Designing Pomelo Citrus Farmers Logbook as a Solution for Monitoring Sustainable Agriculture in Pangkep Regency

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Abstract. This research aims to develop a pomelo orange farmer logbook as a solution for monitoring and managing sustainable agriculture in Pangkep Regency. Pomelo orange farming in Pangkep Regency has great potential, but still needs a more efficient and organised monitoring system. In this study, we propose the use of electronic logbooks to assist farmers in recording and monitoring their farming activities, including recording crop yields, providing post-harvest education and facilitating education on processed products. This research methodology applies an extreme programming approach to logbook development, with system testing using unit testing. The results of this research are expected to make a positive contribution to the development of more sustainable pomelo orange farming in Pangkep Regency. In addition, this research can serve as a model for other regions facing similar challenges in agricultural monitoring and efficient decision-making.

Keywords: Electronic Logbooks, Farmer, Monitoring System, Pomelo Citrus Farming.

1 Introduction

The burgeoning demand for sustenance in contemporary times has translated into the agro-industrial sector becoming a fundamental point of emphasis [1], [2]. Beyond merely serving as a source of food, agro-industry is also instrumental in bolstering economic prospects and fortifying the agricultural sphere [3], [4]. To surmount these obstacles, it is imperative to deploy a more streamlined, evidence-based, and productive strategy that maximises output and facilitates sound judgments.

Efficient and effective management of agricultural resources is a crucial aspect of agro-industrial development [5], [6], especially in the cultivation of Pangkep citrus crops, commonly known as pomelo oranges. Pomelo orange crops have vast potential in terms of production and economic value and can make a significant contribution to the agro-industry [7], [8], [9], [10]. However, the challenge of managing optimal and sustainable pomelo orange cultivation remains a pressing issue.

Rapid technological advancements have revolutionised the documentation paradigm by substituting the manual process of paper-based or document-based recording with a more efficient method [11], [12], [13]. An extensively used manual recording process is the

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Logbook, also referred to as an event logbook. It is a systematic document that captures the daily activities, events, and occurrences within a professional environment. The aim of this study is to create a Logbook system to replace the previous manual paper-based process, with an improved approach utilizing the Pangkep Orange Logbook System. This system has been custom-designed to manage agricultural harvest data, focusing on pomelo oranges, with increased efficiency and accuracy.

This study aims to tackle the aforementioned issues by developing the Pangkep Citrus Logbook System, an innovative tool for keeping records and tracking progress. This logbook is anticipated to assist the decision-making process in Pomelo Orange agro-industry development in Pangkep by providing precise and pertinent data to industry stakeholders. As a result, incorporating this technology will increase the accuracy and usefulness of data in the industry.

The researcher intends to design a Pangkep citrus logbook system as a solution to address the aforementioned issues objectively. The system will contain simple yet effective tools for Pangkep farmers to document and monitor their farming activities. Besides, it will offer reporting capabilities to enable farmers to share details with stakeholders, thus improving transparency in the citrus supply chain. This solution is expected to help maintain agricultural sustainability and provide a solid basis for more informed decision making in agro-industrial development in Pangkep district.

2 Method

The research utilises Extreme Programming (XP), a methodology for software development that aims to enhance software quality by accommodating changes and customer needs [14], [15], [16]. XP increases productivity and introduces checkpoints for adopting new customer requirements. Extreme Programming (XP) comprises several stages including planning, such as comprehending user criteria and developing plans, prototyping and display designing, coding integrated with testing being the final stage. Figure 1 illustrates XP methodology stages.

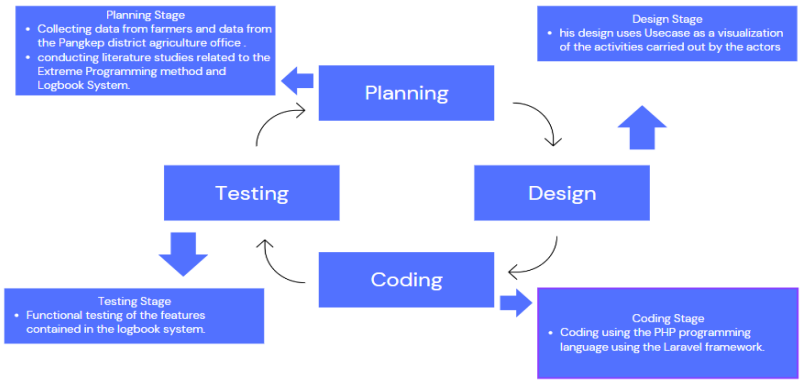


Figure 1. Stages of the Extreme Programming Methodology

2.1 Planning

During the planning phase, we conducted data collection from both farmers and the Pangkep district agriculture office. Our objective was to identify the needs of users and employees who oversee crops. Additionally, we conducted a literature review concerning the Extreme Programming method and the Logbook System.

2.2 Design

Once the planning stage has been completed, the requirements for the fisherman logbook system can be designed. Usecase is utilised in this design as a means of visualising actor activities. Figure 2 illustrates how farmer actors are able to manage crops, receive education on pomelo cultivation and processed products from pomelo oranges. In contrast, admin actors can manage pomelo cultivation education data and pomelo processed products, as well as user management, farmer harvest management, and the monitoring and evaluation of farmer harvests.

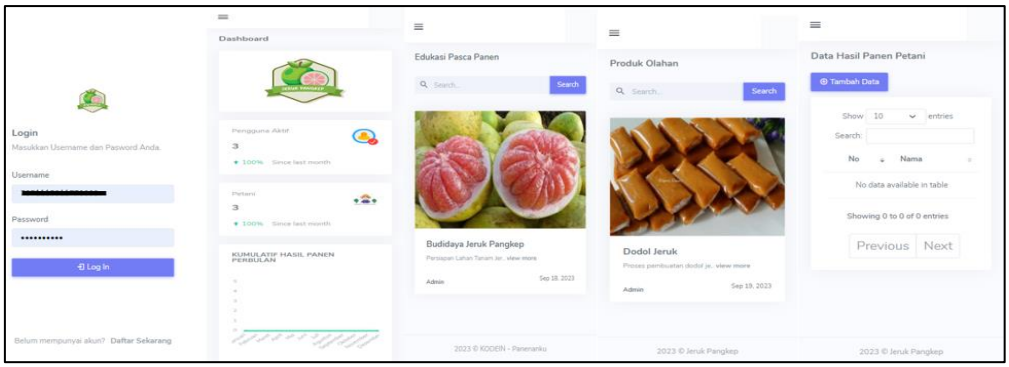
2.3 Coding and Test

After completing the design stage, the coding process begins. This involves using the PHP programming language with the Laravel framework. Additionally, the system undergoes functional testing to ensure readiness for use.

3 Result

3.1 User Interface

At this stage, the user interface of the Pangkep Orange Logbook System is displayed, representing the outcome of a multi-stage research process encompassing planning, design, and coding.



(a) (b) (c) (d) (e)

Figure 2. User interface of pangkep orange logbook (Farmer's)

Figure 2 part (a) illustrates the mechanism by which Farmers access the system. Users can register if they lack an account. Part (b) displays the harvested data on the user's dashboard page. Part (c) is dedicated to the cultivation education page for Pangkep oranges. Then part (d) sees educational information on processed products, and finally part (e) is a page for managing farmer harvest data.

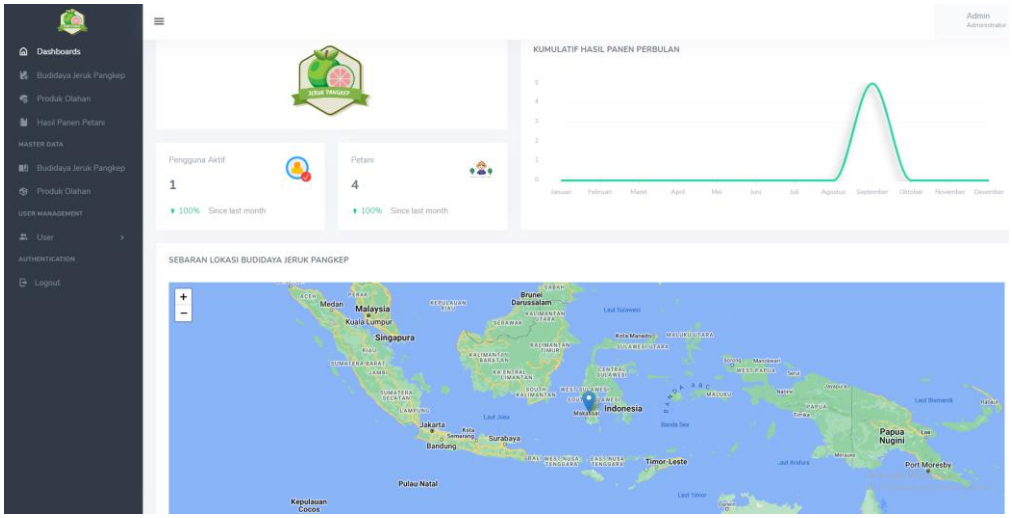


Figure 3. Pangkep orange logbook user interface (Admin)

Figure 3 shows the administrative interface and its functionality. In this system, the administrator can manage data inputted by fishermen. The objective is to create a decision support system for the development of the agro-industry by the local government.

3.2 Testing

During the assessment of this system using functional testing, the objective was to determine the efficacy of the Pangkep Orange logbook system's functional operations. Table 1

illustrates the outcomes of functional testing on each of the system's features, which were evaluated prior to user utilisation.

Table 1. Functional testing

Feature	Test Description	Expected Outcome	Test Result
Login Form	Entering a registered username and password from the database.	Valid users can log in, invalid users are denied access	Successful
Pomelo Citrus Cultivation Education Form	Entering a title, image, and description.	Education data is saved correctly	Successful
Processed Product Form	Entering a title, image, and description.	Product data is saved correctly	Successful
Farmer's Harvest Results Form	Testing the input of harvest data and photos.	Harvest data is saved correctly, photos are uploaded	Successful
Farmer Data Form	Entering full name, NIK, Address, and Password.	Farmer data is saved correctly	Successful
Admin Form	Entering full name, username, email, and password.	Admin data is saved correctly	Successful

4 Conclusion

Based on the research conducted, this study demonstrates that the Pangkep Citrus Logobook System employs the Extreme Programming approach, consisting of planning, design, coding, and testing phases. The system includes various features such as the Login Form, Citrus Pomelo cultivation education form, Processed Product Form, Farmer harvest form, and Farmer and admin data management form, all of which were put to the test for functionality and produced favourable outcomes. This study is intended to help improve the efficiency and productivity of pomelo orange cultivation, as well as to support more informed decision making in agro-industry development in Pangkep.

References

[1] K. Singh *et al.*, "Analysis of barriers for sustainable agro-food supply chain: an interpretive structural modeling and MICMAC approach," *Environ. Dev. Sustain.*, pp. 1–23, 2023.

[2] A. Kounani, A. Pavloudi, and S. Aggelopoulos, "Performance indicators of circular economy in the agriculture and food industry," *Environ. Syst. Decis.*, pp. 1–18, 2023.

[3] A. Faqih, R. Elizabeth, and D. H. Azahari, "The increasing of competitiveness of agro-industry products through institutional empowerment to support the achievement of sustainable agricultural development," *Int. J. Energy Econ. Policy*, vol. 10, no. 5, pp.

663–671, 2020.
[4] W. S. E. Y. W. Yusof, Z. Kassim, R. C. T. M. Abdullah, N. H. Rahaman, L. A. Saidi, and S. N. S. Ramlee, "Development of Digital Economy Strategy and Implementation Approach for Inclusive Growth of Agro-Food Industry," *Int. J. Adv. Res. Econ. Financ.*, vol. 4, no. 4, pp. 23–28, 2022.
[5] T. Setyaningrum, "Proceeding the 4th International Conference on Green Agro-Industry (ICGAI)," 2020.
[6] L. P. Rajan and K. S. Arunkumar, "Effective supply chain management for the agro industry: Prospects," in *Agricultural Sector in India*, Routledge India, 2023, pp. 311–320.
[7] E. Matei *et al.*, "Valorization of agri-food wastes as sustainable eco-materials for wastewater treatment: Current state and new perspectives," *Materials (Basel).*, vol. 14, no. 16, p. 4581, 2021.
[8] P. Khamsaw *et al.*, "Bio-Circular Perspective of Citrus Fruit Loss Caused by Pathogens: Occurrences, Active Ingredient Recovery and Applications," *Horticulturae*, vol. 8, no. 8, p. 748, 2022.
[9] E. Tsouko, S. Maina, M. Alexandri, H. Papapostolou, and A. Koutinas, "Recovery of Value-Added Products and Biological Conversion of Coffee and Citrus Processing Waste Using Green Technologies," *Green Chem. Agric. Food Prod. CRC Press Boca Raton, FL, USA*, pp. 111–149, 2023.
[10] X. Diao, I. Masias, and W. Y. Lwin, *Agri-food trade in Myanmar: Its role in Myanmar's future economic takeoff*, vol. 6. Intl Food Policy Res Inst, 2020.
[11] I. Spilnyk, R. Brukhanskyi, N. Struk, O. Kolesnikova, and L. Sokolenko, "Digital accounting: innovative technologies cause a new paradigm," *Indep. J. Manag. \& Prod.*, vol. 13, no. 3, pp. s215--s224, 2022.
[12] K. K. H. Ng, C.-H. Chen, C. K. M. Lee, J. R. Jiao, and Z.-X. Yang, "A systematic literature review on intelligent automation: Aligning concepts from theory, practice, and future perspectives," *Adv. Eng. Informatics*, vol. 47, p. 101246, 2021.
[13] P. Raj and P. E. David, *The digital twin paradigm for smarter systems and environments: The industry use cases*. Academic Press, 2020.
[14] A. Shrivastava, I. Jaggi, N. Katoch, D. Gupta, and S. Gupta, "A systematic review on extreme programming," in *Journal of Physics: Conference Series*, 2021, vol. 1969, no. 1, p. 12046.
[15] D. W. Sari and K. G. Ayu, "Developing BuJel Application Using Extreme Programming (XP) Methodology," *Int. J. Comput. Tech.*, vol. 8, no. 2, pp. 265–272, 2021.
[16] S. Rahayu, L. Fitriani, R. Kurniawati, and Y. Bustomi, "E-commerce based on the Marketplace in efforts to sell agricultural products using Xtreme programming approach," in *Journal of Physics: Conference Series*, 2019, vol. 1402, no. 6, p. 66108.