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Android-Based Porang Cultivation Application Design for North Lombok District Porang Farmers

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Abstract **Porang is a plant that has the potential to be developed as an export commodity as a food ingredient or industrial ingredient (i.e., food, cosmetics, medicine, or health). North lombok regency location is one of the districts in ntb that currently has potential for developing porang farming businesses. Porang farming is currently carried out in 2 subdistricts, namely gangga and bayan, and has 800 farmer members with a land area of 1000 ha. Having an android-based application will help with the management of farmer administration. Based on the results of black-box testing, all features were confirmed to function properly. Additionally, the System Usability Scale (SUS) evaluation involving 30 users yielded an average score of 74.16, placing it within the acceptable category**).

Keywords: **cultivation, porang, android, flutter, information system**

I. INTRODUCTION

Porang is a plant with great potential to be developed as an export commodity, serving as raw material for food and industrial purposes (e.g., food, cosmetics, pharmaceuticals, and health products). Over the past decade, porang has emerged as one of the economically valuable plantation commodities due to increasing market demand, both domestically and internationally. Indonesia exports porang in the form of dried chips or flour to Japan, Australia, Sri Lanka, Malaysia, South Korea, New Zealand, Pakistan, the United Kingdom, and Italy. The demand for fresh porang or dried chips continues to rise [1]. Therefore, there is substantial potential and opportunity to develop porang as a cultivated crop to enhance farmers' income and welfare.

North Lombok Regency is one of the regions in West Nusa Tenggara (NTB) with significant potential for the development of porang farming. Currently, porang farming activities are carried out in two districts, Gangga and Bayan, involving 800 farmers and covering approximately 1,000 hectares of land. Based on observations, the elevation of the porang growth habitat in North Lombok Regency ranges between 443–457 meters above sea level (m asl), with an average elevation of 452.71 ± 7.476 m asl, which remains within the optimal habitat range for porang cultivation in the region [2]. Although the porang farming sector continues to grow, farmers face several challenges, including limited access to the latest information on cultivation techniques, difficulties in monitoring plant growth, and inadequate solutions for problems encountered during the cultivation process [3].

The development of information technology has introduced numerous information-based applications that provide convenience and benefits for daily life activities [4]. Among these is the rapid advancement of mobile applications, supported by the widespread use of Android smartphones for communication and accessing information on the internet.

Using an Android-based application as a solution to assist porang farmers in North Lombok Regency is highly relevant and appropriate, given the increasing dependence of society on technology, particularly Android smartphones. Many porang farmers have expressed difficulties in accessing better cultivation techniques and often face challenges in monitoring their plants' conditions, such as identifying disease symptoms or nutrient deficiencies. Additionally, many farmers are not yet familiar with using digital technology to find agricultural solutions or share experiences with other farmers. An Android-based application can serve as an effective tool for delivering crucial information, such as cultivation tips, solutions to plant problems, or weather updates that affect porang growth. Another advantage is its ease of access, as Android smartphones are widely used, including by farmers in rural areas [5].

Therefore, research was conducted to develop an Android-based application designed specifically for porang farmers. This application aims to assist in monitoring and cultivating porang while helping younger generations of farmers gather information more effectively. Android smartphones were chosen as the medium for the application due to their widespread use among the community. This transformation effort towards improvement, integrating online platforms with farmers' production processes, supports the era of Industry 4.0, where all production processes rely heavily on internet connectivity.

II. Literature Review

The high potential of Porang farmers in North Lombok Regency has not been balanced with good farmer administrative management. When harvest time arrives, the farmer group will record each farmer's porang harvest, which is recorded in the form of a recap book. Apart from that, not all farmers are properly recorded, and many Farmers are missed from data collection so that the harvest recap results are smaller than the actual harvest amount. Apart from that, the main obstacles faced by farmers in porang seed farming are limited capital, relatively long summer seasons, low use of technology, pest and disease problems, and a lack of extension facilities [2]. Based on the results of these observations, one solution to this problem is to use an integrated farmer administration system and crop land information [4]. With the current development of information technology, many information-based applications have emerged that provide many conveniences and benefits in people's daily life activities. The Android operating system is one of the developments in mobile applications that is often used not only as a communication tool but can also be used to obtain information quickly and accurately, anywhere and at any time, whether in the form of writing, sound, images, video, or multimedia formats (smartphones).

The geographic information system (GIS) on smartphones with the Android platform can be a source of accurate, fast information anywhere and at any time. With GIS, the desired location can be depicted so that a visualization can be obtained, which can be used as a reference for farmers in obtaining the required information [6]. By knowing the location of the land, you can predict the quality of the porang plants, because if the environmental temperature increases, it can affect the respiration rate, which is faster than the photosynthesis process, so that the quality of the tuber planting results is not optimal. On the other hand, short-light conditions in shaded conditions are more effective in producing maximum tubers [7].

Pest control needs to be addressed with quick and

scheduled action because it can affect the amount of production from the harvest. The growth disruptors that need to be controlled are weeds. For this reason, weeding is done by cleaning weeds that can compete with porang plants in terms of water and nutrient requirements [8]. Farmers still use traditional methods to identify pests and diseases by asking more experienced people the names of pests and diseases and how to treat them. Android-based applications can be used to detect pest attacks early so that farmers can carry out early detection of pests and diseases [9].

A. *Porang*

Porang is a type of taro in the Araceae family, which is a type of tuber plant that is able to live in various types of soil conditions. Porang plants do not have to receive direct sunlight, so this plant is easy to find in secondary vegetation areas, the edges of teak forests, under bamboo groves, on river banks, in thickets, and in places with varying degrees of shade. The high glucomannan content in porang tuber carbohydrates makes it a potential ingredient that canabsorb water well. This mannan substance can be used for adhesives, celluloid materials, cosmetics, foodstuffs, textiles, and paper industries. Apart from that, porang tubers are the raw material for making mannan flour, which has several broad benefits in the food sector. The low-calorie content stored in porang tubers can be useful as a healthy diet food [9].

B. *Flutter*

Flutter is an open-source framework used to help developers create multiplatform mobile applications. Flutter is widely used in making mobile apps for large companies, so many application developers are starting to use Flutter to build their applications. Flutter has two important components, namely, the Software Development Kit (SDK) and the user interface framework.

- A software development kit (SDK) is a collection of tools that function to create applications that can be run on various platforms.
- A UI framework is a UI component, such as text, buttons, navigation, and others, that you can customize according to your needs.

Flutter uses the Dart programming language. This is different from general front-end frameworks, which usually use the JavaScript programming language.

III. Research Methodology

The method used in this research uses the Rapid Application Development (RAD) method. Rapid Application Development (RAD) is a development cycle to provide development that is much faster and better than the results achieved. The processes or stages in the RAD method are divided into 4 stages, namely design, system design, system implementation, and evaluation, as presented in Figure 1.

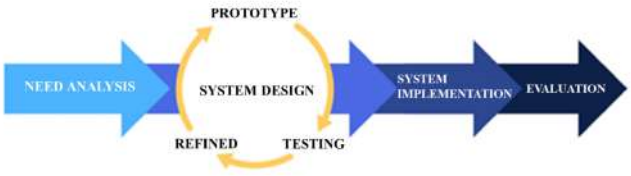

Fig. 1. Rapid Application Development (RAD) Diagram

At the needs analysis stage, it will be made based on information obtained from farmers, which includes equipment requirements, operating systems used, and data requirements needed for cultivating porang plants. After carrying out the needs analysis stage, proceed with the system design stage. This stage functions to change the needs analysis into a design form that is easy to understand. At this stage, the activeness of farmers, who are representatives, is very important to achieving the goal

because, at this stage, the design process is carried out and the design improvement process is carried out repeatedly to adapt to the farmers' needs. Next, after it has been agreed, the application will enter the development stage, where the system design that has been created is changed into a beta version of the application up to the final version. Next, the application that has been created will enter the evaluation stage, where farmers can use the application in the field.

A. Needs Analysis

The stages start with carrying out data analysis and identifying the form or model for designing an Android-based porang cultivation application. This stage begins with collecting data on existing conditions by looking at what type of information is already available, and then the survey and observation data will be analyzed. The results of data processing that have been processed are then adjusted to current actual needs so that they can be used as a reference during the information system design process at the next stage.

B. System Design

At this stage, the required analysis is converted into a form that users can understand, such as user interface design. In designing applications using the Unified Modeling Language (UML), which includes use case diagrams, activity diagrams, and flowcharts.

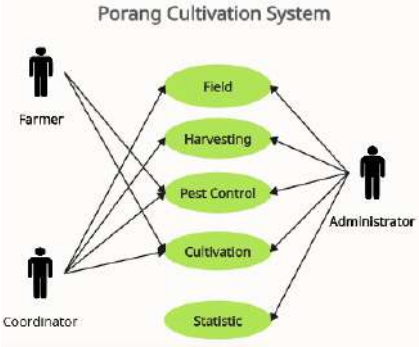

Fig. 2. Use Case Diagram

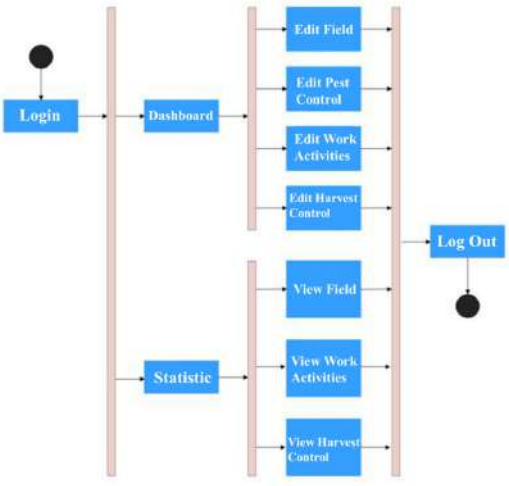

Fig. 3. User Activity Diagram

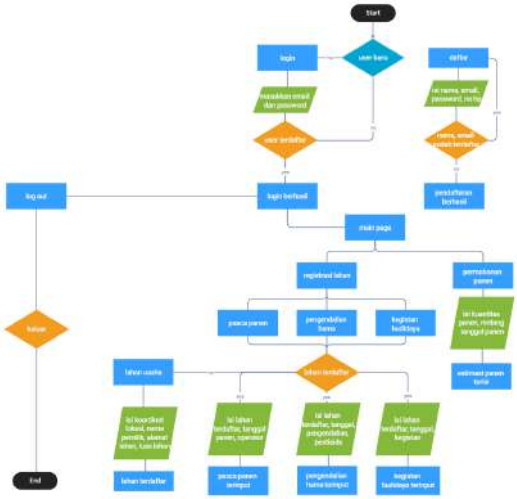

Fig. 4. Flowchart Diagram

C. System Implementation

At this stage, an Android-based porang cultivation application system is implemented based on the features that have been agreed upon and evaluated together at the previous stage. This stage includes application coding (platform creation) for the system, functional and user acceptance tests (testing) by the farmer coordinator, as well as repairs when errors occur during testing (support), hosting and data migration, as well as application training for farmers when the application has been released.

D. Evaluation

At this stage, an Android-based porang cultivation application system is implemented based on the features that have been agreed upon and evaluated together at the previous stage. This stage includes application coding (platform creation) for the system, functional and user acceptance tests (testing) by the farmer coordinator, as well as repairs when errors occur during testing (support), hosting and data migration, as well as application training for farmers when the application has been released.

IV. Discussion

In this chapter, an Android-based porang cultivation application system is implemented based on the features that have been agreed upon and evaluated together in the previous stages. This stage includes application coding (platform creation) for the system, functional and user acceptance tests (testing) by the farmer coordinator, as well as repairs when errors occur during testing (support), hosting and data migration, as well as application training for farmers when the application has been released.

A. User Interface

A.1. User Registration and Login Page

When a user opens the application, the first page that appears is the Register and Login page. The Register page is the interface that users encounter when registering a new account. Meanwhile, the Login page is the first interface

in the application, which functions to give users access rights to the system as long as they are registered. You can see the register interface in Figure 5.

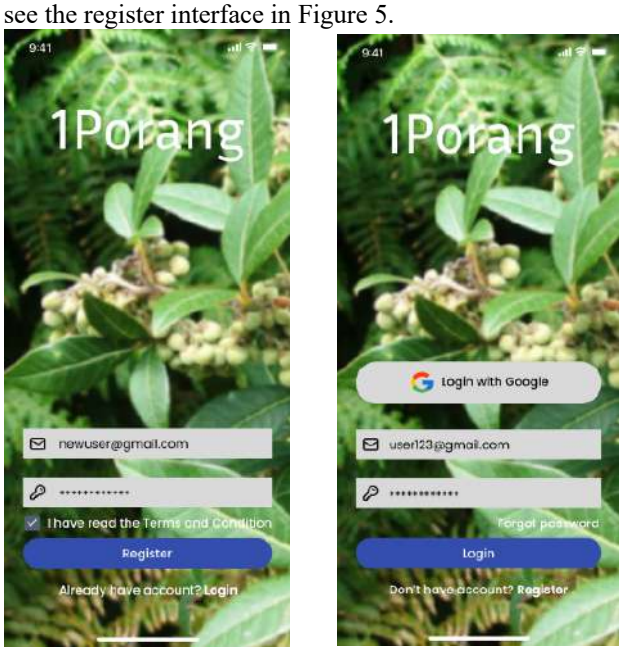

Fig. 5. Register dan Login Interface

A.2. Dashboard

After a successful login, the user will be directed to the User Home page. Here, four button icons will immediately appear, each of which displays the main features in four categories: farming, harvesting, pest control, and cultivation. Apart from that, there is a navigation panel that is used to move to other pages. The User Home page display can be seen in Figure 6.

Fig. 6. Dashboard Interface

A.3. Land and Harvest Registration

The Land Registration page is a feature in the application specifically designed to register land. On this page, users can enter various important information, such as the location of the land, the name of the land owner, and the area where Porang seeds have been planted. The Harvest page is designed to help users record estimated Porang harvest yields from their land. On this page, users can input specific information such as the location of the land, the date on which harvest is expected to take place, and the anticipated quantity of harvest. The display can be seen in Figure 7.

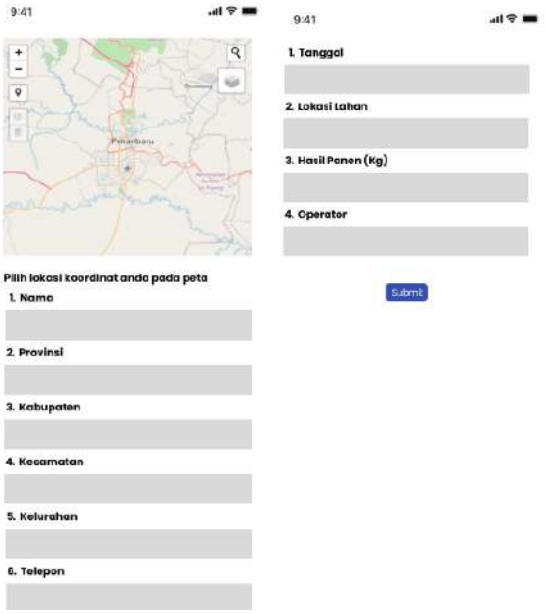

Fig. 7. Land and Harvest Registration Interface

A.4. Pest Control and Farmer Performance Data Collection

The Pest Control Page is a feature in the application that is used to document pest control activities on land. Users can enter information such as dates of pest control activities and types of pesticides used, thereby helping in the tracking and management of agricultural activities. The Cultivation Page functions as a documentation center for recording daily activities in the process of cultivating Porang plants on registered land. The display can be seen in figure 8.

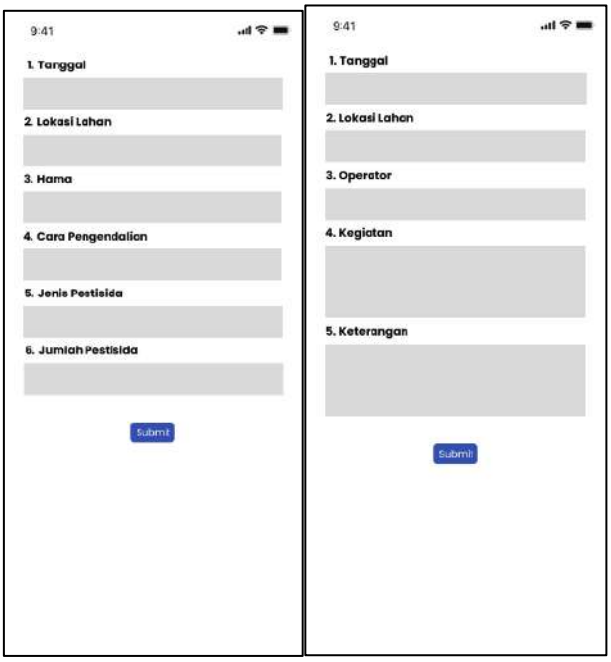

Fig. 8. Pest Control and Farmer Performance Data Collection

A.5. Latest News Interface

In the navbar, there is a News feature which functions to provide the latest information about Porang. This feature aims to ensure users always get the latest updates regarding the Porang plant, be it industry news, research or other developments. The News display can be seen in Figure 9.

Fig. 9. News Interface

A.6. Cultivation Tips

In the navbar section there is also a Tips feature which aims to provide useful advice and guidance in cultivating Porang. This feature is designed to assist users with practical information that can improve the quality and yield of their Porang cultivation. The tips display can be seen in Figure 10.

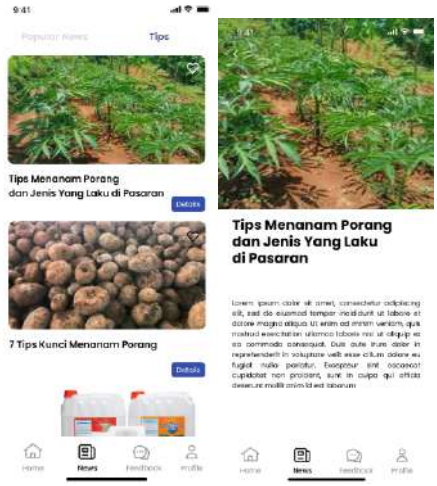

Fig. 10. Cultivation Tips Interface

A.7. Feedbacks

The feedback page has several functions as a question and answer platform with managers, allowing users to ask questions about the products or services they use and get answers directly from managers. Second, the feedback page also acts as a forum for questions and answers with other farmers, allowing users to share experiences, tips or suggestions with fellow farmers. In this way, displaying a feedback page not only facilitates communication between users and managers, but also builds a strong community among users by sharing knowledge and experiences. The Feedbacks display can be seen in Figure 11.

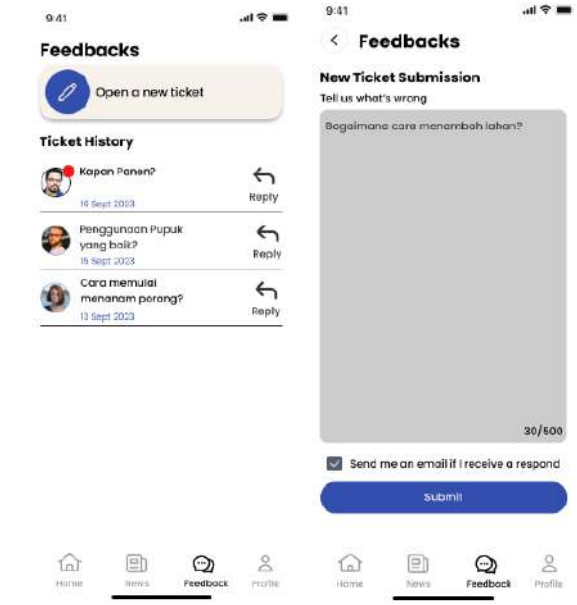

Fig. 11. Feedbacks interface

A.8. User Profile

In the user profile, information such as name, email address, physical address, and telephone number will be

displayed. Users have the ability to edit this information by accessing the Settings page. The user profile page display can be found in Figure 12.

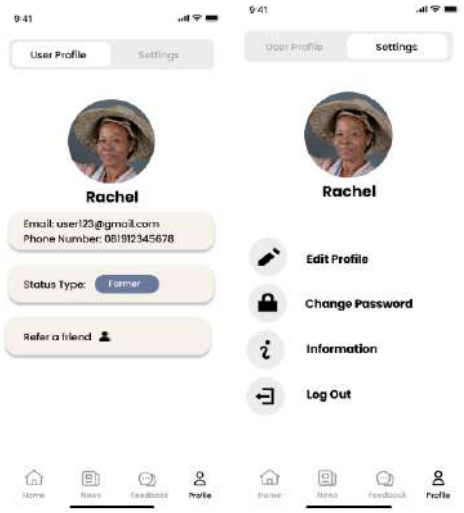

Fig. 12. User Profile Interface

B. Black Box Testing

The system functionality black box testing method is a testing method that tests the functions in the system to determine whether these functions are running as expected or not. The results of several black box tests can be seen in Table I. In this test, there are 10 main parts of the mobile application that are tested.

TABLE I. BLACK BOX TESTS RESULTS

No	Testing	Expected Result	Test Result	Conclusion
1	Registration	Users can register by filling in their name, email, password and cellphone	Agreeable	Valid
2	Login	Users can log into the application, the application will reject users who are not registered	Agreeable	Valid
3	Dashboard	The application can display system feature options and Porang cultivation news.	Agreeable	Valid
4	Porang Development Land Features	Farmers record land data by inputting the land's location, owner, and the area planted with Porang seedlings.	Agreeable	Valid
5	Farmer performance features	Farmers record their daily activities in cultivating Porang plants on the registered land.	Agreeable	Valid
6	Pest Control Features	Farmers record pest control activities based on the activity date and the type of pesticide used.	Agreeable	Valid
7	Porang Cultivation Harvest Number Features	Farmers record harvest estimates from their Porang fields by inputting the land location, estimated harvest date, and harvest quantity.	Agreeable	Valid
8	News Features	Displays the latest updates on Porang plant information.	Agreeable	Valid
9	Feedback Features	Provides a platform for Q&A with other farmers.	Agreeable	Valid
10	Log Out	Users can log out of the system.	Agreeable	Valid

C. User Accceptance Testing

This research utilizes the User Acceptance Test method with the System Usability Scale (SUS) approach, which consists of 10 questions rated on a scale of 1 to 5. Odd-numbered questions are positive, while even-numbered questions are negative, as detailed in Table II along with the value scale information. The questionnaire was answered by 30 respondents, comprising farmers and land coordinators from farmer groups in North Lombok.The value scale information following:

SD : Strongly Disagree
D : Disagree
N : Neutral
A : Agree
SA : Strongly Agree

TABLE II. SUS QUESTIONS

No	Question
1	I think I will use this feature often.
2	I feel this feature is too complicated even though it can be made simpler..
3	I think this feature is easy to use.
4	I think I need help from a technical person to be able to use this feature.
5	I found that there are a variety of features that are well integrated in the system.
6	I think there are many inconsistent things in this feature.
7	I think the majority of users will be able to learn this feature quickly.
8	I found this feature to be very cumbersome to use.
9	I am very confident that I can use this feature.
10	I have to learn a lot of things first before I can use this feature.

There are several steps in SUS testing, including the following:

a. Odd-order questions are positive questions, so the score is reduced by 1.

b. An even question is a negative question, so 5 is subtracted from the score.

c. After calculating each question, you will get the results, which will be added together, and the total result will be multiplied by 2.5.

The following are the results of the SUS test scores, which can be seen in Table III.

TABLE III. SUS RESULTS

No	Question											
	1	2	3	4	5	6	7	8	9	10	Tot	Score
1	4	2	5	1	4	1	5	1	4	2	29	72,5
2	4	2	4	2	5	2	4	1	4	2	30	75
3	4	2	5	2	5	2	5	2	4	1	32	80
4	5	1	5	1	4	1	4	1	4	1	27	67,5
5	4	2	4	2	4	2	4	1	4	2	29	72,5
6	4	1	5	2	4	1	4	2	5	2	30	75
7	5	2	4	2	5	1	5	1	4	2	31	77,5
8	4	1	5	2	4	1	4	2	5	1	29	72,5
9	4	2	4	1	5	1	4	1	4	1	27	67,5
1	4	2	5	1	5	1	5	1	5	2	31	77,5
1	4	1	4	2	4	2	4	2	5	2	30	75
1	4	2	4	2	5	2	5	2	4	2	32	80
1	4	1	4	1	5	2	4	2	5	2	30	75
1	4	1	4	2	5	2	5	2	4	2	31	77,5
1	4	1	4	2	4	2	5	2	5	1	30	75
1	4	1	5	2	5	1	4	1	4	1	28	70
1	5	2	4	1	4	1	5	1	4	2	29	72,5
1	5	2	4	1	4	1	4	2	5	1	29	72,5
1	4	2	4	2	5	1	4	2	5	2	31	77,5
2	5	2	4	2	5	1	4	2	5	1	31	77,5
2	4	1	4	1	4	1	4	2	5	1	27	67,5
2	4	2	4	2	4	2	5	1	5	2	31	77,5
2	4	2	4	2	5	1	4	2	5	1	30	75
2	4	2	5	2	4	2	4	1	4	2	30	75
2	5	1	5	2	4	1	4	2	4	1	29	72,5
2	4	2	5	2	4	1	4	1	5	1	29	72,5
2	4	1	5	2	5	1	4	1	5	1	29	72,5
2	4	1	4	1	4	1	5	1	4	1	26	65
2	5	1	5	1	4	1	5	1	5	1	29	72,5
3	5	2	5	2	5	2	5	1	5	2	34	85
Total												74,16

TABLE IV. SCORE RANGE SUS

No	Acceptable Ranges	Score
1	Not Acceptable	0 - 50
2	Marginal	50 - 70
3	Acceptable	70 - 100

The SUS test results in Table III obtained results from users with an average of 74.16. Based on the range of SUS values that can be seen in Table IV, there is a conclusion from the results of this research, namely that this application can run well and is acceptable

V. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

Based on functional black box testing, it can be concluded that this research has succeeded in implementing an Android-based porang cultivation application for porang farmers in North Lombok district using Flutter.

Based on the SUS test results obtained results from users with an average of 74.16. There conclusion from the results of this research, that this application can run well and is acceptable. This application will help farmers collect data on land, harvest, pest eradication, and farmer performance. As well as providing the latest information on the development of porang plants and interacting with managers and other farmers

B. Recommendations

The application is designed to connect farmers with the global market, unlocking the potential for their products to become export commodities. By facilitating this connection, the application aims to enhance the farmers access to wider market opportunities, ultimately contributing to their economic prosperity and improving their livelihoods. Additionally, the development of products derived from the Porang plant can serve as an alternative to support local MSMEs (Micro, Small, and Medium Enterprises).

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