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Design and Analysis of a Flutter-Based Mobile Application for Palm Oil Monitoring

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***Abstract*—In the current era of digital transformation, it is essential to modernize data processing systems to improve operational efficiency and competitiveness across industries. However, PT Agro Sawit Musi Rawas still relies on outdated manual processes, resulting in reporting delays, inaccurate data, and difficulties in real-time performance monitoring. Therefore, the aim of this research is to design a comprehensive monitoring system specifically tailored to meet the unique operational needs of PT Agro Sawit Musi Rawas. The system criteria were identified through methods such as observations, interviews, and literature reviews, which provided valuable insights into the company's specific challenges and requirements. The system design incorporates data collection and analysis using the URS (User Requirement Specification) and UML (Unified Modeling Language) frameworks, ensuring it addresses the identified needs effectively. The design and analysis follow a structured and systematic process to develop an information monitoring system that enhances transparency, operational effectiveness, and efficiency. The findings reveal that the implementation of the proposed system can significantly improve reporting speed, data accuracy, and real-time monitoring capabilities. By adopting this monitoring system, PT Agro Sawit Musi Rawas can optimize reporting processes, facilitate real-time performance monitoring, and ultimately strengthen its competitive market position.**

***Index Terms*—Monitoring system, unified modeling language, user requirement specification, extreme programming, flutter.**

I. Introduction

PT Agro Sawit Musi Rawas is a prominent palm oil plantation company based in Musi Rawas, known for its high-quality products and commitment to operational excellence. The company's organizational structure includes a production unit, tasked with cultivating, harvesting, and processing palm oil into refined products, and a finance unit, which manages the company's financial operations with a focus on responsible fiscal management.

Despite its successes, PT Agro Sawit Musi Rawas faces significant challenges in integrating modern technology into its operations. Heavy reliance on manual data processing methods in areas such as palm oil production, sales, and financial management has led to inefficiencies and reporting delays that ultimately affect strategic decision-making and overall productivity. These outdated methods, commonly found in the palm oil industry, often lead to operational bottlenecks, impacting the speed and accuracy of reporting [1], [2]. Recent studies emphasize the importance of digital transformation and data modernization to enhance operational efficiency, noting that technological advancements are essential to overcoming these limitations in the sector [3], [4].

To tackle these challenges, PT Agro Sawit Musi Rawas is committed to developing a modern monitoring system that will increase data accuracy and support informed decision-making [5][6]. This advanced monitoring system is expected to improve the productivity, transparency, and competitiveness of palm oil operations by enabling faster, more reliable reporting. Industry experts advocate for such improvements, suggesting that implementing advanced monitoring systems is essential for maintaining competitiveness and boosting productivity within the industry. Upgrading its technological infrastructure will allow PT Agro Sawit Musi Rawas to streamline its reporting processes, strengthen market position, and improve operational efficiency. The planned system is set to transform how PT Agro Sawit Musi Rawas handles its operations, bringing the company in line with modern best practices in data management [7], [8].

II. Related Work

Recent advancements in the palm oil industry underscore the importance of technology integration to enhance operational efficiency. Implementing IoT (Internet of Things) devices within palm oil monitoring systems plays a critical role in improving data accuracy by automating data collection from

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multiple sources, which reduces human error. These devices also provide real-time data updates, enabling timely decision-making that is crucial for effective plantation management [9]. Additionally, cloud-based solutions allow centralized access to data, facilitating seamless, real-time monitoring across various locations and improving operational efficiency [10].

Predictive resource allocation and yield management enhance planning and resource utilization, ensuring that inputs are allocated efficiently to maximize productivity and minimize waste [11]. Additionally, automated financial management systems offer significant advantages in plantation management by reducing errors and expediting financial reporting processes. These systems improve the accuracy of financial data, enabling management to make better-informed decisions swiftly, ultimately supporting a more responsive and agile financial management structure [12].

Furthermore, digital transformation in the palm oil supply chain has shown marked improvements in transparency and traceability, helping companies achieve sustainability goals and boosting their market competitiveness [13]. Hybrid cloud infrastructures, offering greater flexibility and security, are especially suitable for managing large volumes of data typical in palm oil operations, supporting both scalability and critical data protection needs [14].

III. Research Method

Data collected through interviews and observations are analyzed using the URS (User Requirement Specification) methodology to generate a comprehensive document outlining the system's requirements, with emphasis on the needs of end-users. The URS method ensures that the system design aligns with actual user requirements by incorporating feedback during the design phase, resulting in a system that is both relevant and functionally effective for its intended users.

The URS, as shown in Table 1, is developed during the early stages of the system validation process, before the actual development begins, to provide a clear foundation for design decisions and minimize potential misunderstandings. Authored collaboratively by the system owner, key users, and the quality assurance team, this document serves as a vital reference for guiding the development process and validating that all user requirements are adequately addressed [15].

Engaging end-users from the initial stages and continuously gathering feedback throughout the URS preparation phase is critical to the system's success. As highlighted in Table 1, this approach enables the development team to gain user insights early on, enhancing the system's alignment with operational requirements. Through active end-user involvement, the development team can design a monitoring system that not only achieves operational objectives but also elevates user satisfaction and overall system efficacy, resulting in a practical and widely accepted solution [16].

The analysis of data management and reporting processes at PT Agro Sawit Musi Rawas outlines the current workflow for handling palm oil production data. The flowchart highlights key steps, identifying areas for optimization and potential efficiency improvements. Additionally, for aligning system design with user needs, ensuring the system meets operational expectations and industry best practices.

Table 1.
User Requirement Specifications (URS)

No	Requirements	System Requirement	Actor
1.	System Accessibility	The system should be compatible with various mobile devices, including Android and iOS	All Users
2.	Data Management	The system should locally manage and sync palm oil plantation data with a central server	Database Administrator
3.	Authentication	The system must support user login and role-based access control, online and offline	All Users
4.	Data Input	The system should have a user-friendly interface for entering palm oil sales data	Sales Staff
5.	Sales Data Verification	The system should verify sales data completeness before saving it	Management
6.	Sales Reporting	The system should generate sales reports in multiple formats, accessible online and offline	Management
7.	Data Visualization	The system should display charts and patterns in sales data	Management
8.	Data Management	The system should enable users to manage sales data both online and offline	Database Administrator
9.	Real-Time Data Updating	The system should update sales data in real-time when connected to the internet	Sales Staff
10.	Data Export	The system should export sales data in various formats (e.g., PDF, Excel) accessible online and offline	Management
11.	Data Security	The system should implement strong security measures for protecting data locally and during transmission	Security Administrator
12.	Internet Connectivity	The system should handle both online and offline scenarios with stable internet connectivity and offline capabilities	IT Support

Recent research underscores the role of Unified Modeling

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Language (UML) in visualizing system architecture and requirements through diagrams such as use case, class, and activity diagrams. While UML aids in illustrating system design, it is typically used within agile methodologies like Extreme Programming (XP) to enhance communication and effectively clarify design choices.

Extreme Programming (XP) is an adaptive, iterative development methodology that emphasizes short cycles and rapid responses to change. As illustrated in Figure 1, the core phases in XP—planning, design, coding, and testing—facilitate system development within a collaborative, responsive framework. Each phase contributes to continuous improvement and refinement, allowing teams to swiftly adapt to evolving project requirements [17]. The XP stages are shown in Fig. 1.

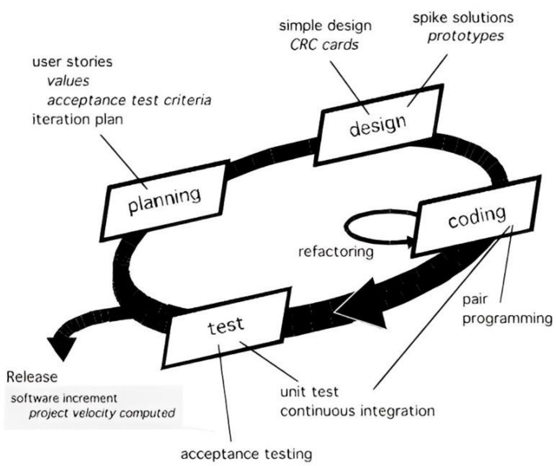

Fig. 1. Extreme programming.

The data below is based on the stages of Extreme Programming, a software development methodology that emphasizes flexibility, rapid iteration, and close collaboration with stakeholders. The methodology consists of several key stages, each contributing to the overall effectiveness and efficiency of the development process. These stages include:

1) *Planning*
   This phase begins with a thorough assessment of user requirements for the new system. Data is carefully collected through methods such as observation and interviews to define business needs and the required software components. Effective planning is essential, as it establishes the system's objectives, main features, and functional expectations, ensuring alignment with user needs throughout development.
2) *Design*
   In this phase, the system's architecture is crafted with precision using modeling tools like Unified Modeling Language (UML). UML diagrams illustrate the system's components, their interactions, and the structural framework. This visualization aids in organizing the development process, guaranteeing that the design is cohesive and meets the outlined specifications.
3) *Coding*
   The coding phase transforms design specifications into functional code, creating user interfaces with tools like Figma and developing the system with languages such as Dart and Kotlin, valued for their advanced capabilities in building reliable applications. Supporting tools, including the CodeIgniter framework and MySQL database, may also be used to ensure adherence to design plans, enabling seamless integration and full functionality.
4) *Testing*
   This phase rigorously assesses the system's performance to confirm it functions as expected. Techniques like black-box testing, where evaluations focus on system outputs rather than internal processes, validate that all features meet the specified requirements. This ensures the system operates efficiently and is ready for deployment [18].

IV. RESULT

A comprehensive and in-depth analysis of data management practices and palm oil production reporting at PT Agro Sawit Musi Rawas has uncovered the current methods of reporting: The flowchart, as depicted in Fig. 2, meticulously illustrates the existing processes for managing and reporting production data, emphasizing each procedural step and identifying potential areas for improvement, optimization, and refinement to enhance overall efficiency and accuracy.

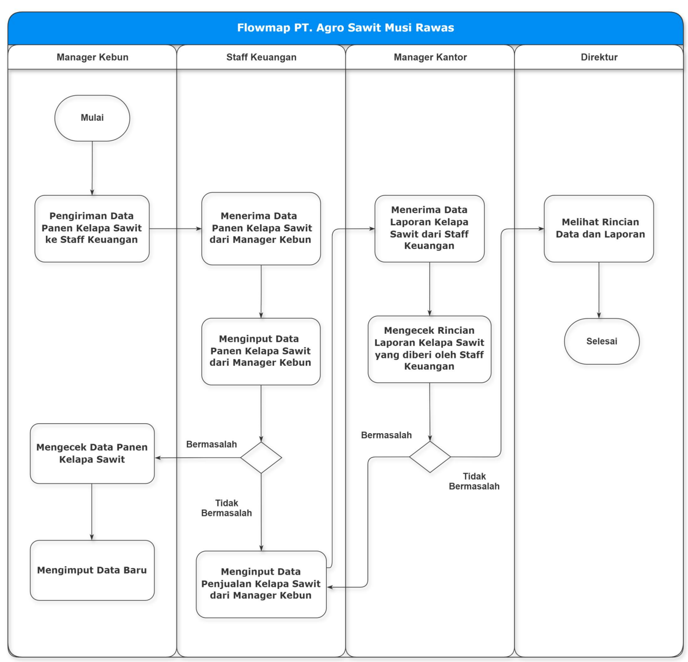

Fig. 2. Palm oil production flowmap.

Fig. 2 presents a comprehensive overview of the documentation required in the palm oil sales procedures at PT. Agro Sawit Musi Rawas. Each document in the workflow is detailed, emphasizing its function, order, and role in maintaining a streamlined sales process. This analysis highlights the contribution of these documents to effective sales management, establishing a robust framework for seamless execution, as shown in Table 2 and Table 3 for evaluation.

Table 2.
Document Analysis

No	Document	Description	
1.	Harvest Data Palm Oil	Function	Stores information and data related to palm oil received from the plantation manager.
		Duplicate	1
		Data Flow	Information and data on palm oil received from the plantation manager are conveyed to the finance staff.
2.	Inventory Data	Function	Stores information and data related to palm oil inventory, fertilizers, and other materials.
		Duplicate	1
		Data Flow	Inventory information and data on palm oil, fertilizers, and other materials received from the finance staff and plantation manager
3.	Sales Data	Function	Stores information and data related to palm oil sales, including date, weight, price, and buyer information.
		Duplicate	1
		Data Flow	Financial information and sales data on palm oil received from the finance staff and conveyed to the office manager.
4.	Production Report	Function	Provides data and information on palm oil production, including quantity and analysis.
		Duplicate	1
		Data Flow	Production - related data and information processed from harvest data is sent to the plantation manager.
5.	Sales Report	Function	Contains information related to palm oil sales, including quantity, value, and sales details.
		Duplicate	1
		Data Flow	Data and information on palm oil sales processed from sales data are forwarded to the office manager.
6.	Financial Report	Function	Includes financial data and information, covering palm oil income and expenditures.
		Duplicate	1
		Data Flow	Financial data and information processed from harvest data, sales data, and financial data are forwarded to the director.

This document analysis delineates the primary functions of each document in the palm oil sales management system at PT. Agro Sawit Musi Rawas. Documents such as harvest data, inventory, and financial reports facilitate the efficient flow of information across departments, ensuring smooth operations and timely communication.

Table 3.
System Requirements Analysis

No.	Functional	C	R	U	D	Note
1.	Inventory Data	✓	✓	✓	✓	
2.	Harvest Data	✓	✓	✓	✓	
3.	Sales Data	✓	✓	✓	✓	
4.	Financial Data Management	✓	✓	✓	✓	
5.	Production Report	✓	✓	✓	✓	
6.	Sales Report	✓	✓	✓	✓	
7.	Financial Report	✓	✓	✓	✓	
	Non-Functional					
1.	The system has an intuitive interface to ensure ease of use for all users.					
2.	The system features a responsive design, enabling access across various devices.					
3.	The system can display available features based on the access rights of the account.					

This discussion outlines the proposed functionalities to be implemented in an efficient and effective data management system at PT. Agro Sawit Musi Rawas.

A. *Unified Modeling Language (UML)*

The reporting system for palm oil production at PT Agro Sawit Musi Rawas employs Unified Modeling Language (UML) diagrams to meticulously depict processes, relationships, and data flows within the system. This visual representation not only enhances transparency but also facilitates a clearer understanding among relevant stakeholders and team members, enabling them to grasp complex interactions and dependencies with greater precision. By leveraging UML diagrams, the system ensures a structured and comprehensive overview, supporting accurate communication of operational intricacies, streamlining workflows, and aiding in informed decision-making [19], [20].

The application administrator plays a crucial role in managing palm oil plantations by overseeing the management application and ensuring it provides essential information for

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users to effectively manage plantation activities. This includes monitoring system performance, troubleshooting issues, and ensuring seamless access to data, all of which are vital for the smooth operation of the plantation. As seen in Fig. 3, the administrator's role is key to maintaining an efficient and user-friendly interface, allowing users to make well-informed decisions and execute tasks with precision and ease.

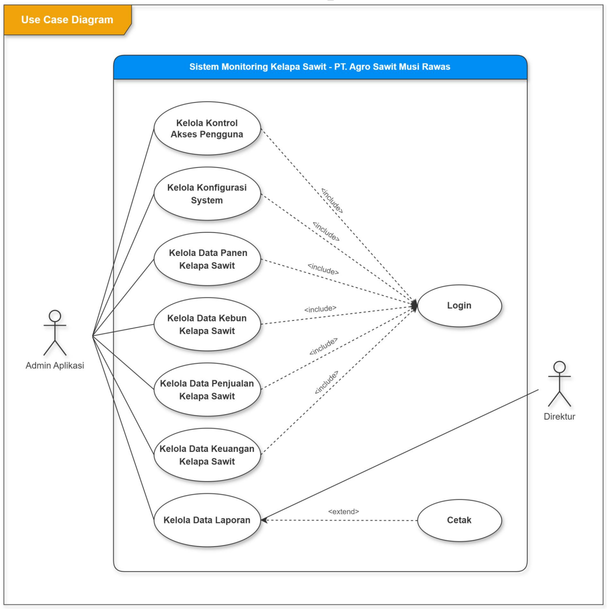

Fig. 3. Application administrator.

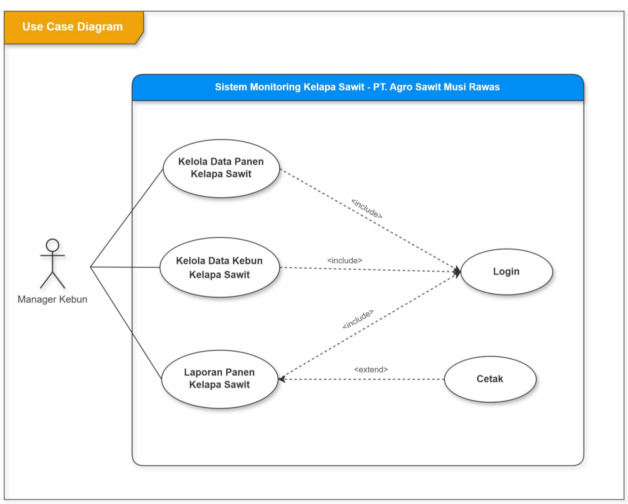

Fig. 4. Plantation manager.

The plantation manager communicates the palm oil harvest figures to the finance team, including data on the volume harvested, as illustrated in Fig. 4. The manager ensures the accuracy and completeness of the recorded harvest data by cross-checking and verifying the information within the system, thereby ensuring reliable and consistent data for financial analysis and decision-making.

The finance staff is responsible for managing data related to palm oil harvests, sales, and financial transactions. They collect and consolidate information from sources like harvest reports, sales documents, invoices, and receipts. This data undergoes careful analysis before being entered into the system, as illustrated in Fig. 5, ensuring high data integrity and reliability for financial assessment and decision-making.

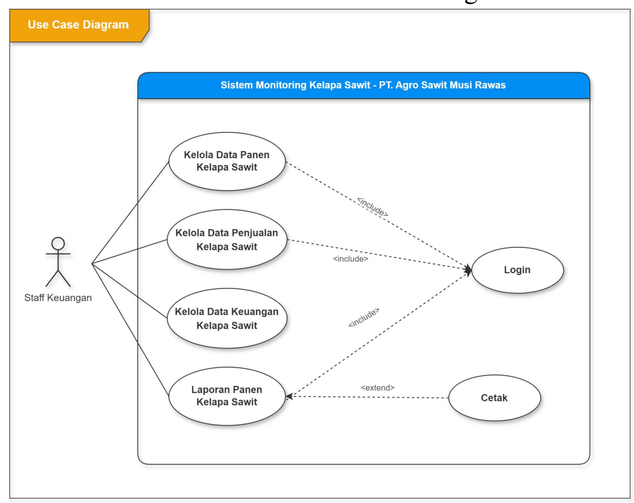

Fig. 5. Finance staff.

Table 4.
Analyze The Use Case

No.	Use Case	Description	Actor
1.	Login	This use case describes the process of logging into the system in order to gain access to reports and other management functions.	Plantation Manager, Finance Staff, Director
2.	Submit Harvest Report	This use case describes collecting harvest data from the plantation and submitting it to the finance staff.	Plantation Manager
3.	Detail Harvest Data	This use case describes gathering data related to the palm oil harvest, sales, and financial records.	Finance Staff
4.	Verify Harvest Data	This use case outlines the procedure for reviewing palm oil harvest data in the system to ensure accuracy.	Plantation Manager
5.	Manage Data	This use case involves managing palm oil data and reports, including adding, deleting, and updating data.	Finance Staff

This set of use cases outlines essential tasks in the palm oil management system at PT Agro Sawit Musi Rawas. Each use case details specific actions performed by users, such as logging in, submitting harvest reports, managing data, and verifying accuracy. These activities ensure efficient data handling and support informed decision-making.

Figure 6 as a class diagram represents a palm oil management system, integrating key entities such as User, Delivery, Supplier, Harvest, Sales, and Finance. Each component manages distinct aspects, from cultivation to financial oversight and detailed reporting. The User entity ensures secure access, while Delivery and Supplier handle logistics. The Harvest entity tracks schedules, crop types, and yields for resource planning.

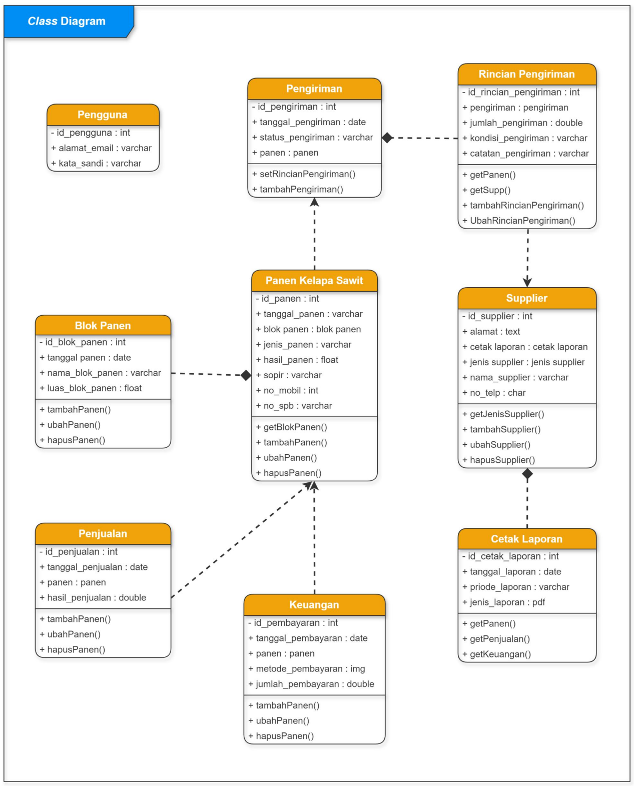

Fig. 6. Class diagram representation.

The sales entity oversees transaction records, ensuring accurate and timely tracking of sales activities. Finance consolidates financial data, offering a comprehensive view of the budget and expenditure, which is vital for strategic financial planning and performance assessment. Together, these entities create an integrated data flow that enhances operational visibility, improves overall efficiency, and enables strategic, data-informed decisions throughout the palm oil production process. This approach aligns with recent research that highlights the importance of integrated management systems in optimizing agricultural operations and boosting productivity [21], [22]. Furthermore, the inclusion of these systems supports effective resource allocation and timely decision execution in agricultural industries, as shown in recent studies [23].

This entity relationship diagram (ERD), as illustrated in Fig. 7, provides a comprehensive representation of a palm oil management system, encapsulating key entities such as User, Harvest Block, Palm Oil Harvest, Sales, Finance, Delivery, Supplier, and Reporting. Each of these entities is meticulously designed to manage critical data streams across various production stages, thereby facilitating seamless data flow, enhancing operational efficiency, and enabling informed decision-making. Nevertheless, the integration of these interconnected functions introduces additional layers of complexity, particularly in maintaining data consistency, coherence, and integrity across the system, underscoring the necessity for robust data management strategies and advanced system design methodologies.

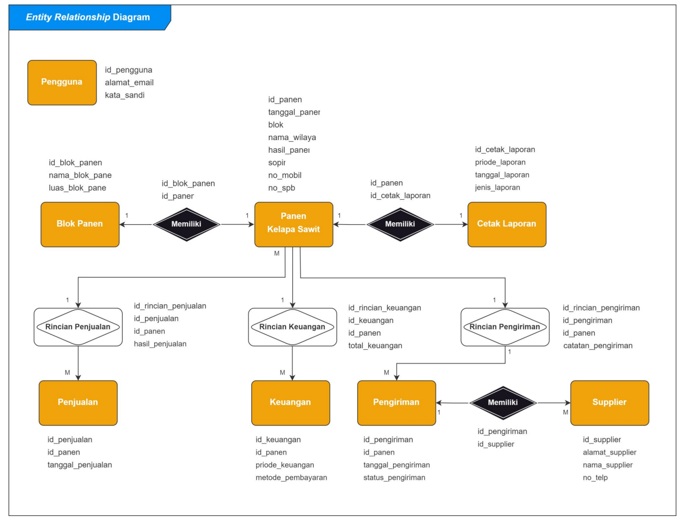

Fig. 7. Entity-Relationship Model

However, when effectively implemented, these systems optimize resource management, logistical coordination, and financial tracking, supporting transparency and sustainable productivity. This approach aligns with research emphasizing the value of integrated management systems in agriculture, optimizing processes and enhancing performance [24]. Tables 5–11 present core data and Fig. 2 shows process flow.

1) *Table Name : User*
Description : Serves to store user-related data.

Table 5.
User Data

Name	Data Type	Length	Optional
id	INT	11	Primary Key
name	VARCHAR	255	NOT NULL
email_address	VARCHAR	255	NOT NULL
Password	VARCHAR	255	NOT NULL

2) *Table Name : Harvest Block Explanation*
Description : Used to store info on harvest blocks.

Table 6.
Harvest Block Explanation

Name	Data Type	Length	Optional
id_harvest	INT	11	Primary Key
block_name	VARCHAR	255	NOT NULL
block_area	VARCHAR	10,2	NOT NULL
harvest_type	FLOAT	255	NOT NULL

3) *Table Name : Harvest*
Description : Used to store harvest data

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Table 7.
Information of the Harvest

Name	DataType	Length	Optional
id_harvest	INT	10	Primary Key
id_block	INT	11	Foreign Key
harvest_date	DATE	-	NOT NULL
region_name	VARCHAR	255	NOT NULL
harvest_result	FLOAT	10,2	NOT NULL

4) *Table Name : Print Report*
Description : Table stores data printing reports

Table 8.
Print Report

Name	Data Type	Length	Optional
id_report	INT	11	Primary Key
id_harvest	INT	11	Foreign Key
Report_period	VARCHAR	255	NOT NULL
driver	VARCHAR	255	NOT NULL
vehicle_number	VARCHAR	255	NOT NULL
report_type	VARCHAR	255	NOT NULL

5) *Table Name : Sales*
Description : To store data on harvested sales

Table 9.
Information Regarding Sales Data

Name	Data Type	Length	Optional
id_sales	INT	11	Primary Key
id_harvest	INT	11	Foreign Key
id_supplier	INT	11	Foreign Key
sales_date	DATE	-	NOT NULL
sales_result	FLOAT	10,2	NOT NULL
payment_method	ENUM	-	NOT NULL
supplier_address	VARCHAR	255	NOT NULL
phone_number	VARCHAR	255	NOT NULL

6) *Table Name : Financial*
Description : Stores financial data on harvest

Table 10.
Information Financial

Name	Tipe Data	Panjang	Optional
id_financial	INT	11	Primary Key
id_harvest	INT	11	Foreign Key
financial_period	VARCHAR	255	NOT NULL
Total_financial	FLOAT	10,2	NOT NULL

7) *Table Name : Shipments*
Description : Stores data on harvest shipments

Table 11.
Information Shipments

Nama	Tipe Data	Panjang	Optional
id_shipment	INT	11	Primary Key
id_harvest	INT	11	Foreign Key
shipment_date	DATE	-	NOT NULL
shipment_status	VARCHAR	255	NOT NULL
shipment_notes	Text	-	NOT NULL

The database structure manages agricultural data, including user access, harvest blocks, sales, finances, and shipments. Each table serves a unique function to optimize management. The User table controls access, ensuring secure login. The Harvest Block table stores land block details, while the Harvest table tracks yields and timings. The Sales table records transactions, the Financial table manages budgets, and the Shipments table handles logistics. This segmentation ensures efficient operation across the system.

This structured approach not only enhances data accuracy and integrity but also promotes better decision-making by providing comprehensive insights into operational data. Recent research [25], underscores the importance of such systems in agriculture, highlighting how integrated and well-organized data management frameworks can improve efficiency, reduce operational risks, and support strategic planning. By ensuring all critical data is captured and easily accessible, this database system contributes to more effective resource allocation, streamlined processes, and a deeper understanding of production dynamics, which are essential for long-term sustainability and growth in agricultural sectors [26].

B. *Implementation*

The design of the monitoring system at PT Agro Sawit Musi Rawas focuses on creating a user-friendly and intuitive interface. Key aspects developed during this design phase include ensuring easy navigation, responsive layout, efficient data presentation, seamless integration with existing systems, and clear visual cues for better user interaction.

- Splash Screen

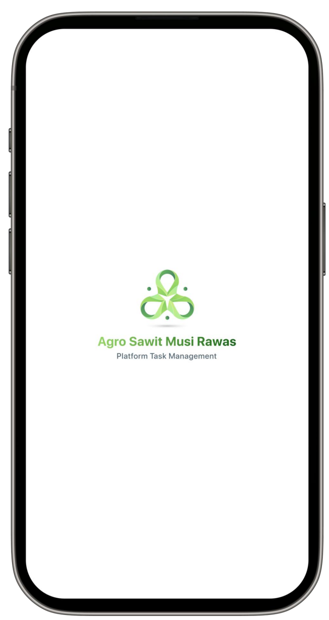

Fig. 8. Splash screen.

A splash screen, as shown in Fig. 8, is the first thing users see when opening an app, displaying the logo and name. It helps reinforce the brand, manage expectations during startup, and smoothly transition to the main interface. A good splash screen can also build anticipation before users access the app's features.

The landing screen, as shown in Fig. 9, is the second page that appears when a user accesses an application, displaying key information about the services offered. Its primary purpose is to grab the user's attention and guide them smoothly through the initial stages of interaction with the application.

- Landing Screen

Fig. 9. Landing screen.

- Login Screen

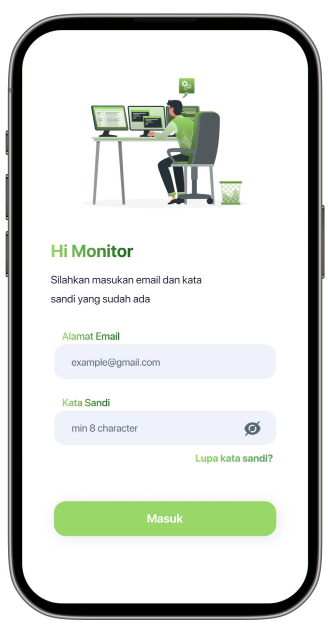

Fig. 10. Login screen.

The login screen, as seen in Fig. 10, is the third page where users input their credentials, like a username and password, to gain access to the application. It ensures that only authorized users can enter, safeguarding the app's security, privacy, and sensitive data, while preventing unauthorized access to its features and protecting user information.

The reset password screen (Fig. 11) is the fourth page where users can reset their password by entering their email address. This feature helps users regain access to their accounts if they forget their password, enhancing security, convenience, and providing a quick recovery option for users.

- Reset Password Screen

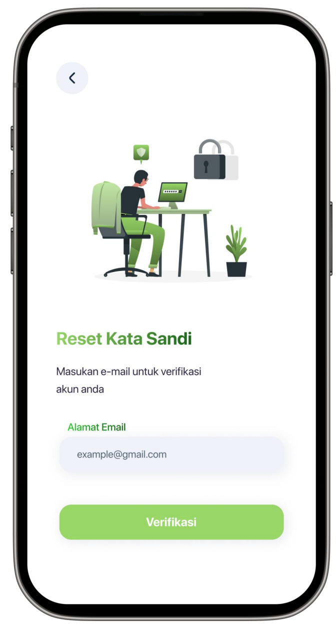

Fig. 11. Reset password screen.

- Home Screen

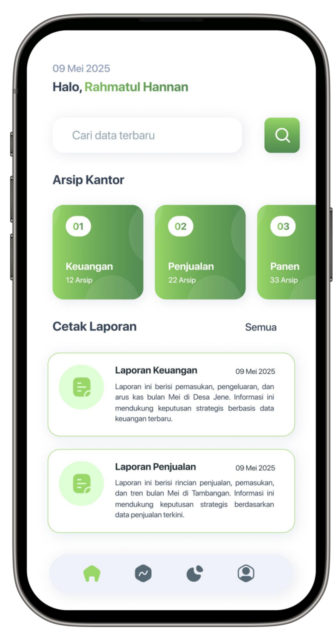

Fig. 12. Home screen.

The home screen, as seen in Fig. 12, is the fifth page that allows users to easily access the app's main features, widgets,

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and key functions. It serves as the central hub for navigating the app, providing quick access to tools, important information, notifications, and personalized settings, enhancing user efficiency, convenience, and overall experience.

The task management screen (Fig. 13) is the sixth page that involves overseeing tasks from start to finish, including planning, assigning, tracking, and reviewing progress. It focuses on setting clear goals, prioritizing important tasks, and continuously monitoring progress to ensure timely completion. Effective task management boosts productivity, meets goals, improves overall efficiency, enhances collaboration, and reduces missed deadlines.

- Task Management Screen

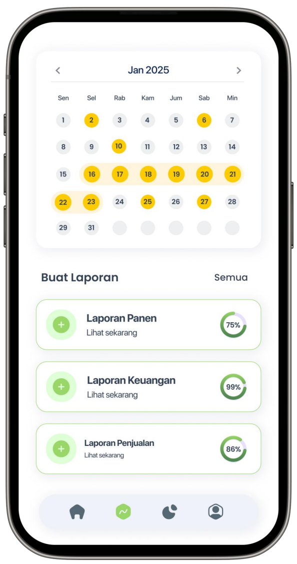

Fig. 13. Task management screen.

- Graphic Screen

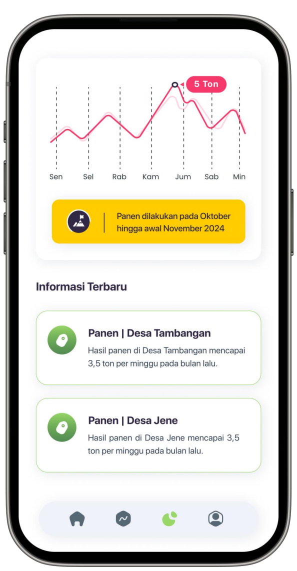

Fig. 14. Task graphic screen.

The graphic screen, as shown in Fig. 14, is the seventh page, a visual display showcasing elements like images, icons, and charts to enhance the overall user experience. It presents information in an engaging way, commonly used in apps, websites, or devices to improve usability and interface. This screen helps users easily interpret data and interact with the application, making it more intuitive and visually appealing.

- User Profile Screen

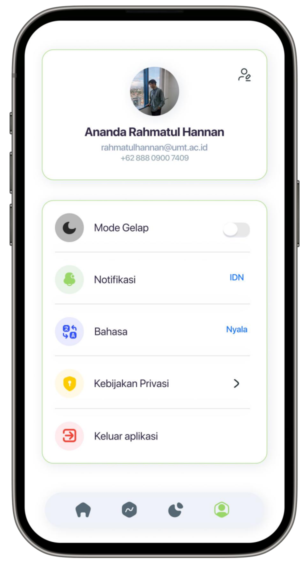

Fig. 15. User profile screen.

The user profile screen is the eighth page, a section in an app or website where users can access and update their personal information, preferences, and settings (Fig. 15). It shows details such as name, email, profile picture, and other relevant data, enabling users to make changes to their account information.

V. Conclusion

Based on the comprehensive discussions in the previous chapters. The conclusions can be drawn as a final summary of this practical work. The analysis and design of the palm oil monitoring system indicate that the existing reliance on manual methods leads to delays, data inaccuracies, and compromised efficiency in decision - making capabilities. Implementing an updated, automated system is essential to improve the speed and accuracy of reporting. The incorporation of Unified Modeling Language (UML) in the design phase of the monitoring system establishes a structured framework and facilitates comprehensive documentation. This integration streamlines processes, minimizes human error, and enhances decision - making efficiency and effectiveness, ultimately improving the reliability of the system.

The redesigned palm oil production monitoring report will present information in a more organized and precise manner. This structured presentation supports management by enabling more effective monitoring of operational performance and facilitating informed decision-making.

Integrating UML into the monitoring system design results in a structured framework and comprehensive documentation. This integration automates processes, reduces errors, accelerates decision-making, enhances system reliability, and improves overall system performance [27].

References

[1] M. H. Sebyar and M. A. Wulandari, "Kesenjangan sosial ekonomi di masyarakat sekitar perkebunan kelapa sawit di kabupaten tanjung jabung barat provinsi jambi," *Agrimansion*, vol. 24, no. 3, pp. 1–15, 2023. doi: 10.29303/agrimansion.v24i3.1584.

[2] M. A. R. Siregar, "Penggunaan teknologi drone dalam monitoring dan pengelolaan lahan pertanian," *OSF Preprints*, 2023. doi: 10.31219/osf.io/dmu5g.

[3] S. Handoko and R. Sukardi, "Operational efficiency in palm oil companies through modernized data systems," *Journal of Industrial Operations*, vol. 23, no. 1, pp. 65–80, 2024, doi: 10.55606/akuntansi.v3i1.1451.

[4] E. Leonardo, E. Nurmala, and M. Sari, "Strategi pengendalian persediaan dengan metode min-max di pt. sawit jambi lestari," *Jurnal Cahaya Mandalika*, vol. 3, no. 3, pp. 1706–1719, 2024. [Online]. Available: https://ojs.cahayamandalika.com/index.php/jcm/article/view/2940

[5] E. Soesanto, F. N. Kaifa, S. K. Aulia, K. Maharani, and A. Z. Muqtafi, "Analisis pengaruh K3 terhadap sistem manajemen sekuriti pada pt. indofood tbk," *IJM: Indonesian Journal of Multidisciplinary*, vol. 1, no. 2, 2023. [Online]. Available: https://journal.csspublishing.com/index.php/ijm/article/view/149

[6] Z. Zulham, Z. Lubis, M. Zarlis, M. R. Aulia, and Y. W. Tanjung, "Strategi optimalisasi adopsi teknologi sistem barcode di pt. langkat nusantara kepong," *Techno Multidisciplinary Journal*, vol. 8, no. 1, 2024, doi: 10.33050/tmj.v8i1.1935.

[7] N. Effendi, D. Handoko, F. Azim, and F. Farida, "Rancangan sistem monitoring kelembapan tanah pembibitan kelapa sawit berbasis internet of things," *Coscitech Journal*, vol. 5, no. 2, 2024. doi: 10.37859/coscitech.v5i2.7572.

[8] N. Nasution and S. Suhairi, "Implementasi sistem ERP dan e-plantation (studi pada pt. surya dumai agrindo, sei pakning, riau)," *Musytari: Neraca Manajemen, Akuntansi, dan Ekonomi*, vol. 2, no. 1, pp. 41–50, 2023, doi: 10.8734/musytari.v2i1.822.

[9] A. Moruk, H. Hermantoro, and T. Suparyanto, "Pemantauan tingkat ph dan kandungan npk dalam proses kompos dari tandan kosong kelapa sawit," *Jurnal Teknologi Pertanian Stiper*, vol. 1, no. 2, pp. 35–48, 2023, doi: 10.55180/aei.v1i2.722.

[10] M. Syarovy, A. P. Nugroho, and L. Sutiarso, "Pemanfaatan model neural network dalam generasi baru pertanian presisi di perkebunan kelapa sawit," *Warta Pusat Penelitian Kelapa Sawit*, vol. 28, no. 1, pp. 39–54, 2023, doi: 10.22302/iopri.war.warta.v28i1.97.

[11] T. C. W. A. Sutignya, *Sistem Pendukung Keputusan (Implementasi SPK Pada Studi Kasus)*, Pontianak, Indonesia: Penerbit Politeknik Negeri Pontianak, 2023.

[12] T. Anggrahini, S. Widyastuti, and M. Sihite, "Pengaruh internal kontrol, organization behaviour, dan digitalisasi terhadap kinerja perusahaan," *Locus: Jurnal Ilmu Manajemen*, vol. 2, no. 11, pp. 1079–1093, 2024, doi: 10.58344/locus.v2i11.1860.

[13] R. Gunawan and S. Haryanto, "Pengelolaan produksi kelapa sawit melalui hybrid cloud," *Jurnal Komputasi dan Agrikultur*, vol. 19, no. 1, 39–52, 2024, doi: 10.7654/jka.2024.8187.

[14] Z. Arifin and D. Kusuma, "Predictive analytics and financial management in palm oil production," *Journal of Plantation Economics and Data Science*, vol. 16, no. 3, pp. 101–120, 2023, doi: 10.1016/jpeds.2023.03.006.

[15] M. Limbong, *Kapita Selekta Magister Administrasi/Manajemen Pendidikan "Isu–Isu Pendidikan di Era 4.0",* Jakarta, Indonesia: UKI Press, 2019.

[16] F. Sarbaini and A. Rafik, "Dampak pelaksanaan pengadaan barang menggunakan SAP di kantor kebun pt. perkebunan nusantara v sei buatan," *Selekta Manajemen: Jurnal Mahasiswa Bisnis & Manajemen*, vol. 2, no. 6, pp. 42–52, 2024. [Online]. Available: https://journal.uii.ac.id/selma/article/view/33579

[17] K. Beck and C. Andres, *Extreme Programming Explained: Embrace Change*, 3rd ed. Boston, MA: Addison-Wesley, 2023.

[18] S. R. Hartanto and F. Zakaria, "Pengembangan aplikasi tepat guna untuk penerbitan kuitansi pembayaran kegiatan siswa di SDIT buah hati 3 Cipayung Jakarta," *Jurnal Ilmiah Pendidikan Manajemen*, vol. 2, no. 2, pp. 85–100, 2024, doi: 10.52643/jipm.v2i2.5237.

[19] N. Marthiawati, K. Kurniawansyah, H. Nugraha, and F. Khairunnisa, "Training on UML (unified modeling language) creation using draw.io application in the information systems program at university muhammadiyah jambi," *Jurnal Transformasi*, vol. 1, no. 2, pp. 45–56, 2024, doi: 10.62383/transformasi.v112.109.

[20] O. Viandari and Q. Aini, "Design and analysis of management information system qurban (SIMAQ) at PKPU human initiative, east jakarta," *Appl. Inf. Syst. Manage.*, vol. 3, no. 2, pp. 79-86, 2020, doi: 10.15408/aism.v3i2.11025.

[21] A. Apriliana, "Faktor-faktor yang mempengaruhi B30 sebagai salah satu produk turunan CPO," *Parahyangan Economic Development Review (PEDR)*, vol. 2, no. 1, pp. 67–78, 2023, doi: 10.26593/pedr.v2i1.7392.

[22] S. D. P. Fujiastuti, "Kebijakan larangan ekspor CPO sementara pada pemerintahan jokowi tahun 2022: perspektif decision making william d. coplin," B.S. thesis, Dept. Intl. Relation, Universitas Islam Indonesia, Yogyakarta, Indonesia, 2024. [Online]. Available: https://dspace.uii.ac.id/123456789/49668

[23] A. R. Muflihani, G. Mulyasari, M. Z. Yuliarso, and E. Sulistyowati, "Analisis sistem agribisnis pada tanaman kelapa sawit rakyat," *Agro Research View*, vol. 3, no. 2, pp. 82–95, 2024, doi: 10.37195/arview.v3i2.1084.

[24] D. R. Anwar, M. L. Uluelang, M. Mahmud, R. Amalia, A. Arham, and H. Hikmawati, "Perencanaan manajemen keuangan berbasis syariah pada koperasi," *Yumary: Journal of Sharia Economic Planning and Development*, vol. 7, no. 2, pp. 1168–1177, 2024, doi: 10.37531/yum.v7i2.7108.

[25] D. Huo, A. W. Malik, S. D. Ravana, A. U. Rahman, and I. Ahmedy, "Mapping smart farming: Addressing agricultural challenges in data-driven era," *Renewable and Sustainable Energy Reviews*, vol. 179, 2023, Art. no. 113858.

[26] M. Torres-Miralles, V. Kyttä, P. Jeanneret, M. Lamminen, P. Manzano, H. L. Tuomisto, and I. Herzon, "Applying life cycle assessment to European high nature value farming systems: Environmental impacts and biodiversity," *Agricultural Systems*, vol. 205, 2024, Art. no. 104096.

[27] A. Sopandi, A. R. Hannan, and H. Khotimah, "Perancangan aplikasi mobile menggunakan framework Flutter pada sistem informasi akademik," *Jurnal Ilmiah Komputer dan Aplikasi (JIKA)*, vol. 8, no. 3, pp. 304–310, 2024, doi: 10.31000/jika.v8i3.11402.