Revolutionizing Farming: Mobile Application for Seamless Manure Distribution among Farmers

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ABSTRACT
Agriculture is the most basic kind of human activity, encompassing both crop production and animal domestication [1]. Efficient farming systems can fully exploit and utilize limited resources, promote the all-round development of agriculture, and ensure the continuous increase of crop production [2]. In the world of agriculture, manure is needed to support the development of plants. Manure must be well distributed so that it is received by farmers on time and as needed. This research utilizes technology to create an application that can help farmers. Smartphone technology and related smartphone apps are a particular form of innovation which has seen increased focus in the farming sector in recent years [3]. Smartphone applications have been developed using Dart programming languange. The social networking opportunities in this app can help foster sustainable relationships among local farmers and manure sellers. Mobile technology offers a promising approach to improve [4] manure distribution between local farmers and sellers and should be explored further.

General Terms
Farmers, Android, Flutter, Dart, PHP

Keywords
Mobile Application, Distribution, Manure, Farmers

1. INTRODUCTION
The agricultural sector in the developing countries is mainly comprised by smallholder farmers and constitutes the backbone of the local economy [5]. Many small farmers experience difficulties in the manure distribution process. To increase the resilience of farmers' livelihood systems, a detailed knowledge of adaptation strategies in the face of the impacts [6] of technological development is required. For this reason, making this manure ordering application will be very useful for farmers in the distribution of manure.

In the world of agriculture, farmers often have difficulty getting manure so that plants that are late in being given manure will take a long time to grow and will even be easily attacked by pests so that the plants die in vain. If farmers do not get manure quickly, the use of manure becomes irregular which is certainly ineffective and time consuming.

Quality attributes are properties of the system that stakeholders use to assess its quality [7]. The users of this application are farmers and breeders, the role of a breeder is to produce manure needed by farmers. Farmers need the manure by placing an order through the application, in the application of this application the function of each menu and appearance of this application is designed so that farmers are easy to understand and use the application at any time. Basically, the majority of farmers do not have qualified devices such as computers or laptops, therefore smartphone mobile applications are very important to support the functions and appearance that have been designed [8].

2. RESEARCH METHOD
This research is designed and continuously developed to perform the functions of its use. The system that works on the application can be visualized in the architecture diagram in Figure 1.

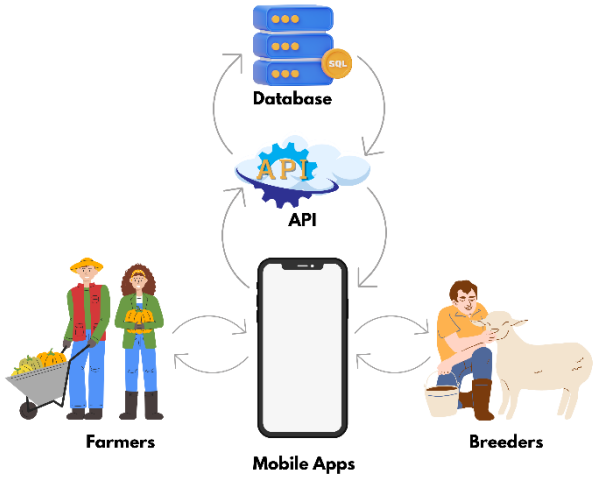


Fig 1: Architecture Diagram

This system will be used by farmers and breeders. The farmer can manage the data in the mobile application as an admin while the farmer acts as a user. The admin and user interfaces are also different because they have different functions, the data in the mobile application can be stored in the database through the Application Programming Interface (API). Application Programming Interface (API) itself is an interface that can connect one application with another. They define sets of rules and specifications for software programs to interact with [9]. MySQL is a relational database server that supports the well-known SQL (Structured Query Language) database language [10]. MySQL Relational Database is used to organize the data relationship model in the system.

2.1 Data Collection Procedure
Data was obtained through 3 stages, namely the observation stage, the literature study stage, and the interview stage.

2.1.1 Observation
Researchers observed and recorded every situation observed directly on agricultural land in Temanggung city to obtain information related to the object of research. Researchers conducted a survey of agricultural land and at that time the

process of watering the liquid that serves to protect rice and chili plants was being carried out.

2.1.2 Literature Study

Researchers collected data through literature such as journals, books, and official documentation on the website concerned. Serves to explore the basic theories and concepts that have been found by previous researchers and follow the development of research in agriculture in order to get a broader orientation regarding the chosen topic, namely the E-Farming application for ordering fertilizers and plant information.

2.1.3 Interview

Researchers conducted questions and answers with the main source, namely Mr. Nur Hadi on March 1, 2022 to obtain the required information or primary data related to the object of research. The questions asked about plant care, planting and harvesting procedures, the use of manure, the type and number of plants planted and the crops that will then be sold or consumed by themselves.

2.2 System Design Logic

Logic design is a sketch of the data processing process and a description of the system presented through Flowchart, Use Case Diagram, and Activity Diagram. In Figure 2 Flowchart below is the system flow of the E-Farming application, to instill quality in published clinical research, reporting guidelines, consisting of checklists and flowcharts, were developed to protect against reporting poorly designed research, and researchers should be aware of the available instruments and their appropriate use [11].

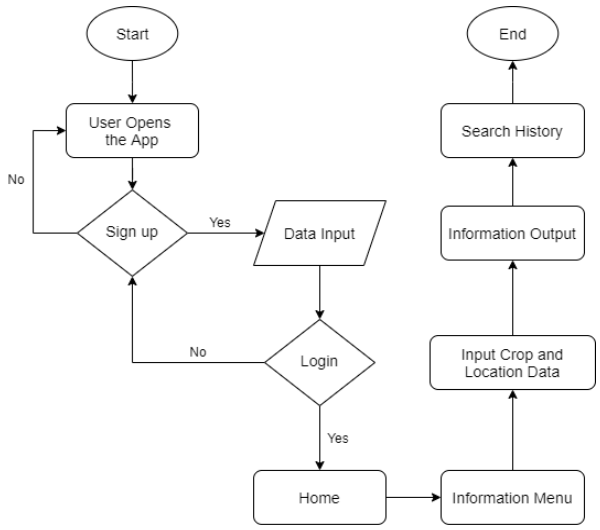


Fig 2: Flowchart

In the Flowchart, the user first opens the application then the user can register a new account by entering the required data. If so, the user can enter the application and will be displayed an initial page that contains several information menus such as the features available in the application. Then the user can choose one of these features and if so, the system will process input from the user which will display the output requested by the user. Users can also see their booking history while using the application. Unified Modeling Language (UML) is a widely used high level modeling language for object-oriented design [12] and the The model, implemented in the Unified Modeling Language, was grounded on international guidelines and refined following the clinical pathway adopted at local level by a specialized rehabilitation centre [13].
In Figure 3 Use Case Diagram there are two actors, namely farmers as users and admins as system managers, for these users can access the registration menu, login, see the homepage of the information and ordering menu, profile, get the desired information output and exit menu.

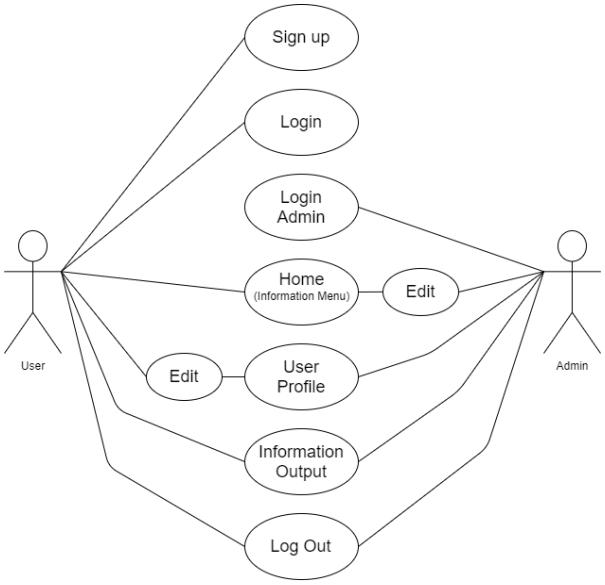


Fig 3: Use Case Diagram

The relationship between the user, system and admin is the flow of the user's process of doing activities with the system which then responds to the input requested by the user and is processed by the system. After being approved by the admin, it is depicted in an Activity Diagram in Figure 4.

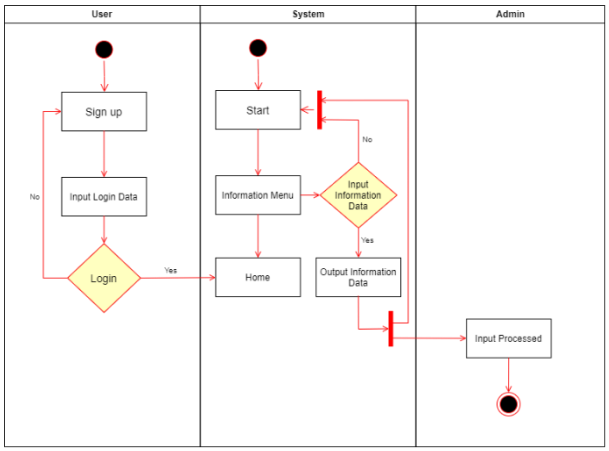


Fig 4: Activity Diagram

2.3 Physical Design

The relationship between tables is depicted with lines that are interconnected between each table. The line is the relationship between the primary key and foreign key of the table. The table defines the database that will be processed in the system which includes the structure of the tables used. However, the relational database requires ample storage space and has low data retrieval and query efficiency [14].

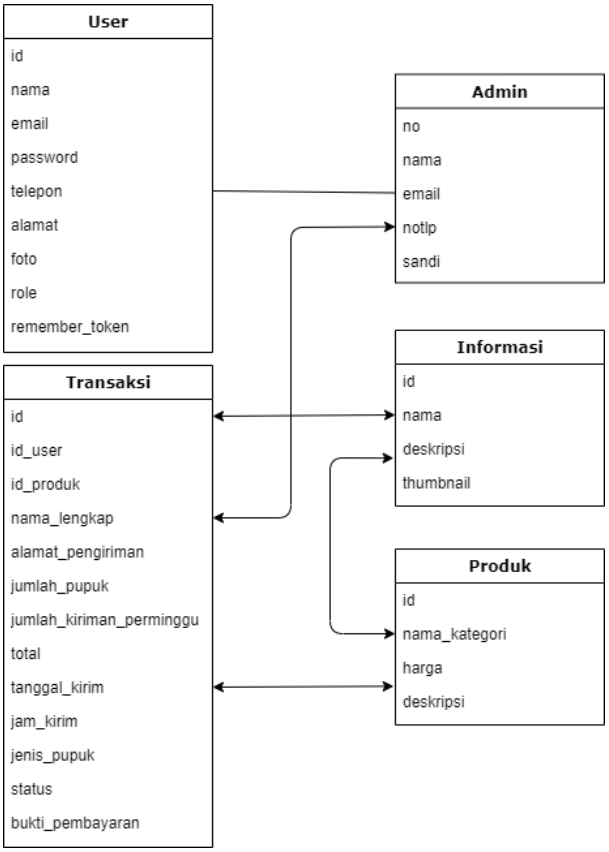
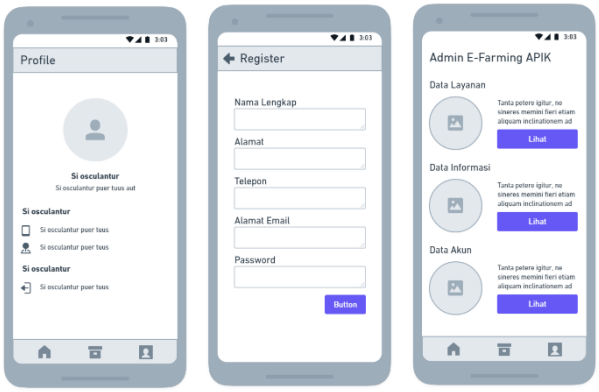


Fig 5: Table Relationship

2.4 Interface Design

The application interface design was developed using Figma and Whimsical to create low fidelity. The interface design used by the admin in Figure 6 has several views. The views to be used are designed as best as possible to aid user convenience.



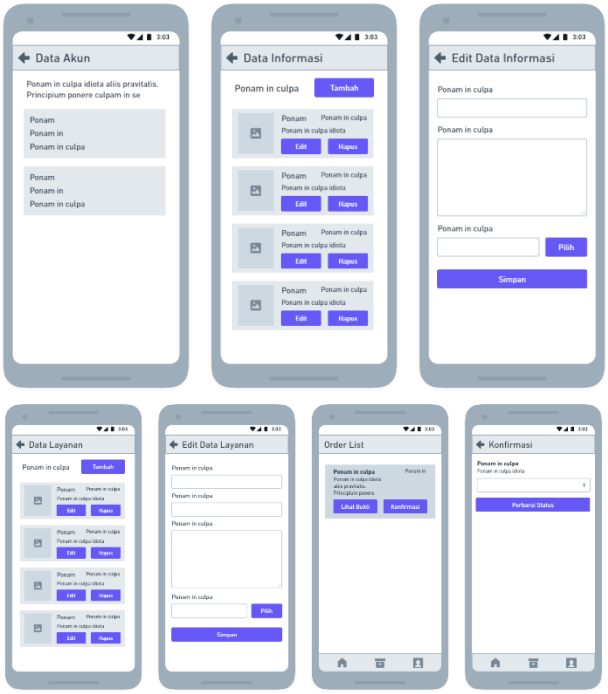
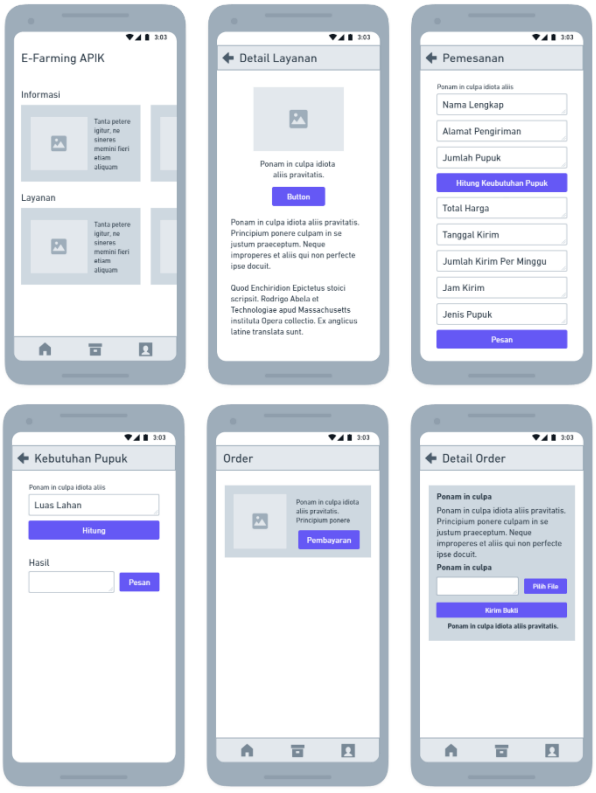


Fig 6: Wireframes Mobile Apps for Admin

The interface design used by the user in Figure 7 has several views. Users can get service information, bookings, and payments.



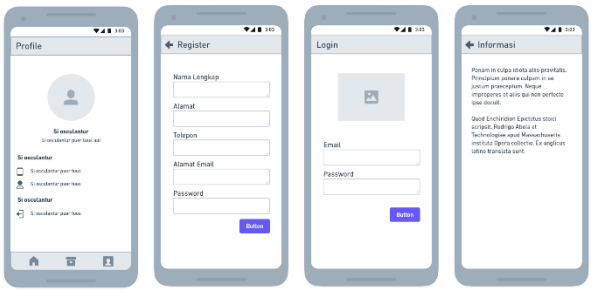


Fig 7: Wireframes Mobile Apps for Users

3. RESULT AND DISCUSSION

3.1 Assumptions

Application users are farmers who own and can operate a smartphone. Farmers can place orders and get information about plant care. Farmers who have made an order and payment will get proof of payment. Admin will process manure delivery according to order details.

3.2 Hypothesis

This hypothesis is based on assumptions obtained and proven in the research stage. This research has a hypothesis that "This E-Farming Application can make it easier for farmers to distribute the optimal use of manure by ordering manure using the application".

3.3 Feature

There are features available on the system that are made to facilitate the admin in serving farmers in placing orders for manure. The following is a table that contains parts of the E-Farming application.

Table 1. List of Feature

No	Actor	Description
1.	Farmers	login page, register page, profile page, home page, information page, service page, order page, manure needs page, order history page, and order details page.
2.	Breeder	admin login page, admin register page, admin profile page, admin home page, account data page, information data page, information data edit page, service data page, service data edit page, order list page, and confirmation page.

3.4 Run an Experiment

After the wireframe is successfully created, the next step is to do the coding. The application is made using the dart programming language and the flutter framework, then also uses the PHP programming language and the laravel framework as a connection to connect the application with the database. The farmers also tested the application by creating a new account and then placing an order. After the demo and preview session, a question and answer session was held to get feedback and suggestions.

3.5 Implementations

The implementation of the system that has been designed and completed is coded in the form of a mobile application. The following is the design of the application.

3.5.1 Login and Register Page

The login page has an email and password data input form according to the data that has been inputted by the user during registration. Then on the register page the user fills in the data according to the form that has been provided to create an account and can enter the home page.

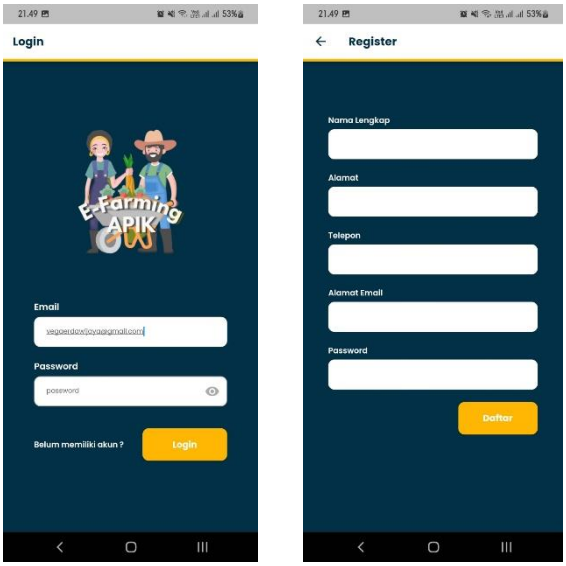


Fig 8: Login and Register Page

3.5.2 Profile and Home Page

The profile page displays user and admin account data that has previously registered and logged in. there is a user account photo, name, and email. Then other information such as phone number and address.

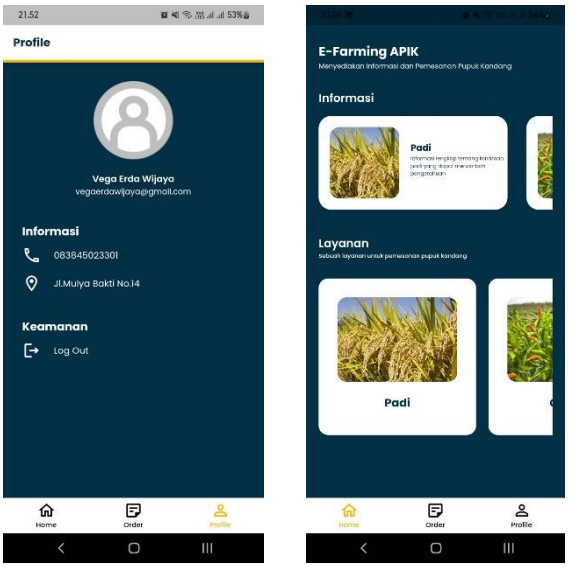


Fig 9: Profile and Home Page

The home page displays the main features, namely information and services. All information about plants will be displayed on the feature then on the service feature there is also an explanation of plant care and can continue ordering manure. On the menu bar below there is a home icon, order history icon, and profile icon.

3.5.3 Information and Service Page

The information page contains information about plants as knowledge. On the service page there is information on how to

manage the selected plants which can then be continued by ordering manure on the order now button.

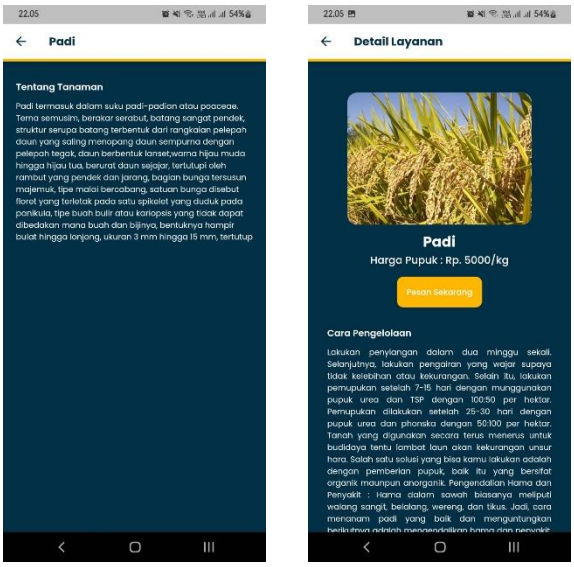


Fig 10: Information and Service Page

3.5.4 Order and Manure Needs Page

The order page displays a data input form by users who want to order manure. The data that has been entered by the user will be saved and then processed as order details. Then on the manure needs page functions for users if they want to order manure by adjusting the land area they have in order to get the results, namely the appropriate amount of manure.

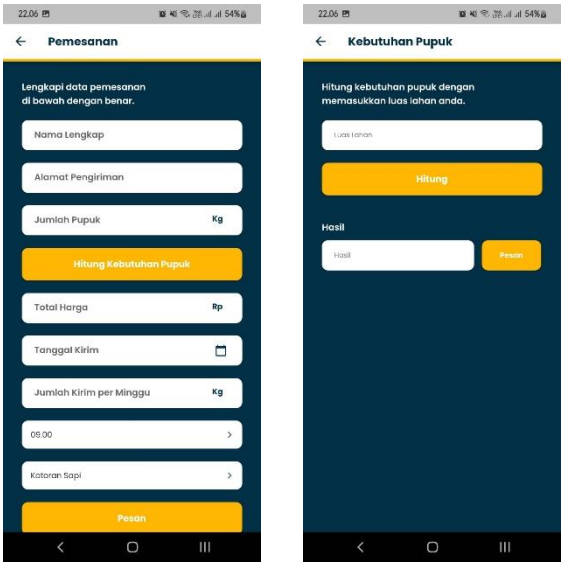


Fig 11: Order and Manure Needs Page

3.5.5 Order History and Order Details Page

The order history page is used to display the order history that has been made by the user. There is data that has been entered then the payment button to continue the order process. Then on the order details page displays complete order details. Users can make payments by uploading the proof of transfer that has been provided by clicking send proof then the admin will process the order.

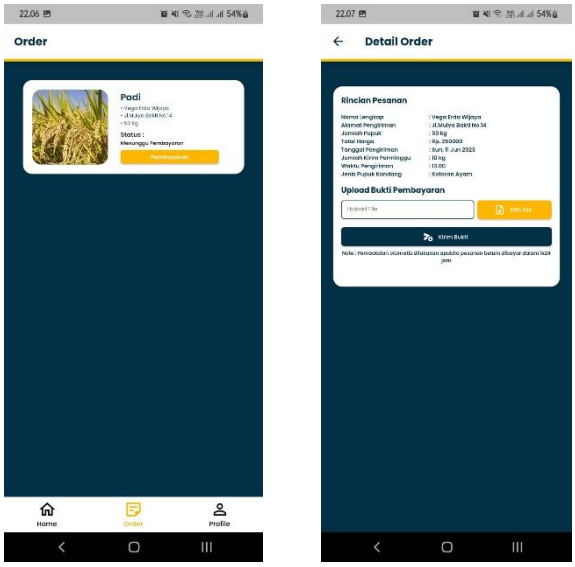


Fig 12: Order History and Order Details Page

3.5.6 Admin Home and Account Data Page

The admin home page is the admin's main display for managing data in each feature or user account. There are service data, information data, and account data menus. On the account data page displays a recap of the list of accounts that have been registered in the E-Farming application, each account created will enter the account data display.

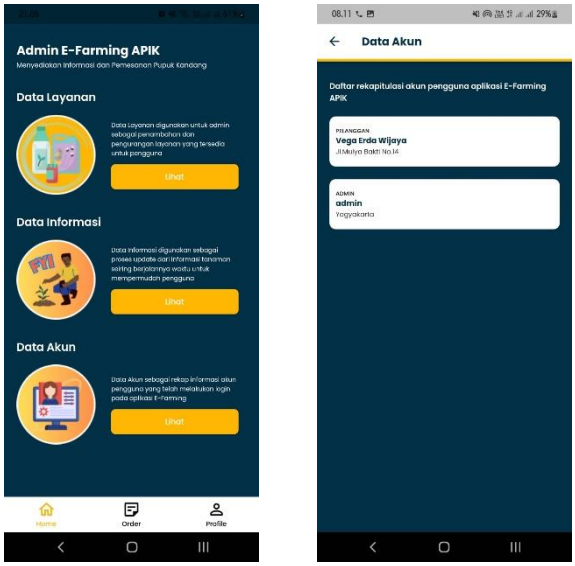


Fig 13: Admin Home and Account Data Page

3.5.7 Information Data and Information Data Edit Page

The information data page is used to store some plant data in the application. Admin manages the data to update or delete information data. On the edit information data page, the admin can change the contents of the data such as photos, names, descriptions and then save them.

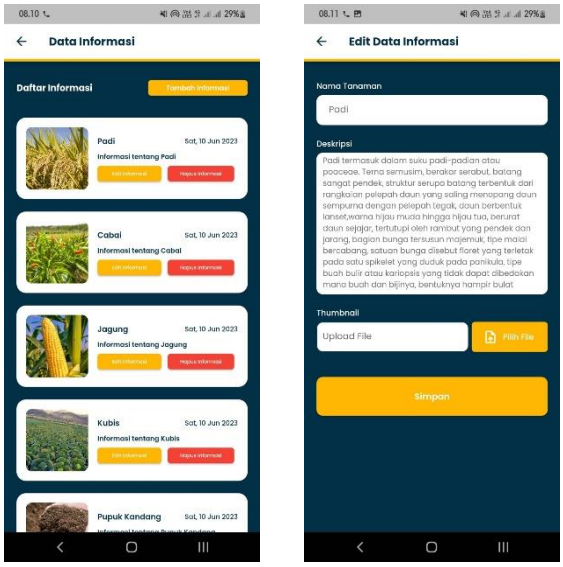


Fig 14: Information Data and Information Data Edit Page

3.5.8 Service Data and Service Data Edit Page

The service data page is used to store some service data in the application. Admins can manage data to update or delete service data. On the edit information data page, the admin can change the contents of the data such as photos, names, descriptions and then save them.

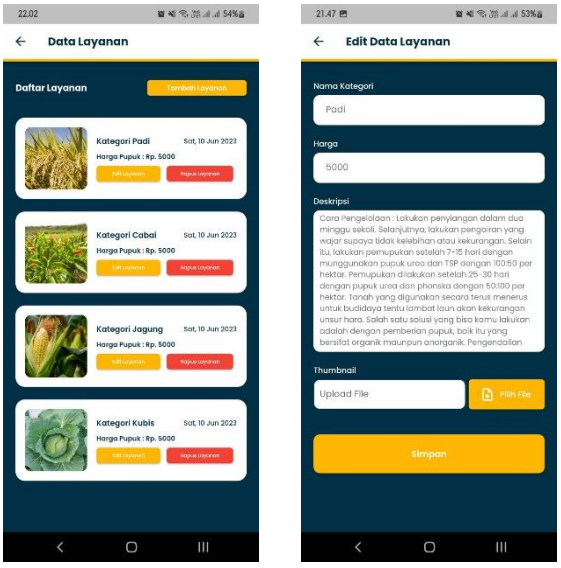


Fig 15: Service Data and Service Data Edit Page

3.5.9 Order List and Confirmation Page

The order list page is used by the admin to manage orders from incoming users. Every order placed by the user will be entered into the admin's order list for confirmation. On the confirmation page, the admin can see proof of uploading payment first and if it has been fulfilled, the admin can change the order status to confirmed and the order status will also be displayed on the user page.

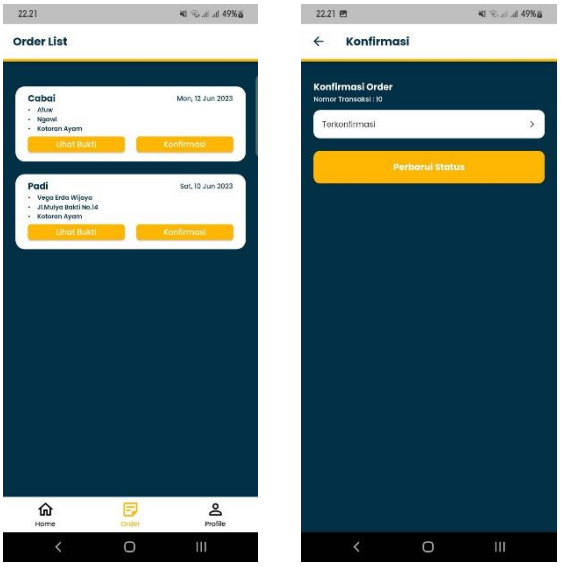


Fig 16: Order List and Confirmation Page

3.6 Discussion of Result

The next stage will be testing or testing which aims to ensure that every function in the system can run as desired. The test used at this stage is black box testing to test each user activity in the application that is expected in accordance with expectations. Although tools with a black-box approach show promising results in error detection, due to the exclusive use of the API specification, they present major limitations when performing other types of tests, such as tests for: 1) validation of the response and its content, 2) workflows between different endpoints, 3) load and latency, and 4) identification of security vulnerabilities [15].

Table 2. Black Box Testing

Testing Activities	Expected realization	Testing Results	Conclusion
Registration	Farmers can create a new account	Can login after successful entering the registered email and password	Accepted
Display request data	Request data appears	Display user request data	Accepted
Order data input	Can enter data according to the selected features	Successfully entered farm data	Accepted
Upload proof of payment	Uploaded correctly	Proof of payment can be viewed	Accepted

Display the transaction list	Display a list of transactions that have been made	Display the transaction list	Accepted
Accessing service features	Display detailed information	Display available feature data service type	Accepted
Status confirmation	Status update	Status update running	Accepted

In this research, farmers and breeders are required as users. Both have been tested in using the application. Feature interaction set in black box model detected by high-dimensional model representation-based method [16]. Optimal manure treatment aimed at usage as agricultural soil fertilizers is a prerequisite ecological pollution control strategy [17]. The concept of mobile-based applications for patients and admins is able to display data changes in real time. Model checker checks whether a given system model (such as a transition system) satisfies a given specification [18]. Based on black box testing, that "Revolutionizing Farming: Mobile Application for Seamless Manure Distribution among Farmers" can be **Accepted**. It can be concluded that users can use the application well and understand the design applied to the application.

4. CONCLUSION

Based on research on the "Revolutionizing Farming: Mobile Application for Seamless Manure Distribution among Farmers" system, it is concluded that the reservation system in the application is able to answer previous problems, namely the difficulty of farmers in finding manure. In addition, the problem with the current application features is that the services provided are still very limited and there is very little information about the factory. Information regarding management procedures can only be obtained by users in physical form when the order arrives. Based on these problems, further development will be carried out which focuses on more services and information, then users can also download information data files in the application.

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