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Website-Based Kakaomu Application Development

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ABSTRACT

The development of digital technology, especially in artificial intelligence (AI), has brought about major changes in various sectors of life, including agriculture. AI allows agricultural activities to be carried out more efficiently, accurately, and based on data. One of the agricultural commodities affected by this progress is cocoa. As one of the largest cocoa producers in the world, Indonesia has a great opportunity to develop this sector. However, the challenges in the field are still quite complex, especially in areas such as Pongo Village and North Luwu Regency. Cocoa farmers in this area face various problems, such as *Helopeltis* spp. pest attacks, declining plantation productivity, lack of market information, and lack of a comprehensive cocoa product tracking system. These problems result in suboptimal harvests and difficulty competing in the global market. To answer this challenge, the development of technology-based solutions is very important. One of the proposed innovations is the Kakaomu web application, which utilizes artificial intelligence to assist farmers in various aspects of agriculture. The main features of this application include pest identification and control, monitoring current market prices, recording production results, and a digital traceability system from the plantation to the end consumer. With the adoption of this technology, cocoa productivity, efficiency, and quality can increase significantly. In addition, this can also strengthen Indonesia's cocoa position in the world export market and encourage more modern and sustainable agriculture.

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INTRODUCTION

In today's digital era, technological developments focusing on artificial intelligence are increasingly influential in facilitating various human activities. Artificial intelligence continues to develop and strives to improve its ability to support efficiency and effectiveness in every action to produce optimal results using minimal energy. This development starts with basic needs in everyday life and ends with being able to meet the level of individual satisfaction and social needs. Over time, technology continues to experience rapid progress, from the agricultural and industrial eras to the information and communication era that has changed almost every aspect of life (Ardiansyah, 2023). This change has a major impact on social, economic, and cultural fields, encouraging individuals to utilize technology in various dimensions of life. Thus, a digital-based lifestyle is increasingly dominant, allowing individuals to carry out multiple



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activities anytime and anywhere without any limitations of space and time. (Danuri, 2019).

Rapid technological advances and digital transformation, especially in the agricultural sector, have experienced significant changes, especially in determining quality harvests. Traditional methods have evolved into digital platforms through artificial intelligence, namely AI, allowing farmers to combine and optimize production more accurately, replacing traditional methods with more efficient digital platforms.(Putra et al., 2023).

In Indonesia, cocoa is one of the leading commodities that significantly impacts the national economy. In addition to providing economic benefits, cocoa also has the potential to drive regional development and the growth of the agro-industrial sector, especially if managed sustainably. Indonesia is one of the countries with the largest cocoa plantation areas in the world and is ranked third as the largest cocoa producer globally, after Ivory Coast and Ghana (Lestari, 2024). Therefore, the cocoa industry in Indonesia has quite an attractive competitive advantage. Cocoa is the main raw material in making chocolate and various luxury food products. However, during the global pandemic, the demand for chocolate and its derivatives has decreased significantly (Ardiansyah, 2023). Similar conditions are also felt by cocoa farmers in North Luwu due to pest and disease attacks and switching to other commodities.(Wijayati et al., 2022). The main problem experienced by farmers today, precisely in the North Luwu Regency, Masamba District, Pongo Village, is that pests that often attack cocoa plants are borer pests/Helopeltis spp. Signs of this pest attack are visible on cocoa fruit in light brown concave spots, which turn blackish over time. (Lea et al., 2024).

Previous research revealed that the cocoa processing industry in North Luwu has great potential, supported by the availability of abundant cocoa raw materials, increasing market demand for local chocolate products, and support from the local government. Cocoa production faces challenges in the form of decreased yields due to pest attacks, diseases, and lack of traceability systems. (ICRAF, 2023). This problem is also experienced by the Masagena Farmers Cooperative, which since 2007 has assisted cocoa farmers and fermented cocoa beans to increase their selling value. However, the number of cocoa beans received by the cooperative has decreased as farmer production has decreased. If not addressed immediately, the sustainability of the cocoa sector in North Luwu could be threatened. One solution is implementing smart farming based on artificial intelligence (AI), namely the Cocoamu application website, to manage pests, diseases, price information, and traceability to meet export standards.(Alfian, Wahida, et al., 2024; Alfian, Siswannto, et al., 2024).

LITERATURE REVIEW

The rapid development of internet-based technology applications at this time has resulted in many information technology applications emerging. One of the currently popular applications is the website. In general, a website is a collection of pages that present information and can be accessed via devices connected to the internet. Web-based applications offer various advantages, such as ease of access, efficiency in disseminating information, and compatibility between multiple platforms. Laravel provides ease and efficiency in building applications with a neat and modular structure. By utilizing websites as a medium for delivering information, the productivity of business actors and agencies can increase because the web facilitates communication, collaboration, and distribution of information.(Ramadhan et al., 2024). An information system is a collection of computer-based and manual components designed to collect, manage, and present data into useful information for users in an organization. In its application, information systems are highly dependent on software and hardware, including a database management system. One of the widely used database



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management systems is MySQL. MySQL is popular because it uses the easy-to-understand SQL (Structured Query Language) to access and process data. In addition, MySQL is open source and distributed under the GNU General Public License (GPL), so it can be used freely without having to pay a license, except for certain versions, such as Windows, which are shareware. This ease and flexibility make MySQL the main choice in developing information systems (Andoyo & Sujarwadi, 2021).

In creating the Kakaomu website service system, Laravel is often chosen because it can handle data flexibly, maintain data security, and is easy to connect to other services. This framework also helps speed up application creation and make operations more efficient. In addition, Laravel has a large, active community, making it easy for developers to learn and solve technical problems. Laravel is one of the most popular PHP Frameworks for building website-based applications (Sinlae et al., 2024). This framework is designed to help developers build applications faster, more efficiently, and more easily while maintaining high quality and security standards. Laravel is based on the MVC (Model-View-Controller) architecture, which separates application logic, views, and data management into organized parts. (Syarif & Risdiansyah, 2024).

*Framework*It offers a variety of built-in features that make application development easier, such as routing, authentication, templating system, ORM (Eloquent), database migration, and many more. (Handika & Purbasari, 2022). Laravel is designed to simplify the development process by providing modern tools and libraries so developers can focus more on the application's business logic without having to build everything from scratch. Laravel is also one of the Frameworks that can help developers maximize the use of PHP in the website development process. In addition, Laravel also has several superior features, such as template engines, routing, and modularity (Aipina & Witriyono, 2022).

METHOD

A website or application must be implemented using a method that allows the design to run smoothly. (Maulida, 2022). This development research (Research and Development or R&D) aims to produce a website-based application, namely Kakaomu. The development research method designs, implements, and tests applications according to user needs. In this study, the approach used is the Prototyping software development model (Syarif & Risdiansyah, 2024). This model was chosen because it allows for iterative and participatory system development so that the results of website-based applications can better meet user needs. The Prototype Model is one of the models used in software development. This model is a breakthrough in the development or creation of software. (Ibrahim et al., 2021).



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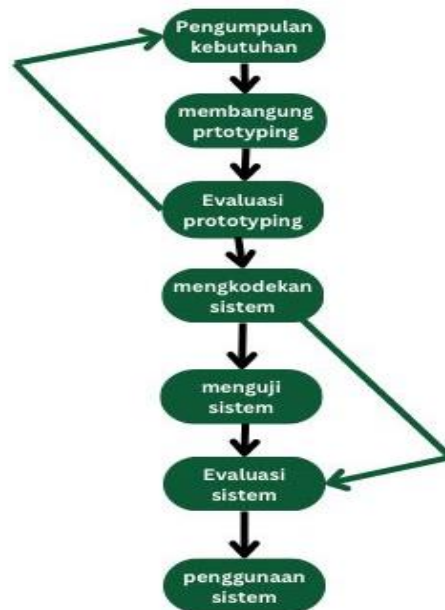


Figure 1. Prototype Model

The steps in the Prototype Model are:

1. Collecting developer and user needs together explains in detail the software format to be built so that the needs and system to be created can be known.
2. Making Prototyping or Prototype: In making a prototype, a temporary design is created to focus on customer presentation, for example, in this process, namely making input and output formats.
3. Prototyping Evaluation This stage process is applied to the client to find out whether the prototyping made is in accordance with the customer's needs and desires. If it is not in accordance with this, the prototyping made temporarily will be reviewed by repeating the steps that have been taken previously. But if it is following this, then the next step can be implemented.
4. System Coding At the coding stage, the approved prototype will be translated into a programming language the developers and users agree upon.
5. System Testing This stage includes testing the developed system. After the software is ready to use, it is important to test it before it is applied in the business process. The purpose of this testing is to reduce the possibility of errors in the software. Testing uses various methods, including architectural testing, path basis, black box, and white box.
6. Evaluation System At this stage, the client evaluates the developed system to ensure that it meets expectations. If the system is inappropriate, the developer will repeat the previous steps, namely steps 4 and 5. However, the final stage can be continued if the system is appropriate.
7. System Usage The system that has been developed and passed the testing process is now ready for users to use.(Syarif & Risdiansyah, 2024).

RESULT

The final result of this study shows that the KakaoMu application has been successfully developed in the form of a web-based system. The designed system is expected to operate effectively according to its function. It can be implemented in real terms to positively contribute to users' identification, monitoring, and tracking of the distribution of cocoa fruit. The following is a display of the main interface of several features contained in the KakaoMu website as follows:

Login Page

This page is the login screen of the Kakaomu application, where users are asked to enter a username and password to access their account securely. With a simple and clean design, users can easily understand and use the login form to enter the system or go to the registration page if they do not have an account.

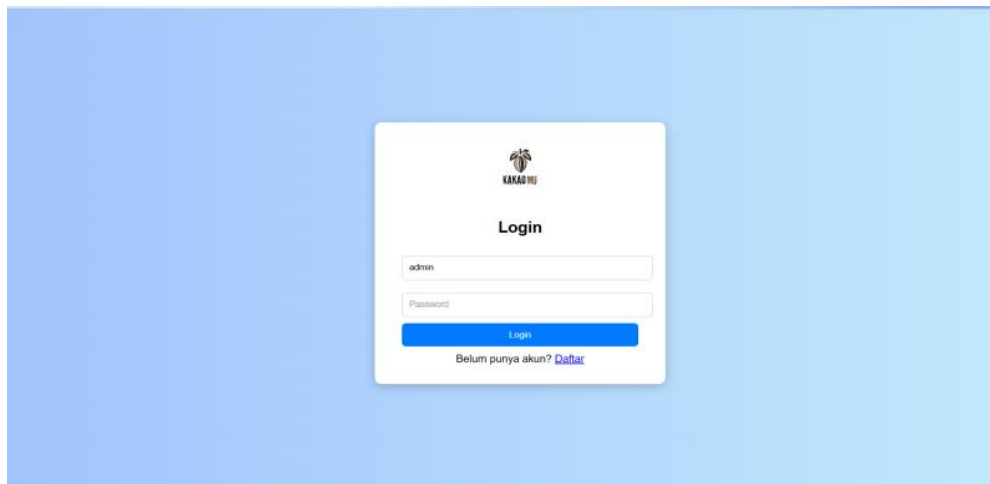


Figure 2. Login page view

Home Page View

This page is the main display of the KakaoMu website. Here, users can see various important information presented in graphical form. Some of the data displayed includes the cocoa fruit's condition, the disease diagnosis results, and the fruit distribution from farmers to buyers. This display is made simple and clear to make it easier for users to quickly understand and monitor all available data. In short, KakaoMu functions as an integrated platform that provides a comprehensive overview of the condition of cocoa fruit, its inspection history, and details of its movement from producer to consumer, all summarized in one informative and easily accessible display.

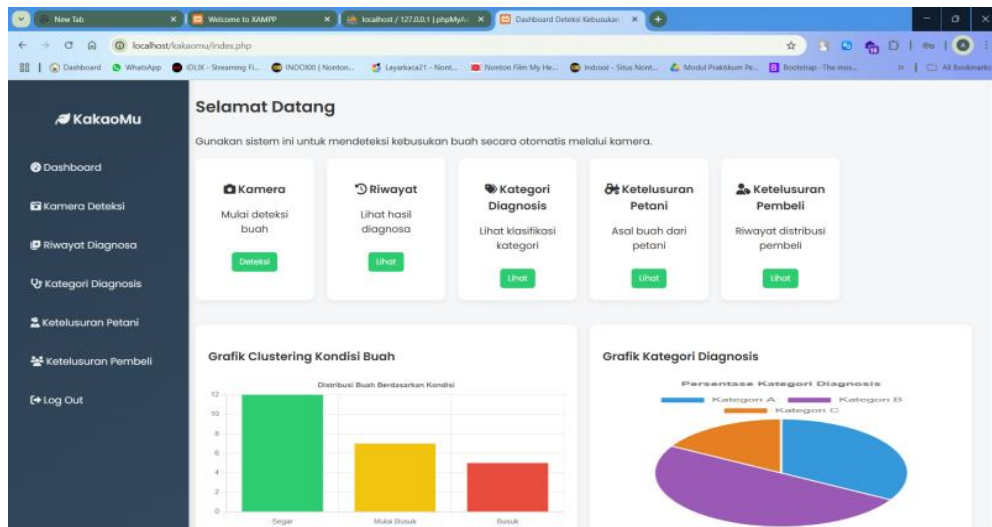


Figure 3. Home page view

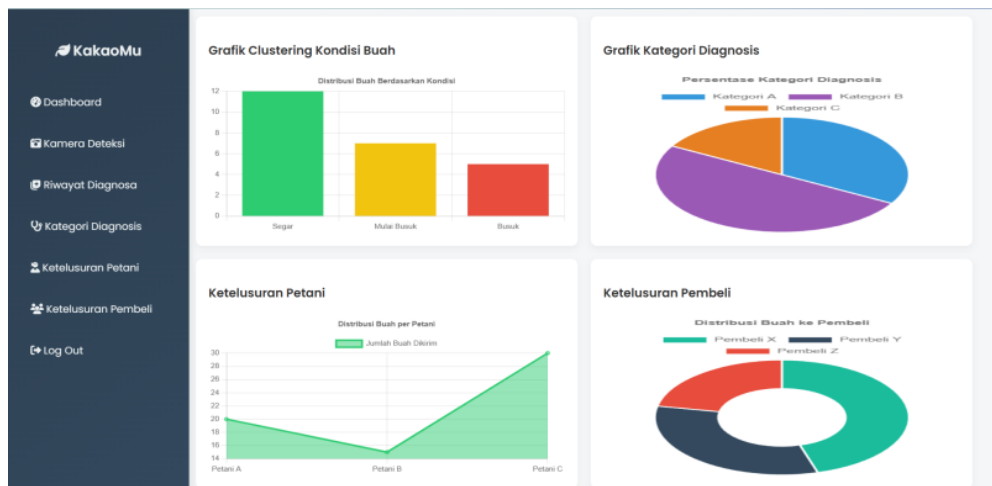


Figure 4. Home page view

Diagnosis Page View

On this page, users have two options to scan cocoa fruit: directly take a photo using the camera by pressing the "Take Image" button or upload an image already stored on the device via the "Choose File" button. Once the image is selected, the system will display a preview at the bottom. In the next step, users click the "Diagnose" button to start the automatic analysis process. Once the analysis is complete, the system will show the examination results, including the condition of the cocoa fruit, whether it is still fresh, has mild rot, or is severely damaged. In addition, the system is also able to identify pests or diseases that may attack the cocoa fruit. With this information, users can immediately take appropriate preventive or handling steps.

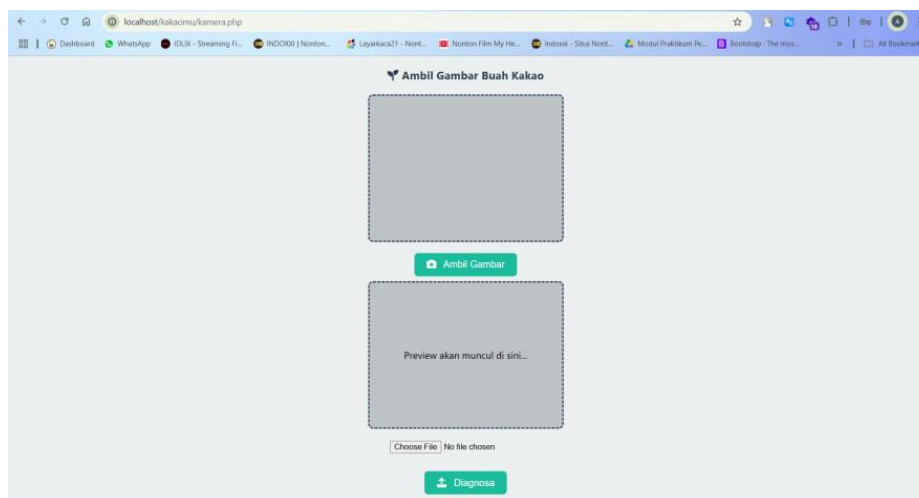


Figure 5. Diagnosis page view

System testing

The KakaoMu website, which automatically detects diseases and rots in cocoa fruit using camera technology, has been implemented in a field trial in Pongo Village. Based on the test results, this system facilitates taking pictures and displaying previews before analysis. Its ability to identify fruit conditions, provide accurate diagnosis results, and present comprehensive visual data including fruit status, type of diagnosis, and distribution flow from farmers to consumers demonstrates effective performance. This innovation is very helpful in detecting rot problems while increasing the efficiency of quality monitoring and strengthening transparency in the cocoa distribution chain in the region.

DISCUSSION

The website-based KakaoMu application has provided an effective digital solution for business processes that were previously carried out manually. This website offers users and business owners easy access through features such as secure login, cocoa fruit detection using a camera, uploading images from the gallery, and presenting visual data in diagnostic graphs and product traceability. The simple and informative interface makes it easy for users to diagnose fruit conditions, track farmer and buyer history, and understand fruit distribution visually. With these features, this website has succeeded in increasing operational efficiency, accelerating the data collection process, and supporting real-time information transparency. Overall, this application is worthy of use and has great potential to be further developed to support the digital transformation of the agricultural sector, especially for small business actors in the cocoa sector.

CONCLUSION

Implementing the KakaoMu website, which was built using the Laravel framework, helps the digitalization process of cocoa businesses in Pongo Village, Masamba District. This system replaces manual work methods so that recording, monitoring, and data management can be done faster, neater, and more efficiently. Key features such as user login, uploading cocoa fruit images, fruit condition detection, traceability graphs, and transaction history are very helpful for farmers and business actors to access information directly and easily. Laravel as a framework also provides advantages in terms of security and ease of application development in the future. Based on the trial results, this website is suitable for use and offers real benefits to the local community. Implementing the KakaoMu website in Pongo Village

shows that this system can be applied in other agricultural areas with similar conditions. Therefore, KakaoMu has the potential to be a digital solution for MSMEs in the farming sector who are facing the current technological era.

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