PRT583

PROCESS DEVELOPMENT METHODOLOGIES

Assessment:

Software Group Project

Topic:

Report on Mango Farm Web Application Development

Submitted by: GROUP 12

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Abstract

The web application system for Mango Farm is going to be revolutionary for management in mango farms as it is going to have a comprehensive web-based platform. With the inclusion of state-of-the-art systems inclusive of real-time weather tracking, employee administration tools and profit analysis features, the application offers a potential draw toward increasing productivity and managerial skills for farmers. This project practice relies on some methodological approaches like Agile and Scrum that valuate acting coordinately, being flexible, and having an evolving and iterative approach. JIRA, which is a non-centralized management tool, assists in proper allocation of tasks, tracking their progress, and promptly resolving issues. The team uses a continuous feedback loop and an iterative improvement in order to solve with good results the diversity of matters, getting therefore a product of good quality that satisfies the farmers of the mango farms, but also adheres to the project timetable and the set budgets. The application's release plan will include internal testing, beta testing, and the official launch phases, therefore, providing a smooth deployment and creating a long-term app relevance in an agro tech environment.

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Introduction

The Mango Farm Web Application project which aims to provide a comprehensive web-based solution dedicated to the management of mango farm operations by introducing a complex online platform, is on its way to changing the game. Creating automation software tailored to the farm boss's needs assumes simple tasks for the employer, such as employee management, weather monitoring and financial analysis. Integrating the current and next-level technologies like React for the front end and Node.js for the back end ensures the app has a smooth and user-intuitive interface. The utilization of on-the-spot data, and robust security systems alongside analytical ability will make the mango farm more profitable and productive.

Background

In the agricultural sector, which is the basis of global food security and stability of the economies, these days digital technologies are introduced to increase production efficiency and ecologic sustainability. Within these developments, web-based apps for farm management are becoming a major factor, being able to provide functions of precision farming that play a huge role in optimization of the operational efficiency and resource management (Sanjeevi *et al.*, 2020). This technical innovation development of an online management application for the mango farm operational purposes comes as an outstanding technique among these technological changes since the observation of worker measurement, weather trace, and financial management are the focus.

A major farming operation in the world of mango farming which is carried out in the tropical and subtropical regions of the world, by and large, is associated with some hurdles like; weather patterns, management of labour and market fluctuations. These issues require unique solutions that bring in actual time and analytics data. Digital tools have proved to be particularly effective in the context of agriculture, and wheat production (Lajoie-O'Malley *et al.*, 2020). Decision-making processes have been brought to a whole new level through their integration. If such a web app is used to manage mango farms, there is a possibility of operations being optimized, and reduced wastage can also be expected, thereby, helping increase profits.

The approached project operates at a border of theoretical agricultural and technology fields with a goal of creating a user-friendly, efficient, and secure platform for mango farm owners (Li *et al.*, 2023). This underlines a great possibility of digital technology towards changing

agriculture governance, which also are in line with diverse objectives striving for environment-sustainable farming & economic growth.

Market Analysis

In the farming area of agricultural technology which has seen the fastest development in recent years, the market for farm management software is gaining real momentum due to the ever-growing practical need for better farming processes and sustainability. The global farm management software market has great potential to develop steadily (Saiz-Rubio and Rovira-Más, 2020). This is a result of the growing popularity of precision farming technologies, the need for more real data monitoring and the use of AI and IoT technologies.

The part focused on software applications centred around particular farming activities, like mango farming, which is one of the leading and fast-growing niches (Okullo *et al.,* 2022). In order to counter the menace posed by a mango farm that is sensitive to climate, pest management and crop yield optimization, special plans are necessary. The market space for a mango farm management web application is essentially created by its ability to offer customized functions in weather forecasting, employee management, and financial analysis, which are all centred on the expectations of the mango farm owners.

Competition analysis indicates a fragmented market with both incumbents and start-ups putting together their toolsets. Generic farm management systems cannot meet the specific needs and requirements of a mango farm entrepreneur, however, a mango farm farm-focused application may stand out in the market as it offers a solution that is specially designed for the segment (Marblé, 2019). Sustainability and efficiency will continue to be more and more important in agriculture. That is why applications of this type are going to have increased demand. This tends to open the doors of such innovations to the market as an alternative to farm management.

Aim

The aim of this project is to develop an application that can track activities on the horticulture farm by adding and keeping records for irrigation, employees, pesticides, fertiliser, etc while allowing the system to remember and remind tasks that need to be done. The system should also be able to provide analytics and reports for future planning production for the farm owner.

Stakeholders

The Mango Farm Web Application project involves a diverse group of stakeholders, each playing distinct but crucial roles. At the centre is the farm owner/manager, the primary stakeholder whose decisions, workflow, and revenue are directly impacted by the application's functionality (Yadav, 2023). Another significant group comprises the farm employees, for whom the application aims to simplify work-related challenges such as communication, payroll, and task management, thereby enhancing their working environment and job satisfaction.

The development team consists of students working on the project as part of an assignment. This team includes front-end and back-end developers, UI/UX designers, and database architects, who collectively bring the concept of the platform to life by creating a user-friendly and functional application. Their technical expertise and creativity ensure that the project aligns with the needs of the users.

Agriculture technology experts and consultants also play a vital role by advising on best practices for farm management and addressing sustainability and emerging trends in agriculture. Their insights ensure that the application's developments are relevant and effective in tackling the unique challenges of mango farming.

Regulatory authorities and farming associations define the standards and rules that the application must meet to ensure data security, participant privacy, and environmental sustainability. Their approval can significantly influence the application's success by garnering public trust and acceptance.

All the stakeholders form an interconnected network that both influences and is influenced by the Mango Farm Web Application, potentially driving a significant transformation in farm management practices.

List of All Stakeholders:

- Farm Owners/Managers (Clients)
- Farm Employees
- Students (Developers)
- Professor (Advisor)
- End-users
- Local Community
- Regulatory Bodies
- Investors/Partners
- Agriculture Technology Experts and Consultants
- Farming Associations

Approaches to delivering the product to a client.

The process of deploying the Mango Farm Web Application to a client, using an Agile approach, is designed to ensure efficiency, usability, and ongoing support, all while keeping the client at the heart of the process.

We start with a client briefing session to understand your detailed requirements, followed by a live demonstration to showcase the app's features, functions, and user interface. This initial stage is crucial as it helps you get a feel for the technology and understand how it can make your farm operations smoother and more efficient.

Following this, we introduce a phased approach to implementation. In the first few iterations, we focus on simple but essential features like staff management and weather tracking. As you and your team become more comfortable, we gradually introduce more complex functionalities such as profit analysis and forecasting. This gradual rollout ensures that you can adapt to the new system without feeling overwhelmed.

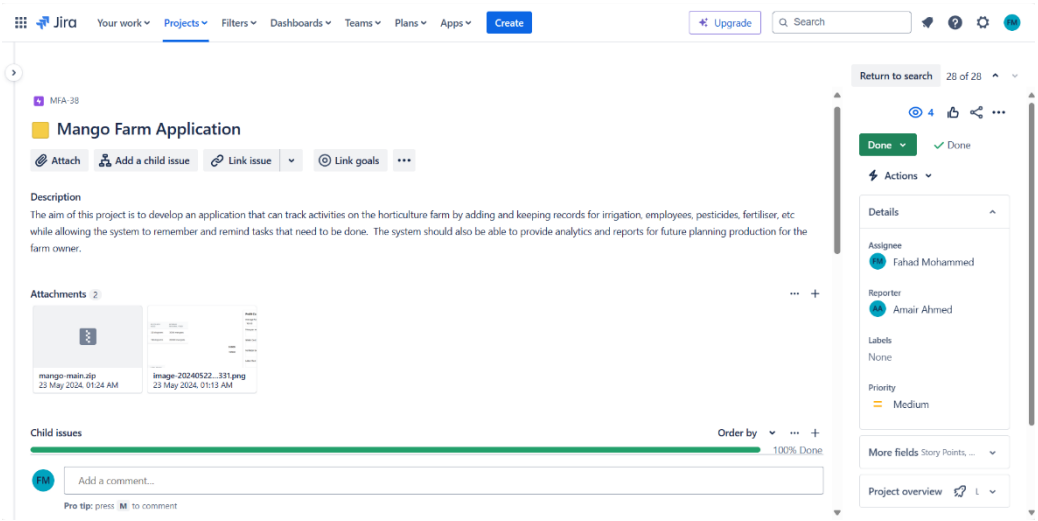
Education and training are also key components of our deployment strategy. We provide tailored training programs for different management levels within your farm administration, ensuring everyone knows how to use the new app effectively. Additionally, you'll have access to printed instructions, online user guides, and a support site or forum where you can find answers to common questions and troubleshoot issues.

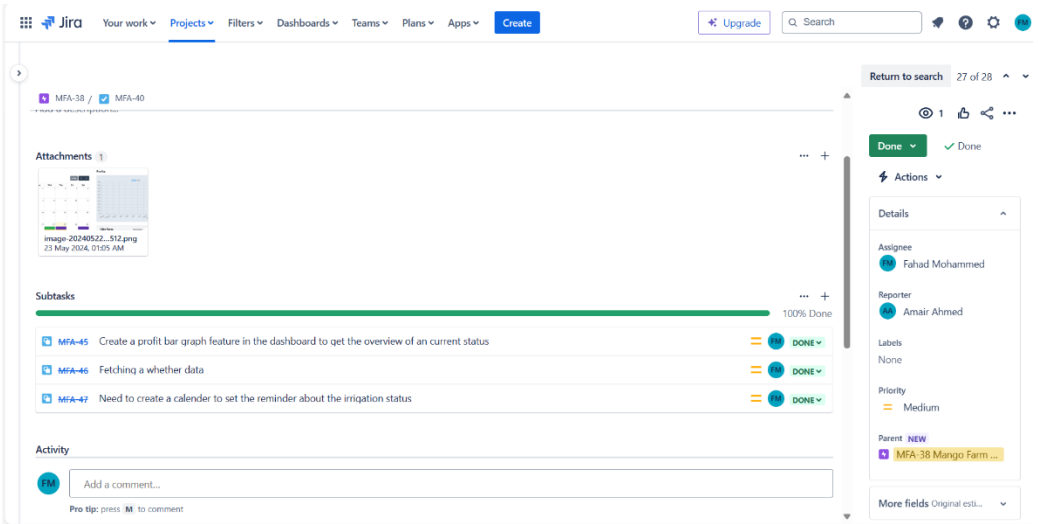
After the initial deployment, we continue to support you with regular technical service and maintenance. We listen to your feedback and experiences, using this input to make continuous improvements to the application. Regular updates based on your suggestions and the latest technological advancements ensure that the app remains relevant and effective over time.

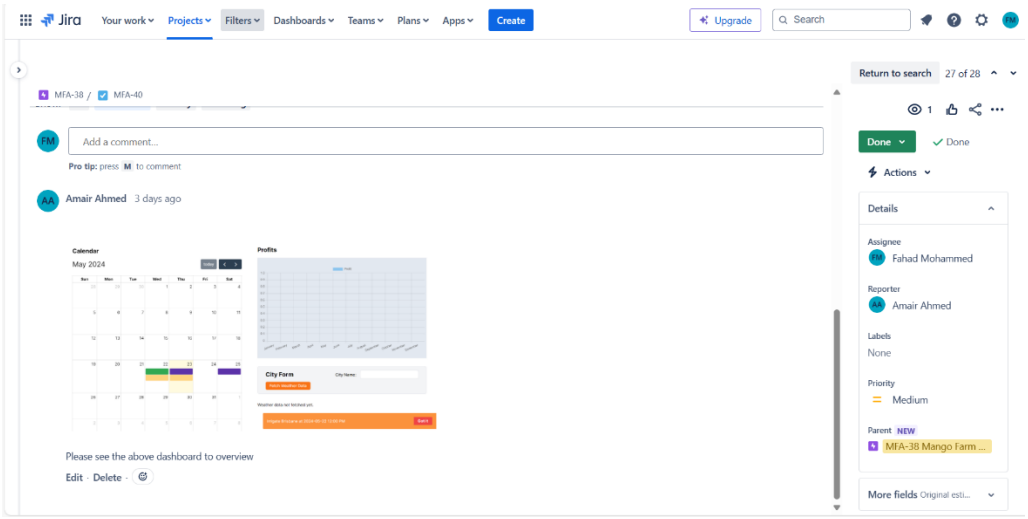
Our client-centric Agile approach focuses on iterative development, continuous feedback, and adaptation. This way, we ensure that you not only get a powerful tool for managing your farm but also a partner committed to your long-term success and satisfaction.

Methodology

The methodology to ensure the success of the Mango Farm Web Application project combines elements of agile methodology, adaptation, and an incremental approach. With JIRA as a project management tool, there will be no problem with task allocation, progress monitoring, and issue resolution since everything is handled efficiently (Ullah and Mehmood, 2020). Scrum daily stand-up meetings scatter communication and alignment between team members thus enabling on-time delivery of features while tackling any hindrances. Feedback loops mean there is constant iteration to correct the app improvement based on the feedback from users and their ongoing needs. Such an approach permits the team to circumvent hardships successfully and offer customers a superior product, following the plan, with budget and time constraints.



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27 of 28
Add a comment...
Pro tip: press M to comment
Amair Ahmed 3 days ago
Calendar
May 2024
Profits
City Form
Please see the above dashboard to overview
Edit · Delete
Done
Actions
Details
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Fahad Mohammed
Reporter
Amair Ahmed
Labels
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MFA-38 Mango Farm ...
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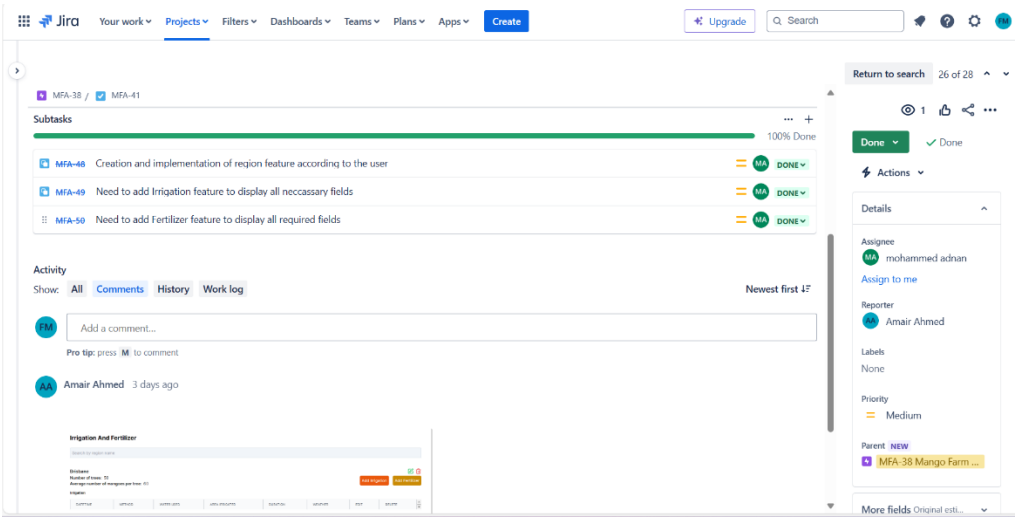
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26 of 28
Subtasks
100% Done
MFA-48 Creation and implementation of region feature according to the user
MFA-49 Need to add Irrigation feature to display all neccassary fields
MFA-50 Need to add Fertilizer feature to display all required fields
DONE
Activity
Show: All Comments History Work log
Newest first
Add a comment...
Pro tip: press M to comment
Amair Ahmed 3 days ago
Irrigation And Fertilizer
Done
Actions
Details
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Assign to me
Reporter
Amair Ahmed
Labels
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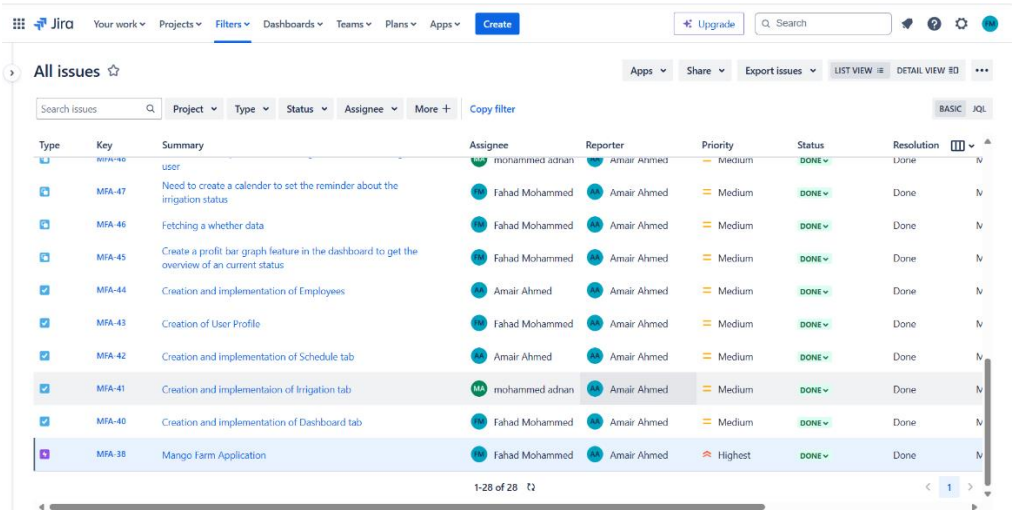
Parent NEW
MFA-38 Mango Farm ...
More fields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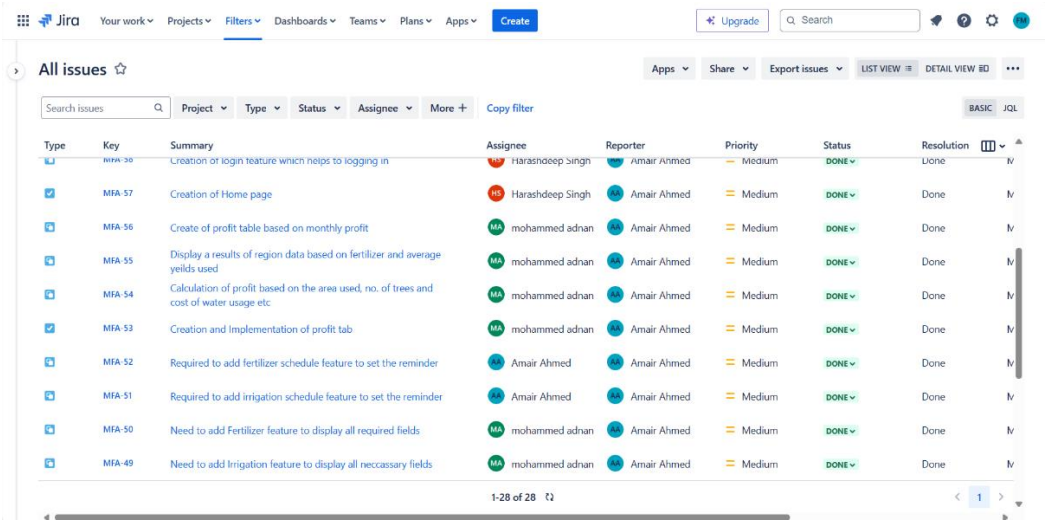
Search issues
Project
Type
Status
Assignee
More
Copy filter
BASIC
JQL
Type
Key
Summary
Assignee
Reporter
Priority
Status
Resolution
MFA-47 Need to create a calender to set the reminder about the irrigation status Fahad Mohammed Amair Ahmed Medium DONE Done
MFA-46 Fetching a whether data Fahad Mohammed Amair Ahmed Medium DONE Done
MFA-45 Create a profit bar graph feature in the dashboard to get the overview of an current status Fahad Mohammed Amair Ahmed Medium DONE Done
MFA-44 Creation and implementation of Employees Amair Ahmed Amair Ahmed Medium DONE Done
MFA-43 Creation of User Profile Fahad Mohammed Amair Ahmed Medium DONE Done
MFA-42 Creation and implementation of Schedule tab Amair Ahmed Amair Ahmed Medium DONE Done
MFA-41 Creation and implementaion of Irrigation tab mohammed adnan Amair Ahmed Medium DONE Done
MFA-40 Creation and implementation of Dashboard tab Fahad Mohammed Amair Ahmed Medium DONE Done
MFA-38 Mango Farm Application Fahad Mohammed Amair Ahmed Highest DONE Done
1-28 of 28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All issues
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DETAIL VIEW
Search issues
Project
Type
Status
Assignee
More
Copy filter
BASIC
JQL
Type
Key
Summary
Assignee
Reporter
Priority
Status
Resolution
MFA-57 Creation of Home page Harashdeep Singh Amair Ahmed Medium DONE Done
MFA-56 Create of profit table based on monthly profit mohammed adnan Amair Ahmed Medium DONE Done
MFA-55 Display a results of region data based on fertilizer and average yeilds used mohammed adnan Amair Ahmed Medium DONE Done
MFA-54 Calculation of profit based on the area used, no. of trees and cost of water usage etc mohammed adnan Amair Ahmed Medium DONE Done
MFA-53 Creation and Implementation of profit tab mohammed adnan Amair Ahmed Medium DONE Done
MFA-52 Required to add fertilizer schedule feature to set the reminder Amair Ahmed Amair Ahmed Medium DONE Done
MFA-51 Required to add irrigation schedule feature to set the reminder Amair Ahmed Amair Ahmed Medium DONE Done
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MFA-49 Need to add Irrigation feature to display all neccassary fields mohammed adnan Amair Ahmed Medium DONE Done
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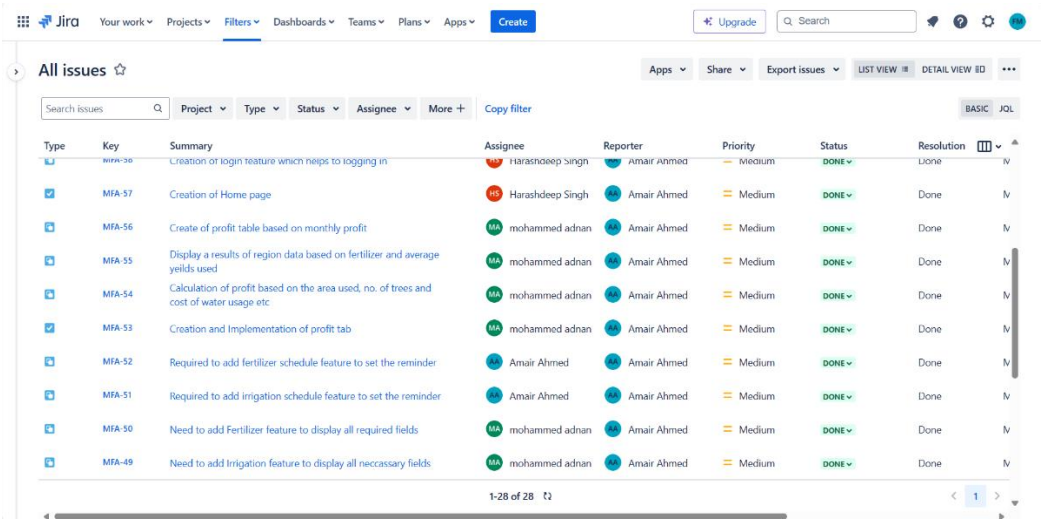
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Search issues
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Resolution
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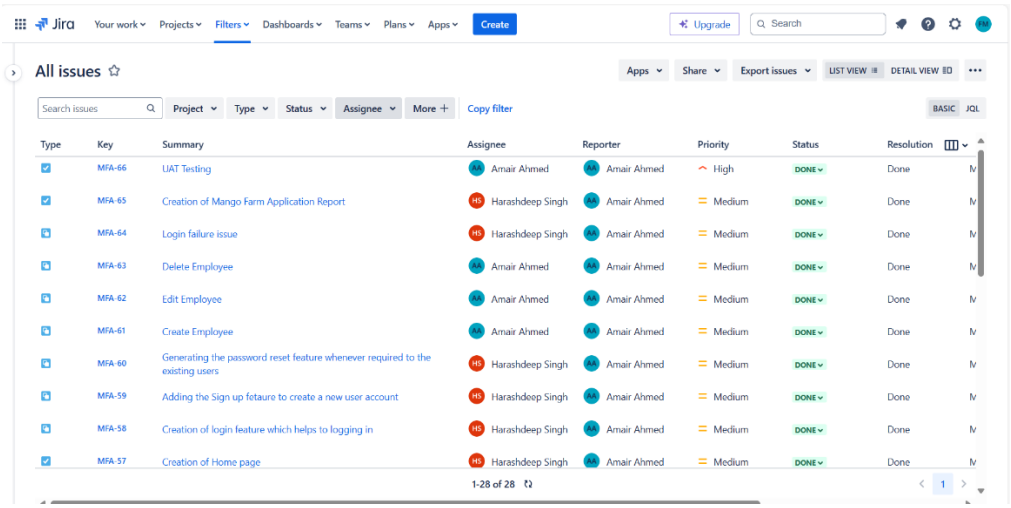
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Search issues
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Type
Status
Assignee
More
Copy filter
BASIC
JQL
Type
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Summary
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Reporter
Priority
Status
Resolution
MFA-66 UAT Testing Amair Ahmed Amair Ahmed High DONE Done
MFA-65 Creation of Mango Farm Application Report Harashdeep Singh Amair Ahmed Medium DONE Done
MFA-64 Login failure issue Harashdeep Singh Amair Ahmed Medium DONE Done
MFA-63 Delete Employee Amair Ahmed Amair Ahmed Medium DONE Done
MFA-62 Edit Employee Amair Ahmed Amair Ahmed Medium DONE Done
MFA-61 Create Employee Amair Ahmed Amair Ahmed Medium DONE Done
MFA-60 Generating the password reset feature whenever required to the existing users Harashdeep Singh Amair Ahmed Medium DONE Done
MFA-59 Adding the Sign up fetaure to create a new user account Harashdeep Singh Amair Ahmed Medium DONE Done
MFA-58 Creation of login feature which helps to logging in Harashdeep Singh Amair Ahmed Medium DONE Done
MFA-57 Creation of Home page Harashdeep Singh Amair Ahmed Medium DONE Done
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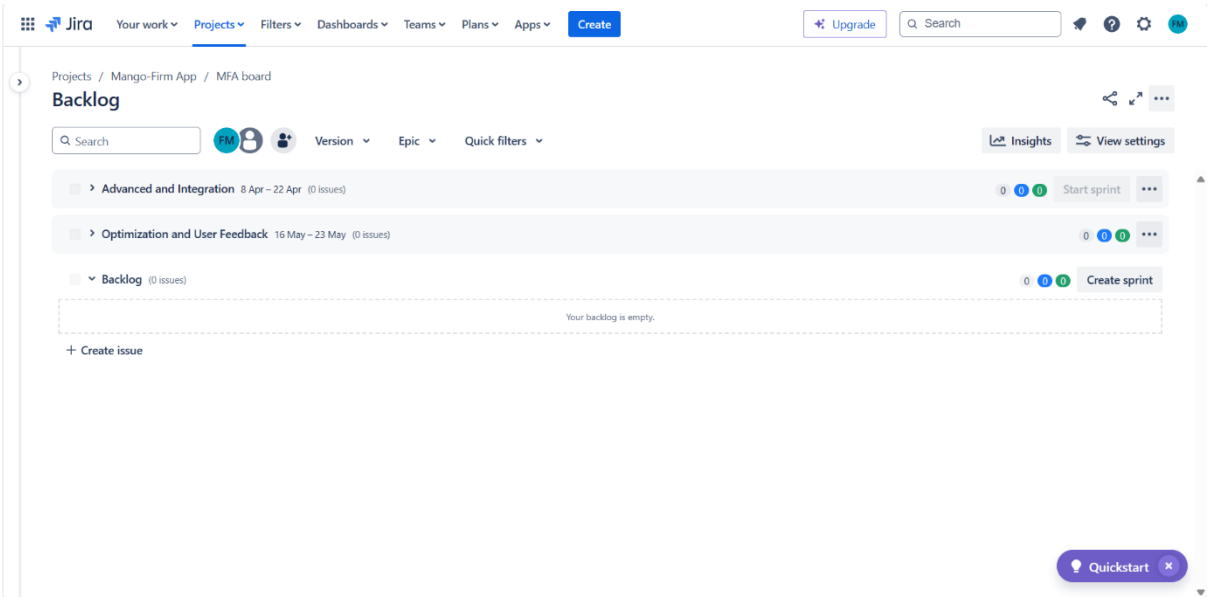
Iteration/Sprint	Activities Completed	Testing Process
Iteration 1	• Setup project environment • Define project requirements Design database schema • Develop a user authentication system	• Unit testing of the authentication system • Integration testing of database schema
Iteration 2	• Implement employee management module • Integrate weather API for real-time data • Design user interface for employee management	• Unit testing of different modules • Integration testing of weather API integration • User acceptance testing (UAT) for UI design
Iteration 3	• Develop a profit calculation feature • Design and implement profit display interface • Refactor code for improved performance	• Unit testing of profit calculation functionality • Integration testing of profit display interface • Performance testing of refactored code

Table 1: Iterations

Product Backlog

Mango Farm Web Application Product Backlog is a sequenced list of functions crucial to the program development and successful roll-out. Secure registration and login system for farm owner, including SSL safeguards and login restricting access to the application and only the owner is granted access (Arshad *et al.,* 2023). The next set of functions is concerned with handling employees' profiles, which include adding employees, viewing their details, and editing based on particular requirements. Furthermore, it has a precise payroll calculator that uses the number of hours worked and hourly rates to determine wages.



This picture shows the backlog screen of the project management software where new upcoming tasks can be listed and prioritized. It is currently empty and shows backlog with only new issue submitted. The checklist in the left navigation bar hints that the integrated system provides an interface for a series of planning and development functions. The weather display resolution is also critical in the backlog, with the embodiment of real-time weather data fetching, forecasting as well as storage of weather import history being the prerequisites for quality weather tracking. A viable part in farm planning and decision-making processes is adaptive irrigation. Building up the profit calculator tools, one can also easily illustrate profit and demonstrate its usage by various categories, further highlighting financial analysis and planning.

Next in line but certainly equally important is the creation of user-friendly interfaces (both desktop and mobile compatible) so that all users have the same experience while accessing the product on any device. The user interface should be universally accessible. Moreover, automation has the creation of visual elements which include bar graphs and pie charts for showing profits as well as a dedication to an elaborate and responsive system which is in place for the customers' support. The proposal of further development based on users' opinions, together with the incorporation of additional functionalities such as the pest management and yield optimizing services, is planned to be done in the next phases, which is a key part of the strategy of this project's agile development.

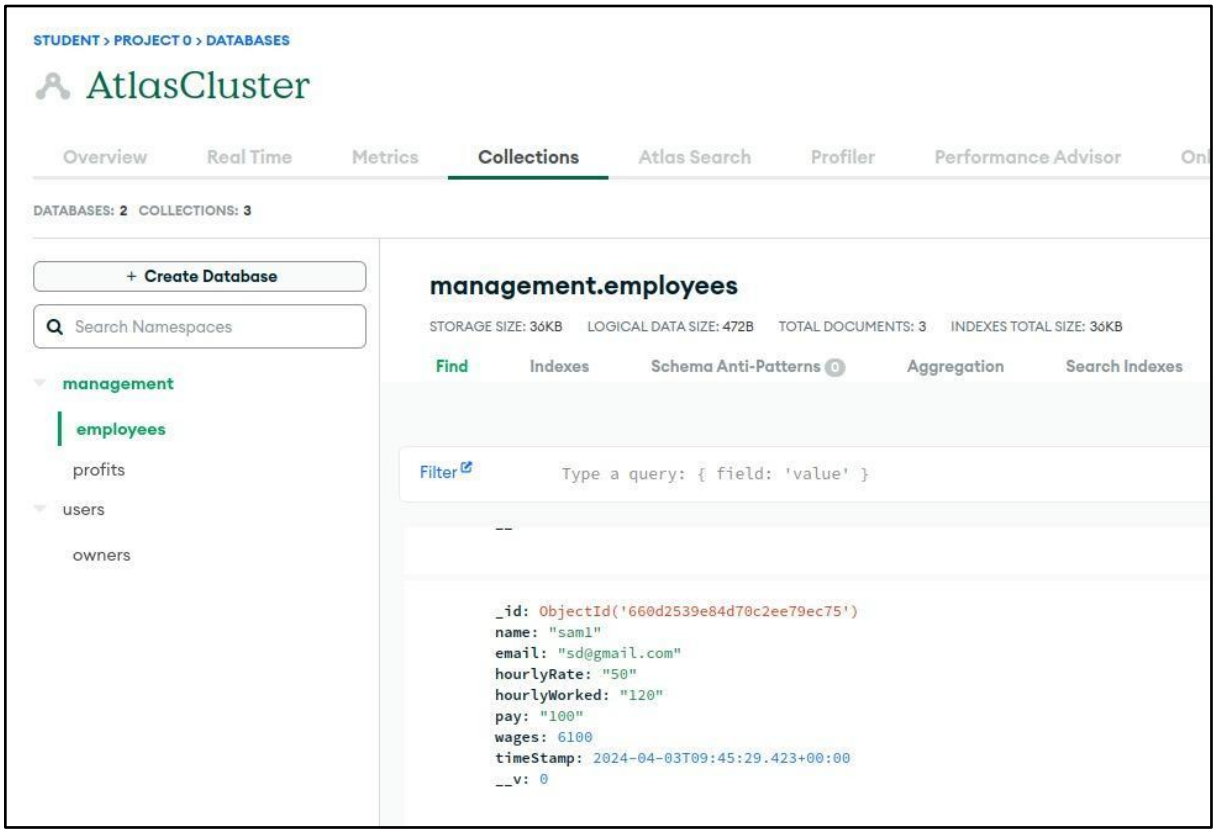
Release plan

The Mango Farm App Presenting Plan includes the following steps including the iterative process for a smooth deployment and improvement. Testing and verification of fundamental features, which comprises user authentication, employee management, and weather integration, constitutes the first step of this phase. In phase two we begin with a select group of users that beta test our product and allow us to collect feedback and address any issues that might come up. The last stage in the application development is the deployment to the intended recipients, along with well-organized training and support programs. The secondary stages will then continue to concentrate on cycle enhancements and user interface upgrades in accordance with the feedback received from consumers and the market directions, thus ensuring the continued relevance and sustainability of the app in the market of agricultural technology.

Release Plan	Description
Phase 1: Internal Testing and Validation	Conduct internal testing of core functionalities including user authentication, employee management, and weather integration. Validate database schema and ensure proper data handling. Address any issues or bugs identified during testing.
Phase 2: Testing with different Users	Invite select users, such as farm owners and employees, to participate in beta testing. Gather feedback on usability, functionality, and overall user experience. Identify and address any usability issues, bugs, or performance issues reported by beta testers.
Phase 3: Iterative Updates and Enhancements	Implement iterative updates and enhancements based on user feedback, emerging requirements, and market trends. Prioritize features and improvements based on user needs and business objectives. Continuously monitor and refine the application to meet evolving needs.

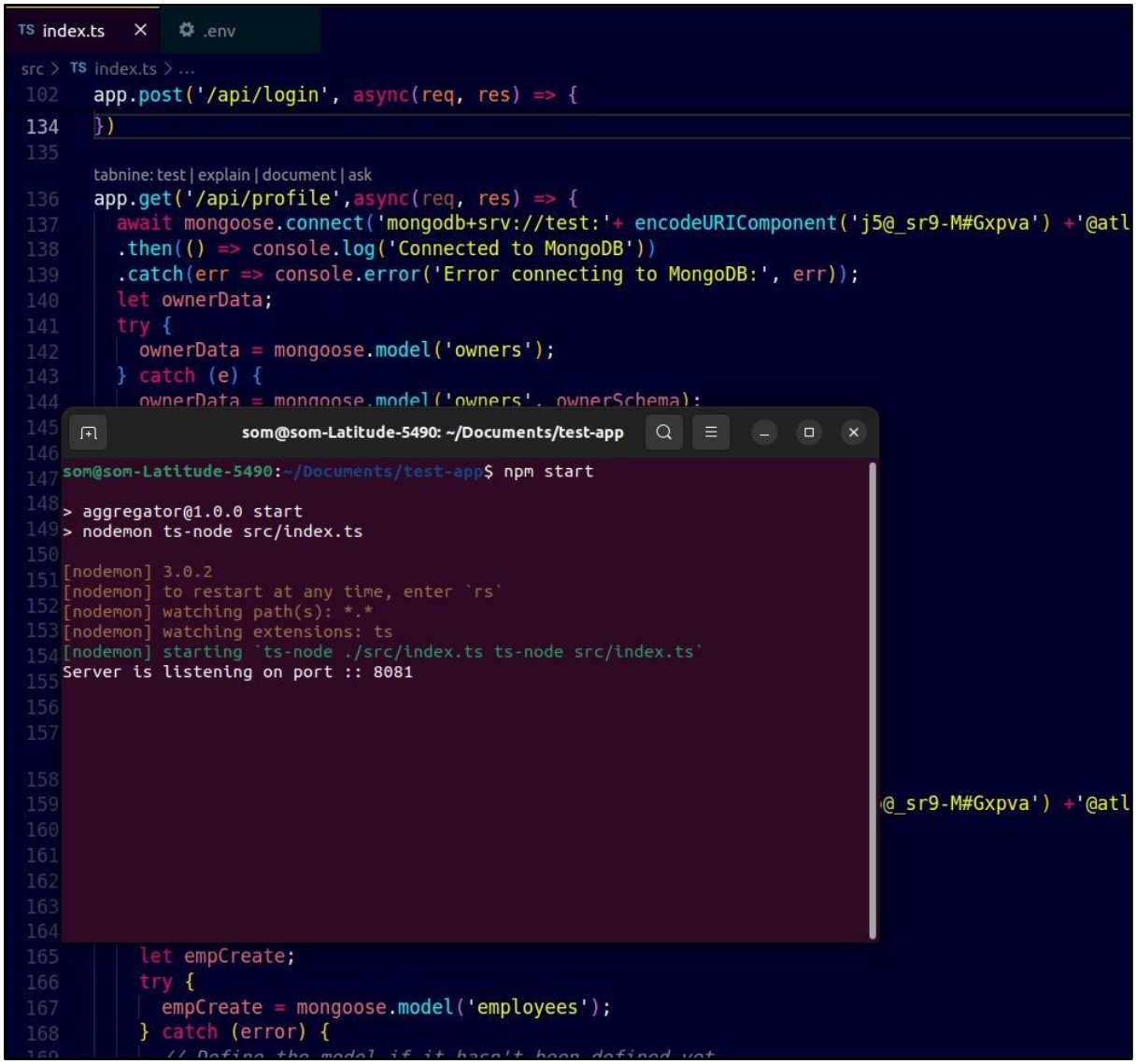
Table 2: Release Plan

Development and Testing



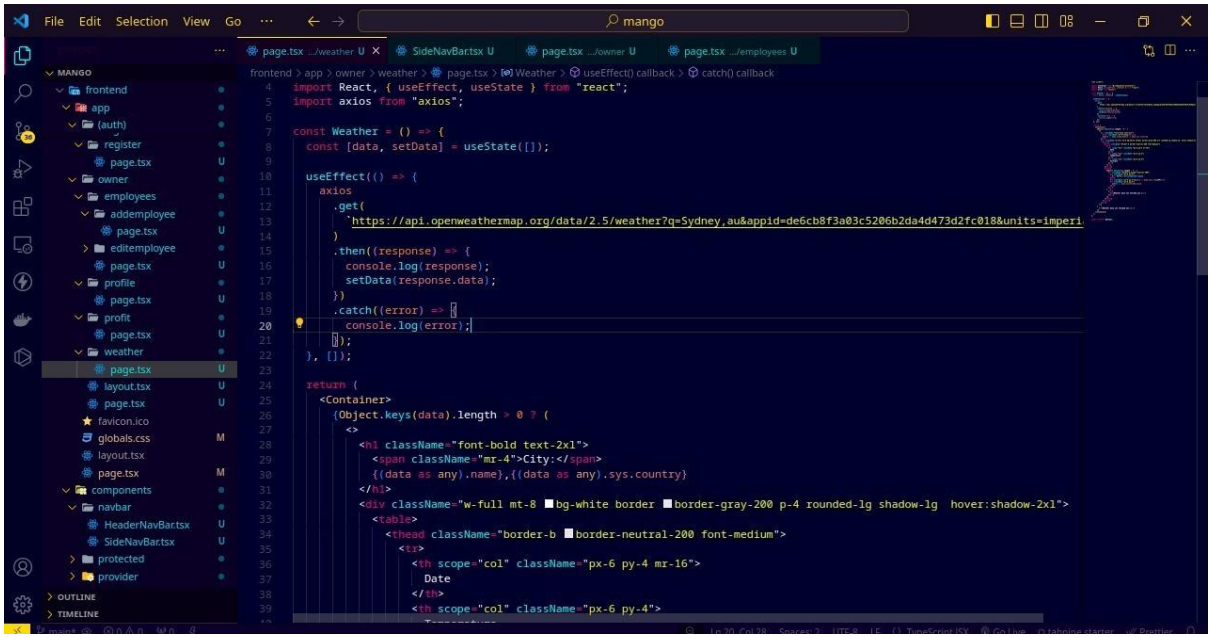
Mongo db Schemas

The figure presents the MongoDB Atlas interface where 'management' is a database name under which 'employees' is a collection. It illustrates the employee record with the database schema that has fields: ID, name, email, hours worked, hourly rate, pay, wages, and timestamp, which are being used to manage employee information.



Backend Server with API code

The below picture includes a TypeScript file in the Node.js project, featuring code connection to the MongoDB database via the Mongoose model. Furthermore, it was discovered that the terminal window shows that the server was started with Nodemon while it is watching for code and restarts automatically if any changes are made.

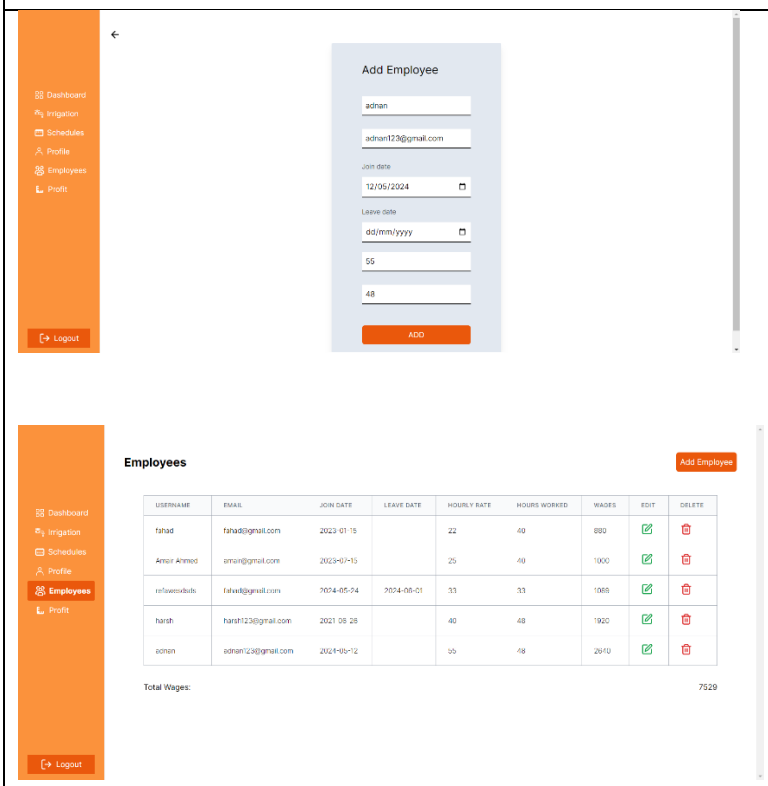


Weather Component Code Snippet in TypeScript with API Integration

The figure represents part of a TypeScript code snippet from a web development job that applies types to React projects. The component illustrates an operational element called weather that calls the OpenWeatherMap and obtains weather data. The response is stored in a variable named `data` in a console log and it is set to a state. There is a catch functioning as a console log if any error arises during an API call. The JSX output by the component only renders a table with weather data of that day if the data is valid.

Test Cases:

Test Case ID:
TC-EMP-001
Title:
Verify Employee Creation
Objective:
Ensure successful creation of a new employee record.
Pre-requisites:
Admin login required.
Access to Employee Management tab.
Status: Pass

Attachment:


Test Case ID:
TC-IRR-001
Title:
Verify Irrigation and Fertilizer Management Tab Functionality
Objective:
Ensure the irrigation and fertilizer management features allow for adding, editing, and deleting records accurately.
Pre-requisites:
1. User must be logged in with appropriate permissions.
2. Access to the "Irrigation and Fertilizer" management tab.
The application should allow adding new irrigation and fertilizer records.
The added records should display correctly in the list.
Editing a record should update the details accurately.

Deleting a record should remove it from the list.
Status: Pass
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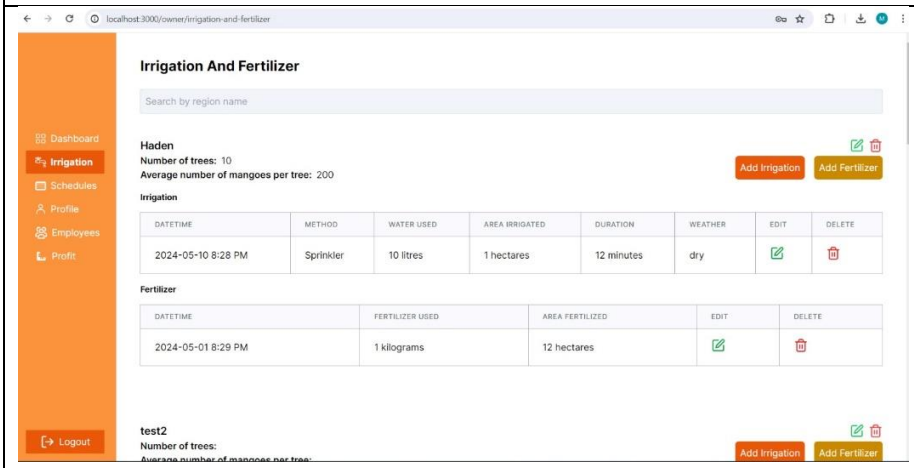

Test Case ID:
TC-PROFIT-001
Title:
Verify Profit Calculation Feature
Objective:
Ensure the profit calculation feature accurately computes total revenue, total costs, and total profit based on input data.
Pre-requisites:
User must be logged in with appropriate permissions.
Access to the "Profit" tab.
Expected Result:
The system should accurately calculate and display the total revenue, total costs, and total profit based on the data entered in the input fields.
The calculation results should be displayed in the "Profit Table" section.
Actual Result:
Successfully able to calculate profits and save them
Status:
Pass

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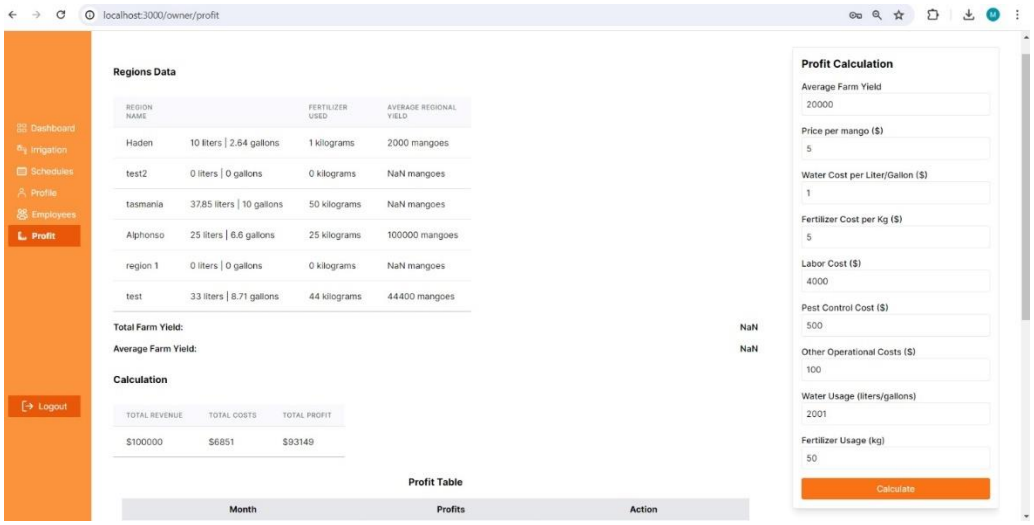
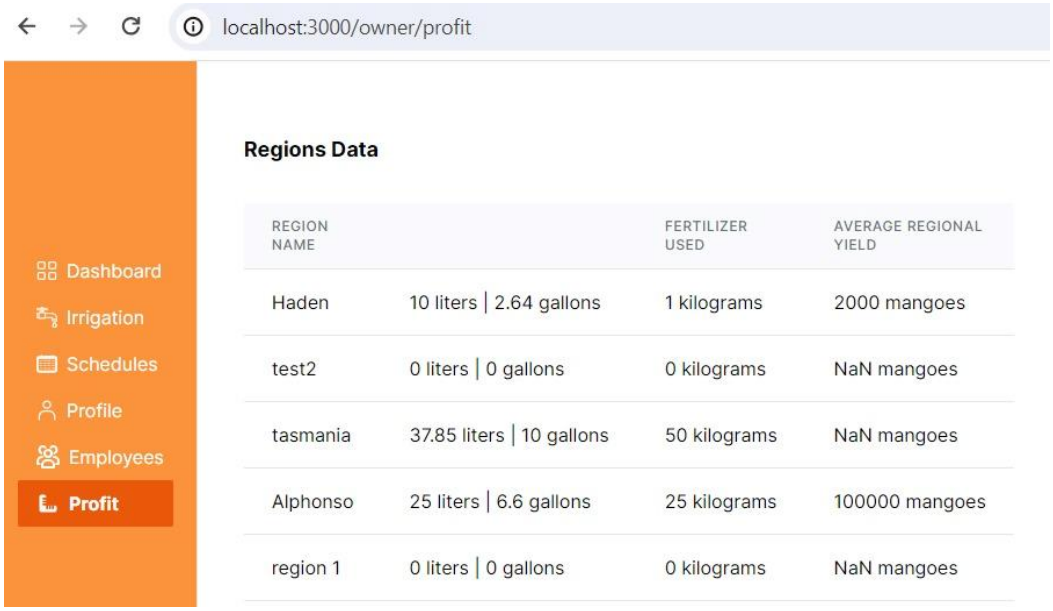
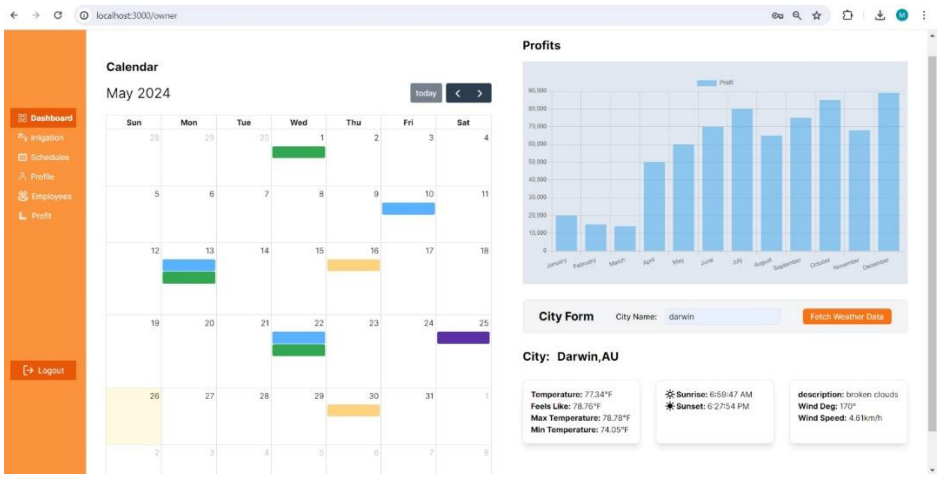
   

Test Case: Verify Weather Data Fetch Functionality
Test Case ID:
TC-WEATHER-001
Title:
Verify Weather Data Fetch Feature
Objective:
Ensure the application accurately fetches and displays weather data for a specified city.
Pre-requisites:
User must be logged in with appropriate permissions.
Access to the "Dashboard" tab.

Expected Result:
The system should successfully fetch and display the current weather data for the specified city.
The weather data should include temperature, feels like temperature, max and min temperatures, sunrise and sunset times, weather description, wind degree, and wind speed.
Actual Result:
Successfully fetched the weather data from all over the world using state name.
Status:
Pass
Attachment:



Conclusion

The implementation of the Mango Farm Web Application signifies a considerable step towards mechanization and improvement of mango farms. The app incorporates processes and also brings in advanced technologies, like live weather tracking, management of employees and profit analysis, which are bound to transform work processes and decision-making processes for the farm owners. The application's adherence to ethical rules and professional standards provides reliable, secure and private transmission system, thereby building trust among users. In moving ahead, it will be the frequent enhancements and periodic iterations that will evolve the application to an extent where it can command its place among the other successful applications in the agriculture technology space.

Lesson learnt

The experience of being involved in the Mango Farm Web Application project has taught us some lessons that one cannot dispense with. An important conclusion is gathered here; the knowledge the target user/group needs is, in this case, the farm owner and the employees, this allows for the application to be meaningful. It had an impact on the integration of actual data, in the case of weather data, to stimulate better judgment in agricultural practices. The project also shed light on the need for an adaptive development approach which is characterized by the flexibility to change and incorporation of the adjustments after feedback collected during the process. Also, it supported the role of a strong reference sign system in safeguarding secret agricultural information, thus making the application more secure and dependable. These perceptions cumulatively contribute to a deeper appreciation of web-based or even other online solutions development in the agri-food sectors.

Ethical consideration

Imparting the utmost importance of Ethical standards during the course of the Mango Farm Web App project, the entire team was guided and followed the ethical principles as defined by recognized IT professional bodies, such as confidentiality, data integrity, respect for privacy, and professional competence. The confidentiality element was protected by installing strict data protection meant to shield the owner of the farm and the employees' data. Fairness was assured by unambiguously informing the public about the features and deficiencies of the app. Privacy concern was taken care of by implementing sophisticated security systems which were used for the purpose of protecting user information. First, the team implemented constant upgrading based on the technology advancement and the latest methods of doing its job professionally and securely. The whole listing of these rules and regulations gives evidence of our commitment to the ethical values that are the cornerstone of the profession, enabling us to gain the trust of our clients.

Further work

The production of the Mango Farm Web Application has been very detailed with many of the elements such as function and the user experience itself being strengthened. Further moving forward, the inclusion of the most advanced predictive analytics for yield and health of the crops. The use of a machine learning algorithm to assess historical data to finally give out actionable insights for managing the farm operation could be considered. In this regard, developing the tracking weather functionality that will show the pest and disease forecast models based on climatic conditions can give us a huge boost in making our crop management practices more effective and efficient. Moreover, by allowing for a mix of IoT sensors for real-time water and soil temperature control, it is possible to put in place an automated system of irrigation control which improves productivity and resource utilization in the sector.

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