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Optimizing the Search for Grass Supply for Domba Garut Farmers Through Location-Based Mobile Application

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Abstract **- This research aims to address the challenges of finding grass supply for Domba Garut farmers. Information about the quantity and quality of grass supply is crucial for maintaining the health and productivity of the sheep. Developing Location Based Service (LBS) technology in Android is an important step as a solution to provide information about the location of grass supply and the types of grass needed by farmers. The information collected from monitoring and reporting grass supply through this Android application can assist farmers in planning, distribution, and ensuring a sustainable grass supply. The research results show that this application, based on UI/UX testing, received a very good rating, and the location-based features have a positive impact on efficiency in terms of time and search processes. As a result, the business processes lead to achieving an adequate amount of grass and contribute to the growth of the Domba Garut farming industry.**

Keywords - Mobile Application; Domba Garut; Business Process; Grass Supply; Google Maps.

I. INTRODUCTION

Garut Sheep Farming is one of the important livestock sectors in the Indonesian economy, especially in Kab. Garut. Besides being renowned for its Art of Agility tradition, Garut sheep present a business opportunity through the meat they produce to meet the needs of the Indonesian society. The consumption of protein from meat, at 6% per capita per day, exceeds the protein consumption from eggs and milk, which is 5.63% per capita per day. To fulfill the demand for meat in the country, the sheep commodity plays a crucial role, with a total production of 0.2 million tons in 2018, which saw an increase of 49.29% compared to 2017 [1]. The Directorate General of Livestock and Animal Health records that the largest population of domestic sheep is in West Java, with a total population of 12.25 million sheep in 2021 [1].

However, in the process of Garut sheep farming, there are several challenges that need to be addressed, one of which is the adequate and efficient supply of grass for the farmers. Striking the right balance of 60% grass and 40% concentrate has a positive effect on the productivity of Garut sheep, including optimal feed consumption and appropriate weight gain [2]. Sufficient and high-quality grass supply is essential for maintaining their health and productivity. Research shows that sheep fed with grass produce higher carcass weight and percentage compared to those fed with green bean sprout waste [3].

In practice, farmers often face difficulties in obtaining adequate grass supply, especially in terms of searching and accessibility. This can hinder the optimal growth and development of the Garut sheep population, and the availability of grass supply is also dependent on the limited grazing land with grass supply [4].

To overcome these challenges, the adoption of information technology is crucial to help farmers address the above issues and have a positive impact on the efficiency and effectiveness of business processes [5]. One of the technologies currently widely used by society is the Global Positioning System (GPS) or Location Based Service (LBS) in Google Maps applications. Google Maps has been utilized in various research to find locations, get location information, and obtain routes to specific places. Location marking and nearest hiking route search application for Mount Merbabu equipped with a digital compass [6]. The concept of monitoring and mapping is also used in the "Peduli Lindungi" application with notification features to provide information for users affected by COVID-19 [7]. An Android-based Location Based Service application that can assist in searching for

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information and tourism location routes in Cimahi City [8].
Another research related to Geographic Information System is about health, which involves searching for health centers (puskesmas) in East Lampung Regency through an Android-based application. The study concludes that the built system can display the location of health centers, routes to health centers, facility information, and assist the Health Agency of Lampung in providing information services about health centers in the East Lampung region [9]. An Android-based tablet with GIS system in the malaria elimination program in Mangaluru City. The research resulted in obtaining disease mapping data based on location and occurrence time [10]. The Malaria Information System application based on web-based Android (OLMIS) that supports health workers in diagnosing and treating cases in the Philippines through data collection, processing, and reporting [11]. The Mobile Prototype Geofreebie application as a location-based freecycling service provides main benefits for returnees from forced migration, increases the size of their social network, and creates a sense of community among them [12]. A location-based store recommendation system using user position data to find user preferences while searching and exploring online shopping sites, and then recommending stores that best suit their interests. The research result indicates that the most appropriate store rankings are given to users based on their product interests and locations [13].

Information about the location and type of grass supply is extremely useful for Garut sheep farmers to ensure a continuous supply of primary feed for their sheep. Based on observations with Garut sheep farmers, they are not aware of grass supply locations other than those closest to their homes. When the primary location runs out, they will search further, spending time and money to obtain sufficient grass supply daily. As a temporary solution, farmers communicate and help each other, sharing information about available grass supply in certain areas.

By using location-based mobile applications, farmers can monitor and report grass supply, enabling them to obtain information about the availability and location of the right grass supply. The data collected from monitoring and reporting grass supply can provide valuable insights to optimize the grass supply process. Analyzing this data allows farmers to identify and plan better, optimize grass supply distribution, and ensure its sustainability.

The adoption of this location-based mobile application is expected to increase the efficiency and effectiveness of the grass supply process for Garut sheep farmers. With this technological solution, farmers can optimize grass supply, enhance productivity and welfare, and contribute to the overall growth of the Garut sheep farming industry.

II. LITERATURE REVIEW

2.1 Android

Android is an operating system developed by Google and based on the Linux kernel. Known for its popularity in mobile devices, Android provides flexibility and freedom for users to customize their devices according to their personal preferences. With Google Play Store, users can easily access and download apps, games, and other content to enhance their user experience [14].

2.2 Google Maps API

Google Maps is a free online mapping service provided by Google. Google Maps API is an application interface accessible through JavaScript to display Google Maps on web pages being built. To access Google Maps, an API Key registration is required, with the registration data being the domain name of the web being developed [15].

2.3 LBS (*Location Based Service)*

Location-Based Services (LBS) are software applications that utilize user location information to provide various relevant services and interactions. By using GPS, Wi-Fi, or cellular network technologies, LBS can determine the user's geographical position and provide information about nearby places, directions, promotional offers, or recommendations based on that location. For example, users can use LBS applications to find nearby restaurants, get directions to their destinations, or receive notifications about special offers in stores around them [16].

2.4 GPS (*Global Positioning System*)

GPS is a system or device used to determine a person's global position on the Earth's surface based on satellite signals. The system uses radio signals with digital data transmitted from satellites. GPS was first developed and used by the United States Department of Defense

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in 1978, and by 1994, the system had operated 24 satellites. Currently, GPS is the only global satellite navigation system that can be used to determine location, speed, direction, and time with full operation worldwide [17].

2.5 *Application Programming Interface* (API)

API, or Application Programming Interface, is an interface used to access applications or services from a program. In computer theory, an API allows developers to use existing functions of other applications without needing to start from scratch. In the context of websites, APIs function as function calls through the Hyper Text Transfer Protocol (HTTP) and receive responses in Extensible Markup Language (XML) or JavaScript Object Notation (JSON) format. With APIs, developers can efficiently leverage capabilities and data from other applications to enhance functionality and integration between applications [18].

III. RESEARCH METHOD

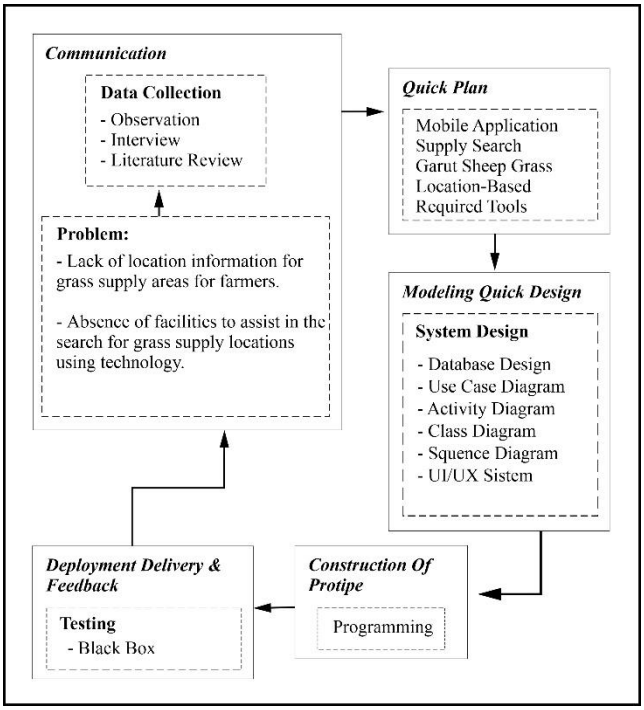
The method used in this research consists of several methods, namely data collection, system development, and black box testing method. Data collection is done through interview techniques, observation, and literature review [19]. The system development is carried out using the prototype method [20]. The functional testing of the system is done using the black box method [21].

3.1 System Development Method

The method used to develop the system is the prototype model, which consists of five stages: communication, quick plan, modeling quick design, construction of prototype, deployment, delivery & feedback [20].

3.1.1 Research Stage

The research stages are conducted following the prototype method, which includes five stages starting from communication to delivery and feedback, as shown in Figure 1.



Gambar 1 Research Stage

In Figure 1, the stages are explained as follows:

a. *Communication*
In this stage, the customers and the application development team communicate about the desired requirements. The development team collects data as the basis for creating the application system.

b. *Quick Plan*
The development team provides a general overview of the features, specifically for the development of the Android-based Garut Sheep grass locator application. The application developers will determine the minimum hardware and software specifications to be used in creating the application.

c. *Modeling Quick Design*
In this stage, the developers create the application based on the design sequence, including ERD for Database Design, use case diagrams, activity diagrams, sequence diagrams, and UI/UX system.

d. *Construction of Prototype*
The developers code the program using Object-Oriented Programming or Java programming language using Android Studio software with MySQL database using PHPMyAdmin tools.

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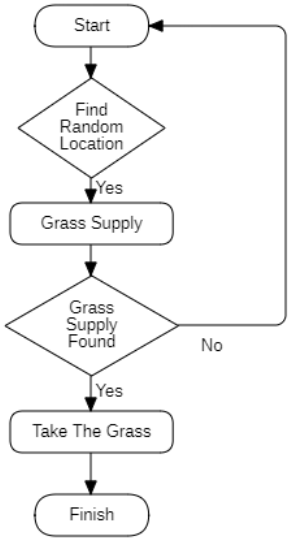
e. *Deployment, Delivery & Feedback*
After the coding stage is completed, it will proceed to the implementation and system testing phase using the black box testing method to test the functionality of the application. If the system passes the test, the application is ready to be tested by customers with usage guidelines to ensure maximum testing. If there are any deficiencies in the system, customers will communicate with the application development team.

3.1.2 System Analysis

Before the application enters the design phase, it is necessary to conduct an analysis of the current business processes to identify problems and needs so that the new business processes can be implemented in the application. The analysis is conducted by collecting data in the Communication stage.

a. Business Process Analysis

The analysis of the current business process for finding grass for Garut sheep farmers in Kec. Cilawu is depicted with a flowchart as shown in Figure 2. The current business process involves farmers searching for grass randomly, and if the grassland is not found, they continue searching until they find it and then proceed to harvest the grass.



Gambar 2 *Flowchart of the Current Business Process*

b. Problem Analysis
The problems that occur in the current running business process are as follows:

1. Lack of information about the available grassland locations.
2. Lack of information about the types of grass available in the areas to be processed.
3. Lack of information about the routes to the locations.

With the current system in place, the grass search business process is not effective because farmers do not have complete information about the locations to be searched.

3.1.3 System Design

Based on the problems identified in the current business process, a proposed Android application is suggested to assist Garut Sheep farmers in obtaining information about the locations of grass supply in Garut Regency. The materials and equipment used for the development of this application consist of hardware and software.

a. Hardware
The hardware used in the development of the Garut Sheep grass locator Android application includes a laptop with the following minimum specifications:

1. Intel Core i3 Gen 4
2. SSD 500Gb.
3. 8Gb RAM.
4. Android smartphone version 5.0 (Lollipop).

b. Software
The software used in the process of creating this application includes:

1. Windows 64 Bit Operation System
2. Android Studio
3. Star UML
4. Figma

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c. System Architecture Design

The proposed architecture design for the Garut Sheep grass locator Android application is shown in Figure 3.

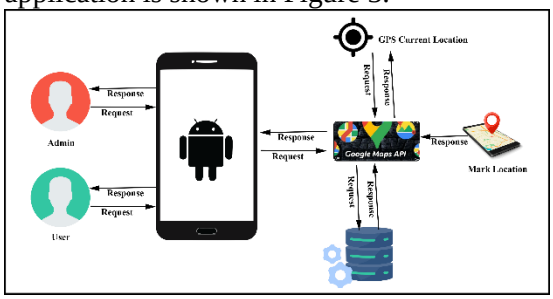

Figure 3 System Architecture

d. *Use Case Diagram Design*

In this stage, we will depict how a user/actor interacts with the application that will be created. The proposed use case diagram for the Garut Sheep grass locator Android application is shown in Figure 4.

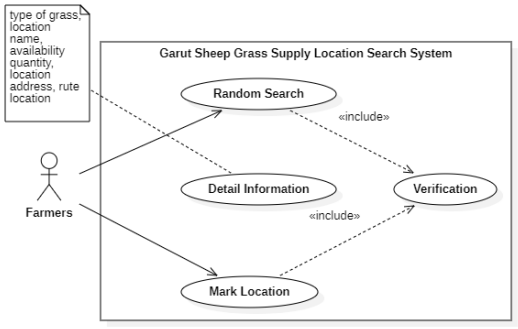

Figure 4 *Use Case Diagram*

e. Database Design

This designed database is useful to facilitate the process of creating the application. There are several core tables used, namely: the location table, the user location table, the user table, and the grass table. The designed database can be seen in Figure 5.

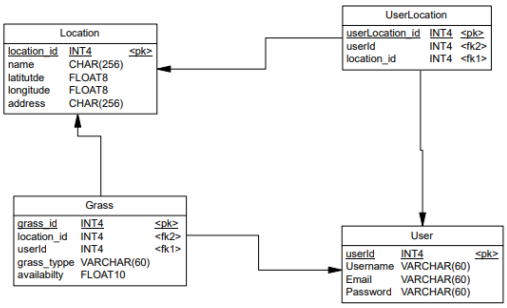

Figure 5 Database Design

IV. RESULTS AND DISCUSSION

4.1 Prototyping Implementation

The results of implementing four out of five parts of the prototyping process, such as analysis, design, and coding, have led to the development of an application that functions according to the planned requirements during the initial stages of application development. An overview of this application can be seen as follows:

Main Menu Display

Figure 6 Main Menu

This main menu is named "Grass Spread," where users are directed to directly view information about grass distribution. It includes GPS feature, route to location, and Google Maps.

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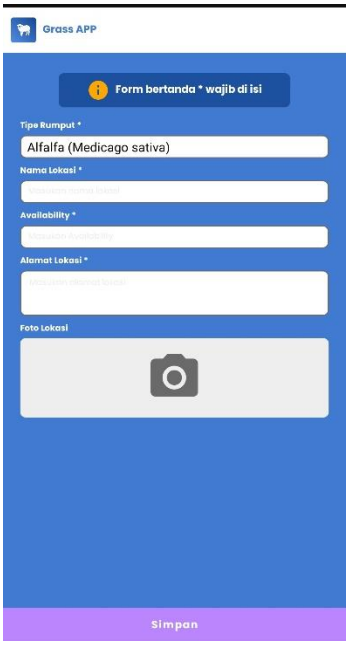

Gambar 7 Add Location Menu

This "Add Location" menu is location-based, where a farmer is located. Therefore, the farmer only needs to input the type of grass, location name, availability quantity, location address, and location photo. The application will automatically input the Latitude and Longitude.

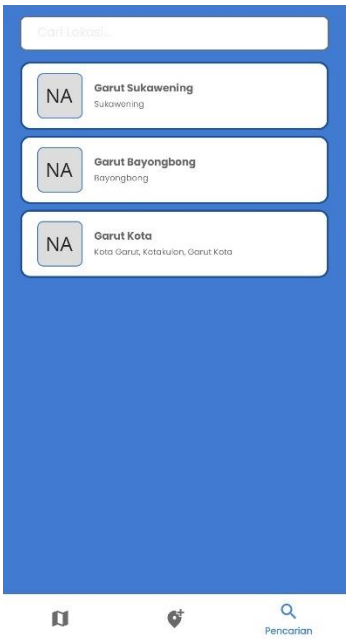

Figure 8 Pencarian

This search menu is created to facilitate farmers in directly searching for a list of information on grass distribution. There are submenus in the search, as shown in the figure below:

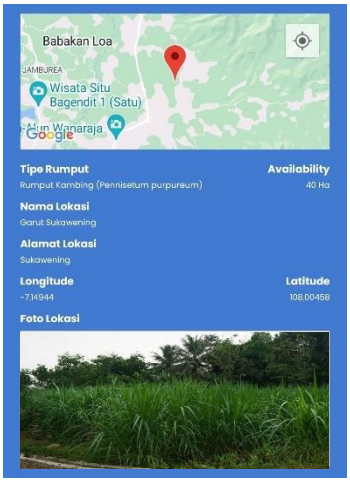

Figure 8 Sub Menu Search

The search submenu provides detailed information about a location, such as Google Maps, grass type, location name, availability quantity, location address, and location photo.

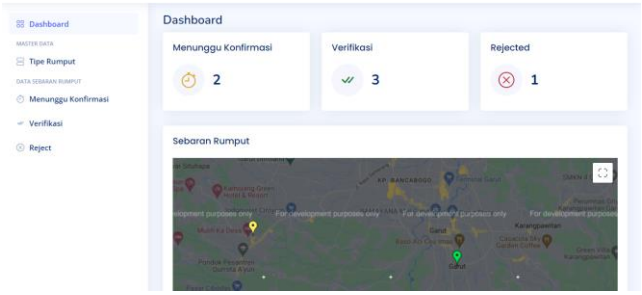

Figure 9 Application Admin

The figure above shows the admin page of the application where an admin can manage the application, starting from verifying and deleting locations.

1. Yellow Mark: Awaiting Confirmation
2. Green Mark: Verified
3. Red Mark: Rejected Location.

4.2 Application Testing

The application testing process was conducted by a professional programmer through black box testing, with the results as shown in the following Table 1.

ID	Function Name	Expected Result	A. Result
1	Dashboard Menu	Details Information	OK
2	Review Menu	Check Location	OK
3	Verification Menu	Manage Location	OK
4	Reject Menu	Allow Location	OK

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Table 2. Black-Box User Application Testing Results

ID	Function Name	Expected Result	A. Result
1	Splash Screen	After 3 seconds, the Dashboard page will appear	OK
2	Grass Spread Menu	Details grass spread	OK
3	Route Location Menu	Displaying the travel route	OK
4	Google Maps Menu	Displaying the Google Maps	OK
5	Add Location	Input Data	OK
6	Auto Sync Data	Data Synchronization	OK

4.3 Testing Results Analysis

After conducting the suitability and functionality testing based on the questionnaire results from the admin system and users from the expert team, the results can be obtained from the input to the output process. The system testing through measurement based on the questionnaire results was conducted using the Likert scale. There was one team consisting of two people, namely the Farmer and the Programmer, and the assessment categories are shown in the table below:

Table 3. Percentage Value Categories

No.	Interval	Kategori Penilaian
1	0-20%	Sangat Tidak Baik
2	21-40%	Kurang Baik
3	41-60%	Cukup Baik
4	61-80%	Baik
5	81-100%	Sangat Baik

After the percentage value categories are determined, the next step is to conduct User Interface and User Experience testing, abbreviated as UI/UX Testing, for the admin system and user application. Each answer for the final result is marked as "OK" and given a score of 1, while the answer "NOT OK" is given a score of 0. The UI/UX testing results for the admin system are as follows in the table below.

Table 4. Admin System UI/UX Testing Results

No	Responden	Question	Score	Result	
				OK	NO
1	Fahmi	8	1	8	
2	Andreas	8	1	8	

From Table 4, the result shows that there are 8 respondents who answered "OK," with a total score of 16. Therefore, the percentage of the UI/UX testing for the admin system is:

$$\text{Value \%} = \frac{\text{number of questions x 2}}{\text{total score}} \; x\; 100$$

$$\frac{8 \text{ x } 2}{15} \; x\; 100$$

$$= 100\%$$

For the UI/UX testing results by the expert team, a 100% score was obtained, with an assessment category of "excellent." The UI/UX testing results for the user application system can be seen in Table 5.

Table 5. User Application System UI/UX Testing Results

No	Responden	Question	Score	Result	
				OK	NO
1	Toro	10	1	10	
2	Andreas	10	1	10	

From Table 5, the result shows that there are respondents who answered "OK" and obtained a score with a total of 20. Therefore, the percentage value of the UI/UX testing for the user application is as follows:

$$\text{Value \%} = \frac{\text{number of questions x 2}}{\text{total score}} \; x\; 100$$

$$\frac{10 \text{ x } 2}{20} \; x\; 100$$

$$= 100\%$$

The results show that the testing conducted by the expert team obtained a percentage value of 100% with an excellent assessment category.

The testing results for the admin system and user application, obtained from the test team, with a focus on functional testing, received an excellent assessment category with a 100% percentage, indicating that the admin system is functioning very well.

The testing results for the user application, based on functional UI/UX testing by the expert team, received an excellent assessment category with a 100% percentage. Based on the above results, it can be concluded that after testing by the expert team, the entire application can run successfully and function as intended.

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V. CONCLUSION

Based on the development process of the Location-Based Information System through the Mobile Application for Finding Garut Sheep Grass, the following conclusions can be drawn:

1. The developed system can provide information about the distribution of grass inputted by each Garut sheep farmer.

2. The system can provide detailed information about the grass distribution, including the type of grass, location name, availability quantity, and location photos.

3. The system can provide routes to the intended location, making it easier to access the specified destinations.

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