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Traditional Herbal Medicine Production Information System Based on Prototyping Method

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ABSTRACT

Indonesia is the country with the second largest biodiversity in the world after Brazil. Indonesia's biodiversity is very rich, both on land and at sea, and is one of the most important in the world. The benefits of Indonesia's biodiversity is as a natural resource that plays an important role one of them in the production of traditional herbal medicine. Madura Island in East Java, Indonesia, is famous for its natural resources and respected Madurese herbal medicine, internationally recognized for its efficacy in addressing health and beauty issues. The increasing demand for traditional herbal medicine products motivates the industry to improve production efficiency, prioritizing effective management and optimal utilization of raw material stocks. This research aims to manage the production needs of traditional herbal medicine by identifying information needs and developing a Production Information System using the Laravel framework to meet industry needs. This research will evaluate the impact of the system on the production process and the management of raw material needs in the traditional herbal medicine sector. The expected results include a positive contribution to the industry, better production performance, and improved handling of raw material stocks. The integration of the Laravel framework is expected to improve production performance and provide features for the traditional herbal medicine industry. In conclusion, this research seeks to offer a customized and effective solution for the traditional herbal medicine industry, addressing the increasing market demand through the optimization of production processes and management practices.

1. Introduction

Herbal remedies combine the various therapeutic experiences of many past generations with the practices of indigenous medical systems. Which offers helpful recommendations for the choice, preparation, and use of herbal formulations for the management, control, and treatment of a variety of diseases [1]. Has the WHO established any particular standards for assessing the efficacy, safety, and quality of herbal remedies? Approximately 80% of individuals worldwide are thought to use herbal formulations as their primary method of healthcare [2]. Due to public interest in herbal medicines and its amazing acceptance for their helpful qualities with few or no side effects against a variety of difficult health-related issues, the traditional health care system is becoming more and more popular globally [3]. Indonesia has a long history of using a variety of plants, animals, and minerals in traditional medicine. However, the custom of using plants is the main foundation of the practice. In Indonesia, more than 2500 species are known to have therapeutic properties [4]. The traditional herbal remedies known as "jamu", a hereditary alternative medicine, were once consumed by Indonesians.

Jamu is still widely used for illness treatment and health maintenance. This is further supported by Indonesia's tropical climate, which contributes to its abundance of natural resources. Around 9.600 of the more than 30.000 plant species that occur in Indonesia are known to have pharmacological properties [5]. Various varieties of medicinal plants in Indonesia often utilized by inhabitants as herbal medicine [6]. One of the islands in Indonesia is Madura. Madura Island, which is included in the East Java province, has extraordinary wealth. The natural resources are very rich, supported by increasingly competent human resources. Madura Island has a very proud ancestral heritage, namely the legendary Madurese herbal heritage. Madurese herbs are found in several districts namely Bangkalan, Sampang, Pamekasan and Sumenep. Jamu Madura still survives in the era of the times [7].

Jamu is a traditional herbal drink made from natural ingredients, and there are still many people who choose jamu as a treatment option because it has the same efficacy as drugs in general. One of the herbs that is quite popular among the public is Madurese herbs. The popularity of Madurese herbal medicine has spread not only domestically but also abroad. This is inseparable from the variety of Madurese herbal products and their proven efficacy in terms of treating several health complaints. People often consume jamu for health purposes, such as to relieve fatigue, relieve pain and maintain stamina. In addition, jamu is also often used to prevent, treat and recover from diseases and maintain beauty in women [8]. Madurese herbs have been very famous since the time of our ancestors and have been passed down from generation to generation [9].

The high demand for Madurese herbal products is an opportunity for stakeholders of the Madurese herbal industry to develop their business. In addition, the relatively safe raw materials of Madurese herbal medicine because they come from spices without chemicals with few side effects, encourage Madurese herbal medicine producers to continue to innovate to provide alternative treatments to the community [10]. Sales of Madurese herbs are increasing. This has an impact on the number of products to be produced [8]. Production is the process of making goods to fulfill needs or add value to them. Activities that do not change the form of an object but increase its usefulness are referred to as service production. This is referred to as service production. On the other hand, activities that increase the utility of an object by changing its form are referred to as production of goods [11].

As production increases, more and more raw materials are required. In order not to disrupt the production process or accumulate in the warehouse, companies must be able to clearly identify the amount of raw material stock they need. The stock of raw materials must be able to meet the number of goods to be produced within a certain period of time. There must be a certain scale for the amount of raw materials used and the minimum amount must be available until it is known when the reorder point is [11]. To support the production management process, an information system is needed that can reduce existing constraints and facilitate management in identifying and analyzing problems and making decisions appropriately and quickly in managing the production process [12].

In this research, a traditional herbal medicine production information system is built that contributes as a solution for herbal medicine producers in managing the production process of their products to run effectively and efficiently. This production information system is developed through a prototyping methodology approach, where this method uses an initial model or prototype to understand, evaluate, and test the system before it is fully built. The prototyping model is a technique for gathering certain information about user information needs quickly. It focuses on presenting those aspects of the software that will be visible to the customer or user. The prototype will be evaluated by the customer/user and used to refine the software development requirements [13]. Prototyping allows interaction between developers and users to identify needs and problems, and make necessary changes before the final system is developed. This production information system will include several modules that can help traditional herbal medicine producers in managing the production process. The tool used in the development of this production information system is PHP-based Laravel and uses a design pattern MVC (Model-View-Controller). The Model-View-Controller (MVC) framework Laravel, which is based on the Hypertext Preprocessor (PHP), enables developers to create reliable and secure web applications. Laravel offers a number of packages and APIs to integrate and facilitate the work of developers and apps. PHP is used to install Laravel. The project was ran using Composer, which also used certain actual commands to create various models, controllers, and services. Laravel makes it possible to use AngularJS and Bootstrap. The user interface, as a front-end technology, is represented by the developer's preferred excellent layout. The root folder of the project structure is where all Laravel projects operate. The composer command or a zip file can be used to install the Easy Laravel project [14].

2. Methods

This research was conducted with a literature study to obtain data and information about herbal medicine in Madura. Prototyping begins with requirements gathering, involving developers and system users to determine the objectives, functions and operational needs of the system [15]. The steps in prototyping in Fig. 1 are as follows :

1. Needs Gathering.
2. Fast design process.
3. Building a prototype.
4. Evaluation and improvement.

Gathering needs involves a meeting between the developer and the customer to determine the overall purpose of the software. In collecting these needs, interviews and field observations were conducted with Madurese herbal medicine producers in Bangkalan, Sampang, Pamekasan, and Sumenep. This interview was conducted to obtain data related to the production process, such as data on raw materials for each herbal medicine, raw material suppliers, quantity of raw materials, number of workers, and others; identifying needs in the form of an outline of the basic needs of the system to be created. Design focuses on the representation of aspects of the software from the user's point of view; this includes input, process and output formats. Rapid design leads to the construction of a prototype, the prototype is evaluated by users and design analysts and used to adjust the requirements of the software to be developed. The prototype is set up to meet the needs of the user, and at that time the developer understands more clearly and in detail what he needs to do. After the four steps of prototyping have been carried out, the next step is the actual creation or design of the product [16]. The evaluation method is testing, namely black box testing. Black box testing is a software testing method that focuses on checking its functionality without paying attention to its internal structure or program code. Each module in the form of functionality of the information system will be tested with several input scenarios and how the outputs or responses from the system.

This model enables the creation of software prototypes that act as intermediaries between developers and users in the development of information systems. Prototypes are early versions of software created to demonstrate concepts, test various design options, and identify and solve emerging problems [17].

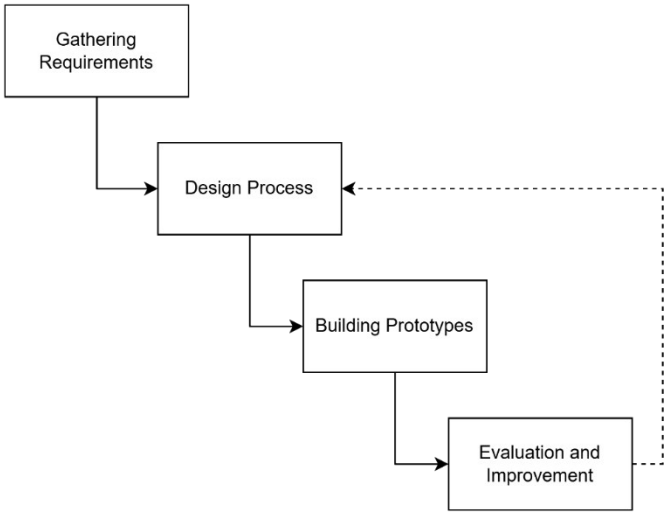

Fig. 1. Production Information System Development Method

3. Results and Discussion

3.1. Use Case Diagram

UML (Unified Modelling Language) is a visual modelling technique for object-oriented system design and a standard language for visualizing, designing, and documenting software systems [18].

Use Case is a scenario description of the interaction between the user and the system [19][20]. A Use case diagram describes the relationship between actors (users) and the activities they can perform on the system. The following is a Use case diagram that shows the role of actors in their interactions with the system. In Fig. 2 there is a use case involving two actors, namely admin and user. This use case allows the admin to manage the production and product information of traditional herbal medicine, while the user can see the production of traditional herbal medicine.

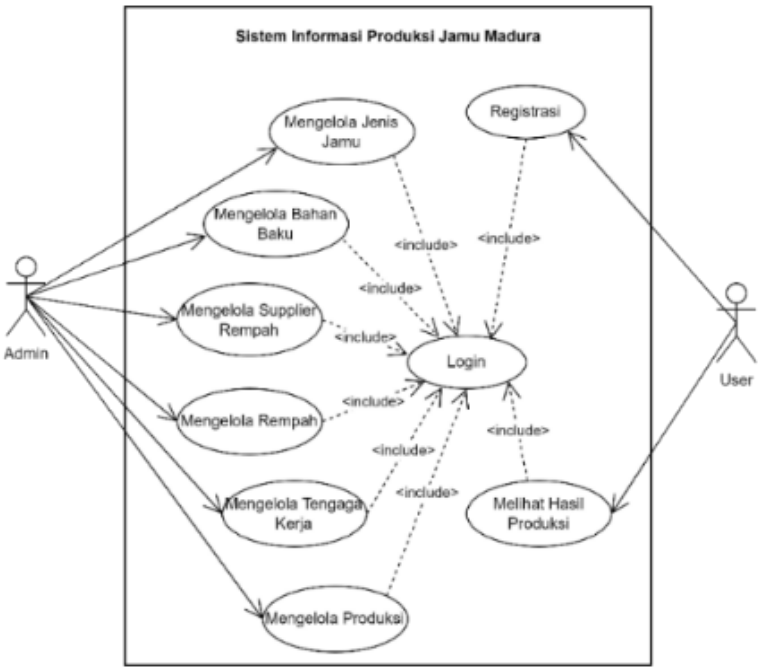

Fig. 2. Use Case Diagram

3.2. Database Design

A. CDM (Conceptual Data Model)

Fig. 3 defines the main entities (such as tables in a database) and the relationships between them. The CDM is used to communicate with non-technical stakeholders and ensure that the data structure reflects the overall business needs.

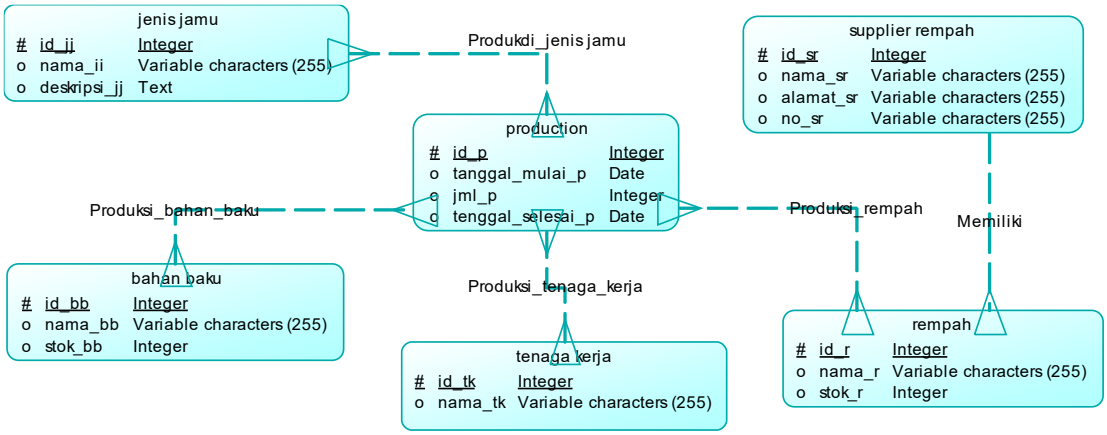

Fig. 3. CDM

B. PDM (Physical Data Model)

In Fig. 4, the PDM takes into account technical details such as column data types, indexes, foreign keys, and the physical layout of data within the database. The PDM also describes how data will be stored, indexed, and accessed in the physical database.

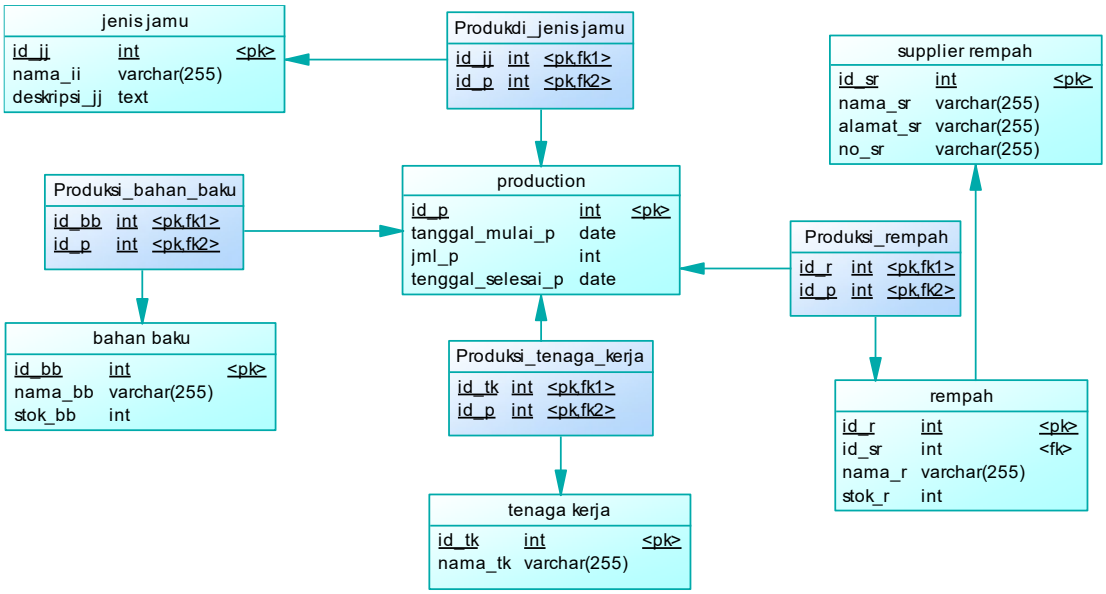

Fig. 4. PDM

3.3. Use Interface Implementation

Interface is one of the services provided by the information system as a means of interaction between users and the information system. The following is the interface of the traditional herbal medicine production information system:

A. Home Page

In Fig. 5 is a view of the main page of the traditional herbal medicine Production information system, where on this main page displays the login and footer for information on social media addresses and system makers.

Fig. 5. Home Page

B. Login Form

In Fig. 6 is the login view of the admin and user. On this page the admin and user are asked to enter an email and password, if the email and password are available in the database then the admin will enter the admin page and the user will enter the user page. There is a registration menu, for users, if they don't have an account then they are asked to register first.

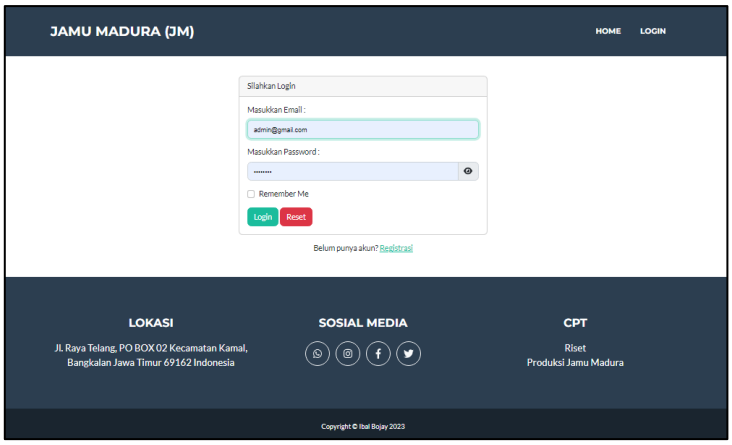

Fig. 6. Login Form

C. Registration Form

In Fig. 7 is a registration menu display where the user is asked to enter a name, email and password, if the user has registered then the user can log in.

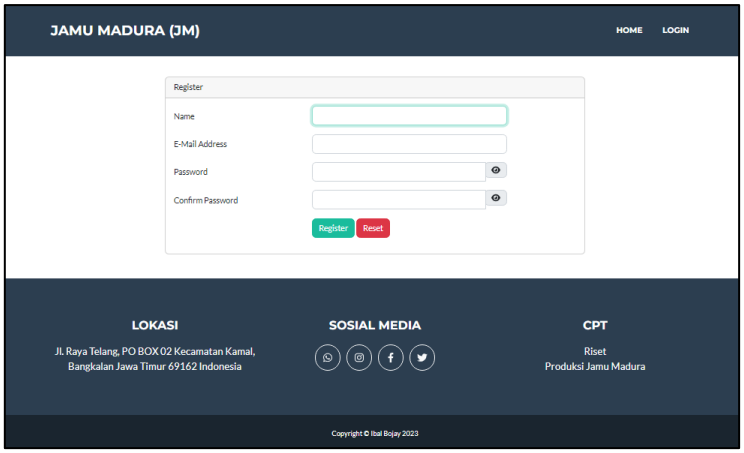

Fig. 7. Registration Form

D. Add Type of Herbal Medicine

In Fig. 8 is a display of the add type of herbal medicine form where in this form the admin is asked to enter the type of herbal medicine to be produced or the name of the herbal medicine to be produced.

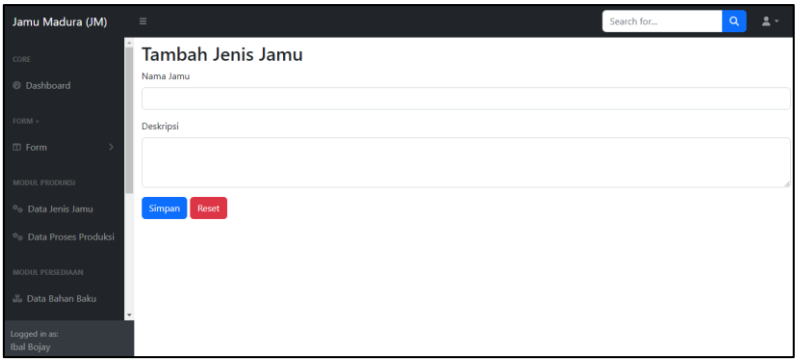

Fig. 8. Add type of Herbal Medicine

E. Add Raw Material

In Fig. 9 is a display of the added raw material form where in this form the admin is asked to enter non-spice raw materials that will be produced.

Fig. 9. Add Raw Material

F. Add Supplier Data

In Figure 10 is a display of the add spice supplier form where in this form the admin is asked to enter the spice supplier data that will be used or to find out which spices are from which suppliers.

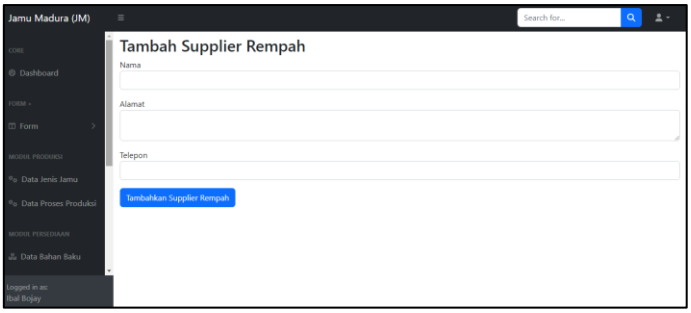

Fig. 10. Add Supplier Data

G. Add Herbs Data

In Fig. 11 is a display of the add spice form where in this form the admin is asked to enter spice data and select the spice supplier that has been entered in Figure 10.

Fig. 11. Add Herbs Data

H. Add Labor

In Fig. 12 is a display of the add labor form where in this form, the admin is asked to enter the name of the labor.

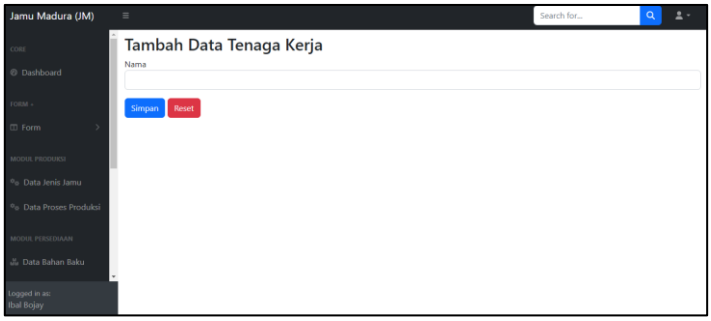

Fig. 12. Add Labor

I. Production Form

In Fig. 13 is a display of the production form where in this form, the admin is asked to enter the data that has been input earlier, such as the admin can choose the start date of production, the admin can choose the type of herbal medicine, the admin can choose non-spice raw materials, the admin can choose spices, the admin can choose labor, the admin can enter the desired amount of production, and finally the admin enters the production completion date.

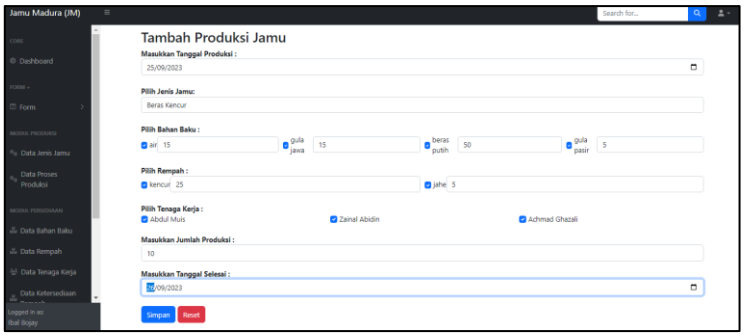

Fig. 13. Production Form

J. Production Table

In Fig. 14 is a table display for production where this table displays the production results in the admin in Fig.13.

Fig. 14. Production table

K. User Page

In Fig. 15 is a table display for production where this table displays the production results in the user entered in Fig. 13.

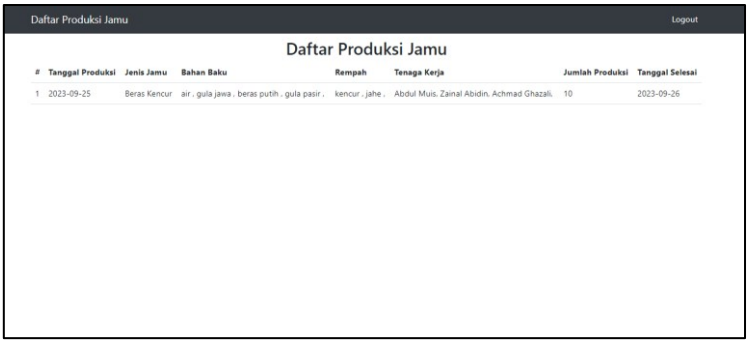

Fig. 15. User Page

3.4. System Testing

Testing is done by applying the Blackbox Functional Testing method to ensure that the functional program of the traditional herbal medicine production website has functioned as expected [21]. The results of the test can be seen in the table below:

A. Home Page Testing

Table 1 is the test result of the main page of the herbal medicine production information system. In the table, each functionality has been tested and works according to user needs. Starting from displaying the header, displaying Madurese herbal medicine production website information, and displaying the footer.

Table 1. Home Page Testing

No	Functionality	Description
1	Header Display	Succeed
2	Display the website information of traditional herbal medicine production	Succeed
3	Footer Display	Succeed

B. Register and Login Testing

Table 2 is the test result of registering and logging in the traditional herbal medicine production information system. In the table, each functionality has been tested and works according to user needs. Starting from entering username and password, submitting and processing the register formular, redirecting users according to access rights, and logging out.

Table 2. Register and Login Testing

No	Functionality	Description
1	Input username and password	Succeed
2	Submit the register form	Succeed
3	User redirect based on privilege	Succeed
4	Logout	Succeed

C. Herbal Medicine Type Testing

Table 3 is the test result of the herbal medicine type page or herbal medicine name on the traditional herbal medicine production information system. In the table, each functionality has been tested and works according to user needs. Starting from entering the type of herbal medicine or herbal medicine name and displaying the type of herbal medicine or herbal medicine name.

Table 3. Herbal Medicine Type Testing

No	Functionality	Description
1	Input herbal medicine name and type	Succeed
2	Display herbal medicine name and type	Succeed

D. Non-Herbs Raw Materials Testing

Table 4 is the test result of the non-spice raw material page on the traditional herbal medicine production information system. In the table, each functionality has been tested and works according to user needs. Starting from entering raw materials and stock and displaying raw materials.

Table 4. Non-Herbs Raw Materials Testing

No	Functionality	Description
1	Input raw material and stock	Succeed
2	Display raw material	Succeed

E. Herb Supplier Testing

Table 5 is the test result of the spice supplier page on the traditional herbal medicine production information system. In the table, each functionality has been tested and works according to user needs. Starting from entering the name of the spice supplier and displaying the name of the spice supplier.

Table 5. Herbs Supplier Testing

No	Functionality	Description
1	Input the name of herbs supplier	Succeed
2	Display the name of herbs supplier	Succeed

F. Herbs Testing

Table 6 is the test result of the spice page on the traditional herbal medicine production information system. In the table, each functionality has been tested and works according to user needs. Starting from entering the name of spices and stock, entering the name of the spice supplier from the spice supplier table, and displaying spices and spice suppliers.

Table 6. Herbs Testing

No	Functionality	Description
1	Input herbs name and stock	Succeed
2	Input herbs supplier name	Succeed
3	Display herbs name and supplier	Succeed

G. Labor Testing

Table 7 is the test result of the labor page on the traditional herbal medicine production information system. In the table, each functionality has been tested and works according to user needs. Starting from entering the name of the workforce and displaying the name of the workforce.

Table 7. Labor Testing

No	Functionality	Description
1	Input the name of labor	Succeed
2	Display the name of labor	Succeed

H. Production Testing

Table 8 is the test result of the production page on the traditional herbal medicine production information system. In the table, each functionality has been tested and works according to user needs. Starting from entering the production start date, selecting and entering the name of the herbal medicine to be produced, non-spice raw materials, spice raw materials, labor, production amount, production completion date and displaying production results.

Table 8. Production Testing

No	Functionality	Description
1	Input the production start date	Succeed
2	Select and enter the name of the herbal medicine to be produced	Succeed
3	Selecting and entering non-spice raw materials to be produced	Succeed
4	Selecting and entering spices to be produced	Succeed
5	Selecting and entering the workforce to be produced	Succeed
6	Enter the quantity of production to be produced	Succeed
7	Enter production finish date	Succeed
8	Displays production results	Succeed

4. Conclusion

This research has identified the information needs in the production process of traditional herbal medicine and designed a Production Information System that fits the needs and is user-friendly using the Laravel framework. The use of this information system can have a positive impact on the Madura Jamu industry, including improved production processes, better organization of raw material needs, improved product quality, better customer service, and faster decision making. With an integrated production information system, traditional herbal medicine producers can face the challenges of managing increasing production and meeting growing market demands. The integration of the Laravel framework in the development of information systems can provide advantages in terms of performance and data security. This research is expected to make a positive contribution to the traditional herbal medicine industry in improving the performance of the jamu production process. In addition, this solution can also have the opportunity to increase herbal medicine production, increase the income of traditional herbal medicine producers, expand the network of herbal medicine producers and herbal medicine consumers, and increase herbal medicine orders online and answer the development challenges faced by the industry in the modern era. For future development of the

system, it can be integrated with e-commerce and a system that can recommend traditional herbs according to user needs.

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