

## **Android and Laravel-Based M-Petani Application for the West Java Provincial Agricultural Crop Department**

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### **ABSTRACT**

*The West Java Provincial Agricultural Crop Department faces various challenges in communication and service delivery to farmers, such as a shortage of agricultural extension workers, manual processes for submitting complaints, and inefficient seed request procedures. To address these issues, the M-Petani application was developed, an Android-based solution utilizing web service technology with JSON format for data exchange and integration. This system is designed to deliver agricultural information, facilitate seed requests, and provide a digital platform for submitting complaints. Alpha testing confirmed the application functions in accordance with technical specifications, ensuring secure data validation and storage. Beta testing, conducted with 30 farmers in West Java, demonstrated positive feedback, particularly regarding ease of use, reliability, and user satisfaction. The application enhances communication efficiency, accelerates responses to complaints, and simplifies data management at the Agricultural Crop Department. These results highlight M-Petani as an effective and environmentally friendly digital solution that supports paper reduction and improves service delivery to farmers in West Java.*

**Keywords:** M-Petani Application, Web Service, Farm, Efficiency, Digital Communication

### **ABSTRAK**

*Dinas Pertanian Provinsi Jawa Barat menghadapi berbagai tantangan dalam komunikasi dan pemberian layanan kepada petani, seperti kurangnya tenaga penyuluh pertanian, proses pengaduan yang masih manual, dan prosedur permintaan benih yang kurang efisien. Untuk mengatasi masalah tersebut, dikembangkanlah aplikasi M-Petani, yaitu solusi berbasis Android yang memanfaatkan teknologi layanan web dengan format JSON untuk pertukaran dan integrasi data. Sistem ini dirancang untuk menyampaikan informasi pertanian, memfasilitasi permintaan benih, dan menyediakan platform digital untuk mengajukan pengaduan. Pengujian alfa memastikan fungsi aplikasi sesuai dengan spesifikasi teknis, memastikan validasi dan penyimpanan data yang aman. Pengujian beta yang dilakukan terhadap 30 petani di Jawa Barat menunjukkan umpan balik positif, khususnya terkait kemudahan penggunaan, keandalan, dan kepuasan pengguna. Aplikasi ini meningkatkan efisiensi komunikasi, mempercepat respons terhadap pengaduan, dan menyederhanakan pengelolaan data di Dinas Pertanian. Hasil ini menyoroti M-Petani sebagai solusi digital yang efektif dan ramah lingkungan yang mendukung pengurangan penggunaan kertas dan meningkatkan pemberian layanan kepada petani di Jawa Barat.*

**Kata Kunci:** Aplikasi M-Petani, Layanan Web, Pertanian, Efisiensi, Komunikasi Digital

### **INTRODUCTION**

The Agricultural Crop Department of West Java Province (DPTP) is a government agency responsible for supporting food security, adding value to agricultural products, and increasing agricultural production while prioritizing

environmental sustainability to achieve environmentally conscious and contingency-focused development in West Java. However, several issues have arisen regarding the department's services and communication with the people of West Java. The first issue is the shortage of agricultural extension workers, which hampers the effective dissemination of information to farmers. Second, complaint submission processes remain inefficient as they are still conducted face-to-face. Third, the process for requesting crop seeds is similarly inefficient due to its reliance on in-person interactions. Lastly, the dissemination of information is still document-based, making it neither efficient nor effective, while also failing to align with environmentally friendly development goals.

In light of these challenges, a system is needed to enhance efficiency and effectiveness, such as a mobile application-based system. The choice of a mobile application is justified by its ability to facilitate rapid and direct communication and information distribution to farmers across West Java. Additionally, it supports government programs promoting environmentally friendly development by reducing paper usage for printed forms.

## **LITERATURE REVIEW**

Web service is a technology that enables applications or software components, both within and outside an organization, to communicate with each other using protocols such as HTTP and SOAP (Simple Object Access Protocol). This technology employs standards that are platform- and programming-language-independent, facilitating integration between different systems. One of the data formats commonly used in web service communication is JSON (JavaScript Object Notation). JSON is a lightweight, readable, and programming-language-independent data exchange format. It was originally created based on the JavaScript programming language under the ECMA-262 standard, third edition, in December 1999. JSON is a text-based format independent of any programming language, using syntax familiar to programmers of C-family languages such as C, C++, C#, Java, JavaScript, Perl, Python, and others, making it ideal for data exchange (Hutauruk, 2019).

In the context of modern application development, Android is one of the most popular platforms for mobile device operating systems, built on Linux and open source. Android application development often utilizes the Android SDK (Software Development Kit) and API (Application Programming Interface), which generally use Java programming language, simplifying integration with web services (Rossa & Shalahuddin, 2016). The architecture of Android, composed by application, framework, libraries, android runtime, and Linux kernel (Dewi, et al., 2020).

To design complex software systems, the Unified Modeling Language (UML) is used as a visual modeling tool that supports the specification, documentation, and construction of object-oriented software. The object-oriented programming approach itself offers a method for managing software complexity by viewing it as a collection of objects containing data and operations (Adyana, 2020). In object-based system development, databases play a crucial role as integrated data storage that supports operations such as retrieval, modification, and data analysis (Fowler, 2012). A database is defined as a collection of data consisting of one or more interrelated

tables, where each user is authorized to access (modify, delete, analyze, add, or update) the data within those tables (Fowler, 2012). By utilizing these components, effective and efficient software development can be achieved through the integration of technology, methodologies, and supporting tools (Presman, 2010).

## **METHODS**

### **Problem Analysis and Current System**

Problem analysis is conducted by identifying the issues or obstacles encountered in the study, specifically the effectiveness and efficiency of communication between the community and the West Java Food Crops Agriculture Office (DPTP). This highlights the need for a system that can enhance efficiency and effectiveness, one of which is the implementation of a mobile application-based system. The current system is still conventional and not environmentally friendly.

### **Proposed System**

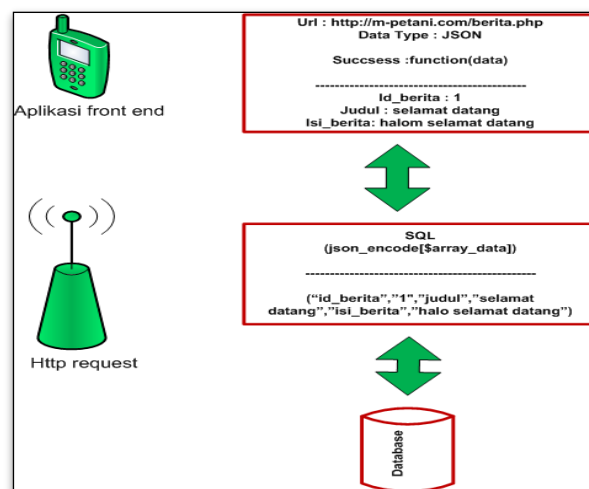
The new business process is necessary due to the development of a new system for disseminating information. The proposed new business process involves:

**Table 1.** Proposed Business Process

No	Activities	Proposed Business Process
1	Information on food prices, agriculture, pest control, etc.	Information is stored in the system and then displayed in the Android application
2	Seeds request	Filling out the seed request form can be done through this application.
3	Complaint notification	A facility for submitting complaints can be done through this application, making it easier for farmers to report issues without having to visit an extension worker, while also speeding up the work of extension officers.

### **Front End and Back End Application**

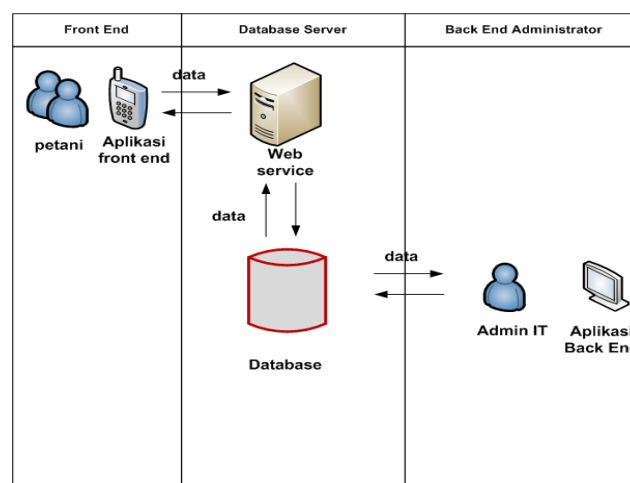
The front-end application serves as the interface between the user and the system. The front end is used to display agricultural information, provide services for new seed requests, and offer a platform for quickly submitting complaints/issues to extension officers. Meanwhile, the back-end application is the data processor implemented on a web-based system. The back end consists of an admin web, web services, and a database server.



**Figure 1.** Request Data JSON

## Data Flow

Data flows through the internet. Data provided for both the front-end and back-end applications is stored in the database server. Below is the data flow:



**Figure 2.** Data Streamlined

## Analysis of Non-Functional Requirements

The analysis of non-functional requirements describes the needs of the system that focus on the behavior the system should have. This serves as a basis for identifying shortcomings and requirements that must be fulfilled in the system design to be implemented. This includes the analysis of hardware requirements, software requirements, and system user analysis.

## Analysis of Functional Requirements

The analysis of functional requirements describes the processes and activities that will be implemented in the system to ensure its proper functioning. The analysis is modeled using UML (Unified Modeling Language). The modeling stages in the

analysis using UML include the use case diagram, use case scenario, activity diagram, sequence diagram, and class diagram.

## RESULTS AND DISCUSSION

### Implementation

The stage of translation of the design based on the analysis results into a specific programming language, as well as the implementation of the built system.

### Hardware Implementation

**Table 2.** Hardware and Software Implementation

No	Hardware	Specifications	Desktop Operation System	Windows 7
1	Processor	2.0 GHz	Browser	Mozilla Firefox
2	Ram	512 MB	SDK	Android SDK Windows
3	Hardisk	80 Gb	ADT	ADT v.10.0.0
4	Mouse	Standard	JDK	JDK v 1.6
5	Keyboard	Standard	IDE	Eclipse Galileo
6	Monitor	Standard	Desktop Operation System	Windows 7
7	Network Interface Card	10 Mbit/s		

### Interface Implementation

### Back End and Front End

**Table 3.** Back End and Front End

No	Interface	File	Interface	File
1	Login	Index.php	Login	Login.java
2	Main Page	Media.php	Complaints	Keluhan.java
3	News Management	Berita.php	Request	Permohonan.java
4	User Management	User.php	List	Daftar.java
5	Manage Pest Information	Hama.php		
6	Manage Price Information	Harga.php		
7	Complaints	Keluhan.php		
8	Announcements	Pengumuman.php		
9	Request	Permohonan.php		

## Testing

Testing is a stage to identify errors and shortcomings in the developed system to assess its ability to meet the research objectives. The testing method used for the M-Petani application is black-box testing, which focuses on the functional requirements of the system. This method consists of two testing phases: alpha and beta.

## Alpha Testing

Alpha testing is conducted at an early stage before the software is released to end users. The goal is to find and fix errors or bugs in the system. The focus of alpha testing is to ensure that all system functions work according to the specifications and requirements that have been set. Since it is conducted in an internal environment, this testing allows developers to address issues before the software is tested by external users. Beta testing, on the other hand, is conducted after alpha testing is completed and the system is deemed stable enough for use by a group of external users. This testing involves end users in real operational environments to identify issues that may not have been detected during alpha testing.

## Back End Application Testing

The testing phase is a crucial step in system development to ensure that the system being built meets the requirements and functions as intended. This testing is conducted to identify and correct errors or shortcomings in the system before implementation.

**Table 4.** Back End Application Testing

Features Tested	Data Types	Case	Expectation	Actual Observation
Login	Correct Data	Username: admin Password: admin	Filled	The system accepts and login is successful
	Incorrect Data	Username: empty Password: empty	Displays the message "All fields must be filled"	Displays the message "All fields must be filled"
News Management	Correct Data	Input all news data completely	Displays news at the top of the news list	Displays news at the top of the news list
	Incorrect Data	News title is empty	Displays the message "All fields must be filled"	Displays the message "All fields must be filled"
Manage Pest Information	Correct Data	Filled with type, target, symptoms,	Displays a tabulated list of pest info	Displays a tabulated list of pest info

Features Tested	Data Types	Case	Expectation	Actual Observation
		solution, and image		
	Incorrect Data	Empty information	Displays the message "All fields must be filled"	Displays the message "All fields must be filled"
Manage Price Information	Correct Data	Filled with plant type, price, and image	Displays a tabulated list of price info	Displays price info at the top of the price info list
	Incorrect Data	Empty information	Displays the message "All fields must be filled"	Displays the message "All fields must be filled"
Complaints	Correct Data	Displays the message: "Please follow the taught planting procedures."	Displays a list of answered complaints	Displays all answered and unanswered complaints
	Incorrect Data	Empty information	Displays the message "All fields must be filled"	Displays the message "All fields must be filled"
Request	Correct Data	Status: in process	Displays a list of requests being processed	Displays all processed and unprocessed requests
	Incorrect Data	Empty information	Displays the message "All fields must be filled"	Displays the message "All fields must be filled"
Announcement	Correct Data	Contains announcement title and content	Displays a list of announcements already inputted	Displays the announcement at the top of the list
	Incorrect Data	Empty information	Displays the message "All fields must be filled"	Displays the message "All fields must be filled"
Category	Correct Data	Category is filled	Displays a list of categories that have been inputted	Displays the announcement list in the first category

Features Tested	Data Types	Case	Expectation	Actual Observation
	Incorrect Data	Empty Data	Displays the message "All fields must be filled"	Displays the message "All fields must be filled"

## Front End Application Testing

**Table 5.** Front End Application Testing

Features Tested	Data Types	Case	Expectation	Actual Observation
Login	Correct Data	Username: admin  Password: admin	Filled	The system accepts and login is successful
	Incorrect Data	Username: empty  Password: empty	Displays the message "All fields must be filled"	Displays the message "All fields must be filled"
Listed	Correct Data	Input all news data completely	All fields are filled	The system displays all information
	Incorrect Data	All information empty	Displays the message "All fields must be filled"	Displays the message "All fields must be filled"
Request	Correct Data	Complete information: name, area, address, etc.	All fields are filled	All fields are filled
	Incorrect Data	Empty information	Displays the message "All fields must be filled"	Displays the message "All fields must be filled"
Complaints	Correct Data	Title, sender name, and complaint content are filled	All fields are filled	All fields are filled
	Incorrect Data	Information empty	Displays the message "All fields must be filled"	Displays the message "All fields must be filled"

## Beta Testing

Beta testing is conducted to evaluate the system's quality directly in the field by involving users. This research collects data through questionnaires from 30 farmers in West Java as respondents.

**Table 6.** Interviewsws Result

1	Greatly assist in delivering information.	<b>Very Helpful</b>
2	Application makes it easier to identify the problems.	<b>Easy to Use</b>
3	Application easy to use.	<b>Easy to Use</b>
4	Still rely on manual methods	<b>No</b>

**Table 7.** Questionnaire Result

Attitude Category	Score Range	Frequency	Percentage
Very Positive Attitude	20 – 25	22	73.34 %
Positive Attitude	15 – 20	8	26.66 %
Negative Attitude	10 – 15	-	-
Very Negative Attitude	5 – 10	-	-
Total		30	100 %

## DISCUSSION

The testing results indicate that the M-Petani application system, both on the back-end and front-end sides, functions as expected. In the alpha testing conducted by the development team, the main focus was to ensure data validation, error handling, and data storage worked according to technical specifications. This testing confirmed that the system meets functional requirements and there are no technical errors in core processes.

Beta testing, conducted directly in the field involving 30 farmers in West Java as respondents, provided an objective perspective from prospective users. The application assessment was carried out using a Likert scale, covering aspects of usability, reliability, and user satisfaction. The results of the beta testing showed that users gave positive responses to the application, indicating that the application meets their needs in an operational context.

From the beta testing results, it can be concluded that the Android-based M-Petani application is capable of facilitating various activities of the West Java Provincial Agriculture and Food Crop Office, such as:

1. Delivering information on agricultural commodity prices.
2. Sharing information on plant pests and diseases.
3. Accelerating responses to farmers' complaints.
4. Simplifying the process of requesting new plant seeds.
5. Disseminating the latest agricultural news.

Additionally, the two testing phases play complementary roles:

1. Alpha Testing ensures that the application runs technically according to the system design, free from errors or malfunctions.

2. Beta Testing evaluates user acceptance and satisfaction, validating that the application not only functions technically but is also relevant to user needs in the field.

The combination of these two testing phases demonstrates that the application development has successfully achieved its primary goal, which is to provide an effective digital solution for the West Java Provincial Agriculture and Food Crop Office to support their operational activities and enhance services for farmers.

## **CONCLUSION**

Based on the testing results of the back-end and front-end applications, the M-Petani application has proven to be effective in improving the efficiency of information delivery and services for farmers in West Java. With this application, farmers can access information without relying on extension workers, submit complaints anytime and anywhere, and easily request new plant seeds from the West Java Provincial Agriculture and Food Crop Office. Additionally, this application also helps the agriculture office in identifying and addressing farmers' issues more quickly and accurately.

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