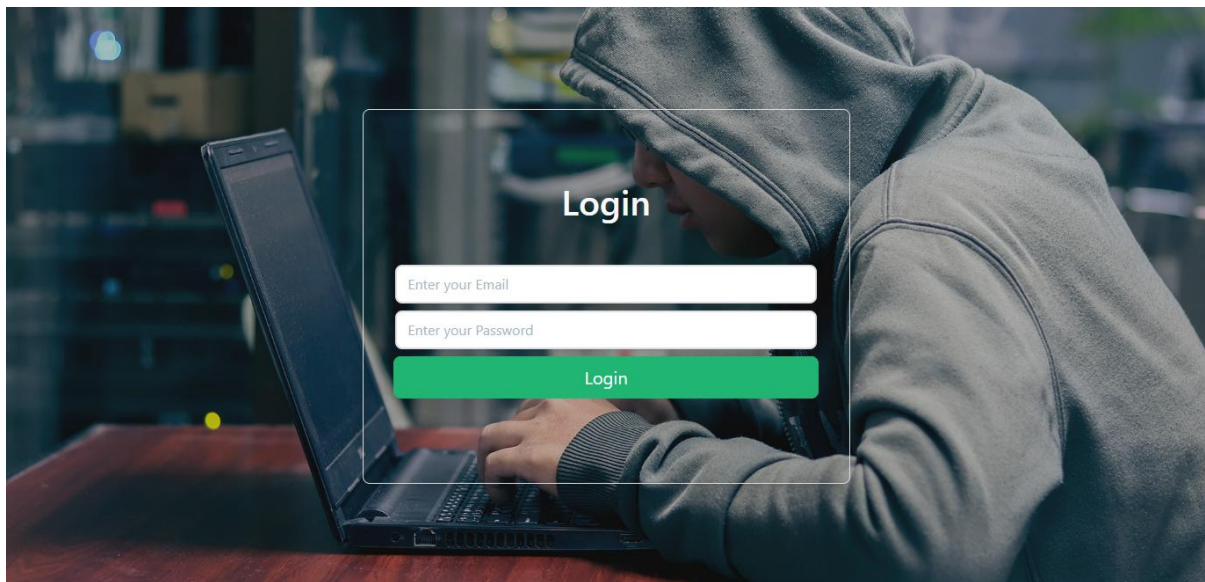



Fig 5.7 : Admin Login Page

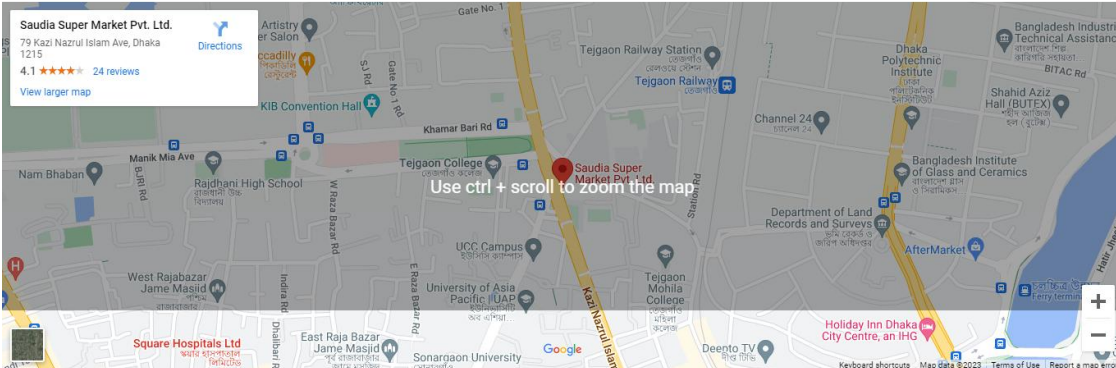
## 5.6.2 Customer View

### Rooftop Details:

**ROOFTOP GARDEN**
Home   Rooftops   Order History   0   [Sign Out](#)   Riyaz Hossain



**Location - Rerum ea modi et et**



<b>Name</b>	Nash Bradford
<b>Details</b>	Consectetur cillum c Et corrupti sed qua
<b>Price</b>	81
<b>Email</b>	<a href="mailto:mdriyaz5965@gmail.com">mdriyaz5965@gmail.com</a>
<b>Phone</b>	<a href="#">Z</a>

Details Information

Add To Cart

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Fig 5.8 : Rooftop Details

## Add To Cart Page:

**ROOFTOP GARDEN** Home Rooftops Order History 3 Sign Out Riyaz Hossain

**Nash Bradford**  
Price : ₹ 81  
[Remove](#)

**Imogene Norman**  
Price : ₹ 16  
[Remove](#)

**Grady Blake**  
Price : ₹ 55  
[Remove](#)

**Order Summary**  
Items Order : 3  
Total Price : 233  
[Place Order](#)

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Fig 5.9 : Add To Cart Page



Place Order Page:

IN WHICH METHOD DO YOU WANT TO PAY?



Fig 5.10 : Place Order Page



Fig 5.11 : Place Order Page

Card number

Expiration date

CVC

[Pay](#)

Fig 5.12 : Place Order Page

Order History Page:

Home
Rooftops
Order History
🛒 3
Sign Out
Riyaz Hossain

### Order History

#	Order Items	Order Items Location	Email	Date	Time	Payment Status
1	Nash Bradford Grady Blake Imogene Norman	Rerum ea modi et et Dolorem ad ipsam lab Voluptatum aut aut q	mdriyaz5965@gmail.com	2023-04-09	05:53 PM	Pending
2	Grady Blake Imogene Norman	Dolorem ad ipsam lab Voluptatum aut aut q	mdriyaz5965@gmail.com	2023-04-09	05:56 PM	Confirmed
3	Nash Bradford Grady Blake Imogene Norman	Rerum ea modi et et Dolorem ad ipsam lab Voluptatum aut aut q	mdriyaz5965@gmail.com	2023-05-01	04:13 PM	Confirmed

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Fig 5.13 : Order History Page

## 5.6.3 House Owner View

### Add Rooftop Page:

**ROOFTOP GARDEN** Home Add Rooftop My Rooftop Sign Out fowzia fariha taj

### Add Rooftop

Name

Phone

Email

How many square feet?

Location

Image 1

Image 2

Image 3

Google Map

Some Details

More Details

Price

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Fig 5.14 : Add Rooftop Page


## My Rooftop Page:

**ROOFTOP GARDEN** Home Add Rooftop My Rooftop Sign Out SHAHIDUL ISLAM


### My Rooftops



📍 Rerum ea modi et et  
🏠 5 sqft  
💰 81 Tk BDT  
[Details](#) [Delete](#)



📍 Dolorem ad ipsam lab  
🏠 14 sqft  
💰 55 Tk BDT  
[Details](#) [Delete](#)



📍 Voluptatum aut aut q  
🏠 48 sqft  
💰 16 Tk BDT  
[Details](#) [Delete](#)

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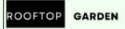
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Fig 5.15 : My Rooftop Page

## House Owner Rooftop Details Page:

Home Add Rooftop My Rooftop Sign Out fowzia fariha taj



### Location - Farmgate

<b>Name</b>	fasdfsad
<b>Details</b>	sfasfsadfasfsad asdfasdfasfsad
<b>Price</b>	34345
<b>Email</b>	<a href="mailto:farihataj255@gmail.com">farihataj255@gmail.com</a>
<b>Phone</b>	<a href="tel:234234234">234234234</a>

Details Information

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



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Fig 5.16 : House Owner Rooftop Details Page

## 5.6.4 Admin View

Admin Dashboard Page:



Fig 5.17 : Admin Dashboard Page

Admin Dashboard All Rooftop:

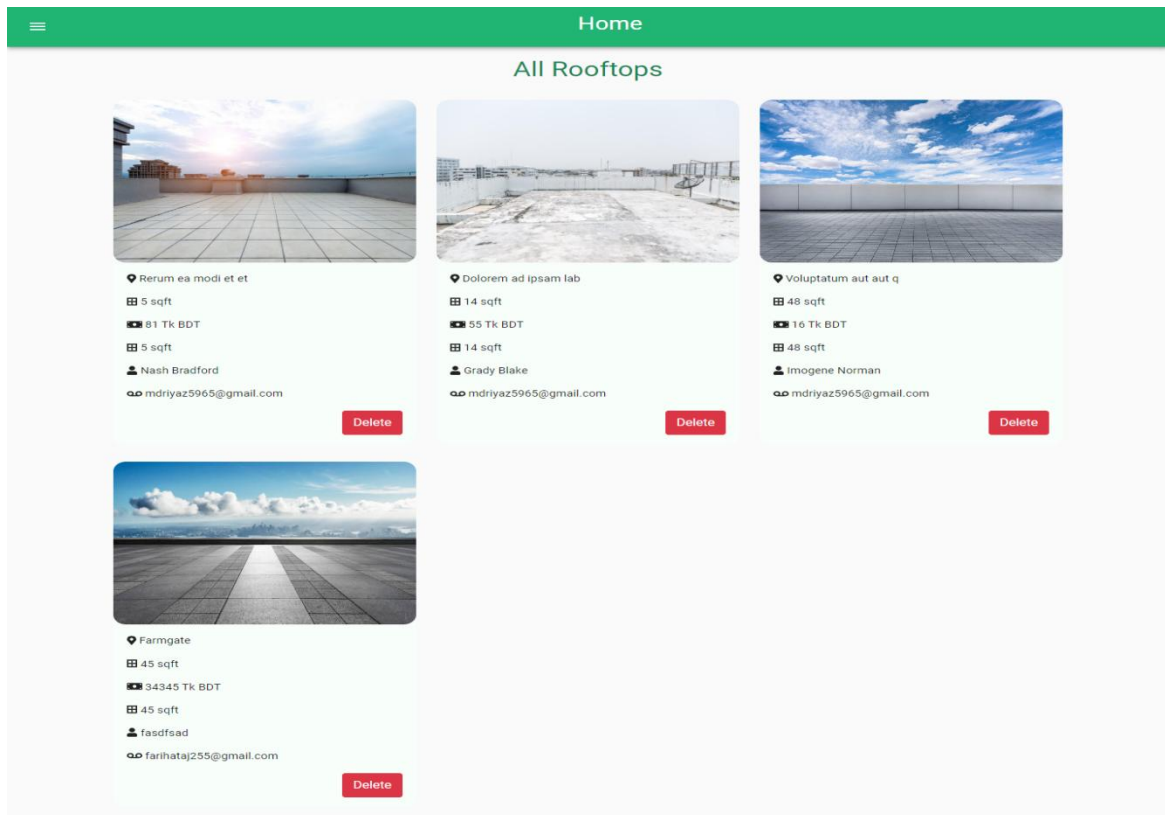


Fig 5.18 : Admin Dashboard All Rooftop

### Confirm Payment Page:

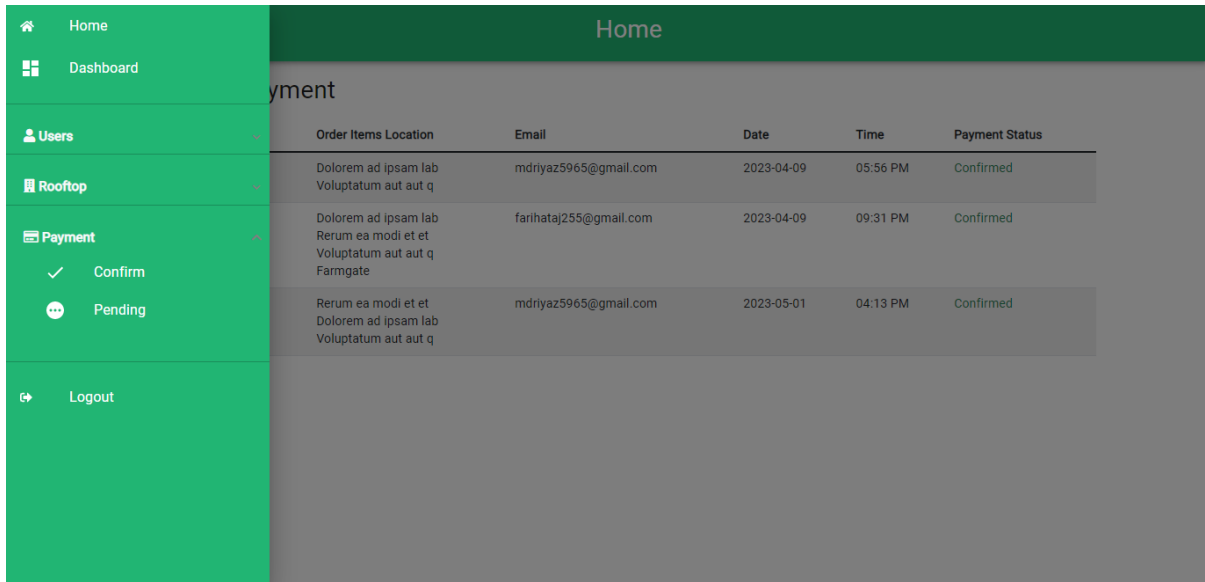


Fig 5.19 : Confirm Payment Page

### Pending Payment Page:

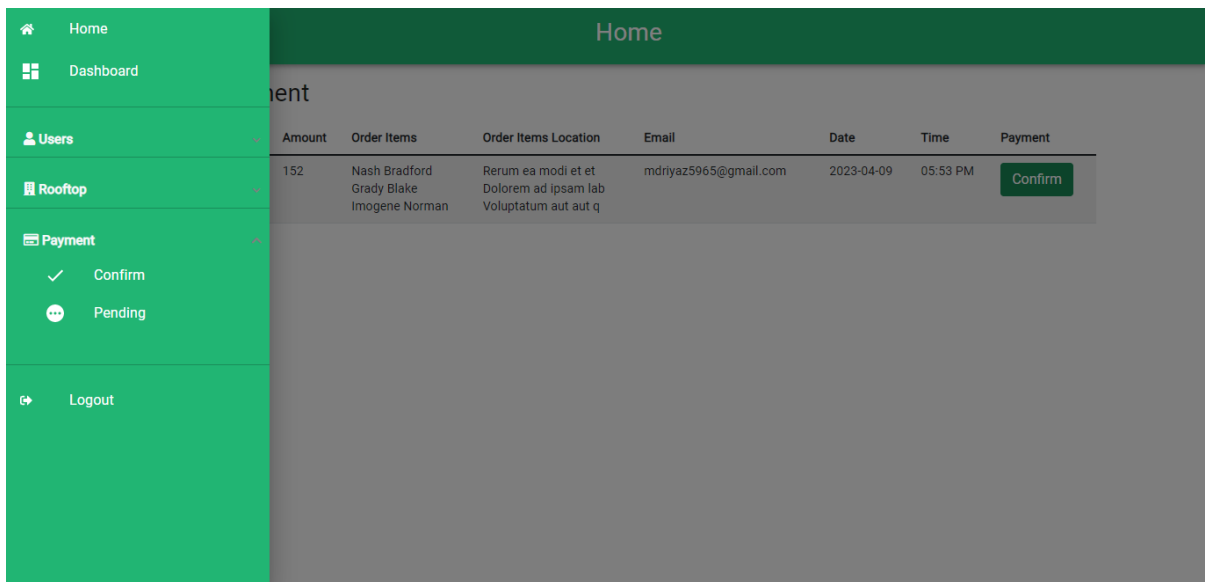


Fig 5.20 : Pending Payment Page

## CHAPTER 6

### CONCLUSION AND FUTURE WORKS

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#### 6.1 Scope for Further Developments

This is an era of technology At everywhere at every place there will be the use of inter- net So website is important for every step of society That's why it needs to be rethink that website need to be user friendly, not too large nor useless in scale Our goal is to serve internet service to every door to door Facebook page is not enough.

There are several possible areas for further development of a rooftop garden web project, such as:

**Adding new features:** The rooftop garden web project could be expanded to include additional features such as a plant identification tool, a weather forecasting tool, or an online marketplace for purchasing plants and gardening supplies.

**Improving user experience:** The user experience of the web application could be enhanced by improving the website's layout, navigation, and overall design. This could include adding new visual elements or optimizing the application for mobile devices.

**Integrating with other services:** The rooftop garden web project could be integrated with other services such as social media platforms or weather APIs to provide users with more information and functionality.

**Enhancing security:** The web application's security could be enhanced by implementing additional security measures such as two-factor authentication, encryption, or regular security audits.

**Optimizing performance:** The performance of the rooftop garden web project could be improved by optimizing the website's code, database queries, or server configuration.

**Adding multiple languages:** Adding support for multiple languages could help the rooftop garden web project reach a wider audience.

Overall, the scope for further developments of a rooftop garden web project is vast and depends on the needs of the project's audience and stakeholders. The project team should continue to assess user needs and market trends to identify opportunities for growth and improvement.

#### 6.2 Conclusion

Rooftop agriculture can complement other forms of urban agriculture because of its unique use of built-up space. Although the potential of rooftop agriculture to contribute to urban sustainability (including climate change adaptation) is recognised, its scale of implementation is still limited, both in terms of production area and intensity of individual rooftop gardens as well as in terms of total rooftop production and area at city level. There is a need to address legal and regulatory issues, technical and infrastructural requirements and adapt cultivation practices to specific growing conditions and safety and sustainability requirements. Innovative practices addressed in this book show pathways to further development of rooftop agriculture.

In conclusion, the rooftop garden web project is a valuable tool for homeowners, gardeners, and anyone interested in creating a green and sustainable living space. The project has



several features that allow users to design and maintain their own rooftop gardens, as well as connect with other users and share tips and advice.

The development of the rooftop garden web project involved the use of the MERN stack, which is a powerful and popular toolset for web application development. The project team used agile methodology to ensure that the project was delivered on time and met the needs of its intended audience.

The rooftop garden web project has several advantages, including its ease of use, flexibility, and scalability. It is accessible to users from all over the world, and can be customized to meet the needs of different users and contexts.

Looking ahead, there are many opportunities for further development and expansion of the rooftop garden web project, including the addition of new features, optimization of performance, and integration with other services. Overall, the rooftop garden web project is a valuable resource for anyone interested in creating a sustainable and green living space.

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