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IMPLEMENTATION OF MOBILE-CLOUD TECHNOLOGY IN THE PLANTATION INDUSTRY (CASE STUDY: CASSAVA PLANTATION AT PT SENTOSA GROUP)

Lailyn Puad[1], Rike Limia Budiarti[2] , Elzas[3]
[1,3] Sistem Informasi, Universitas Nurdin Hamzah, Jambi, Indonesia
[2] Teknik Informatika, Universitas Nurdin Hamzah, Jambi, Indonesia

Lailyn Puad : https://orcid.org/0000-0001-5341-7537
Rike Limia Budiarti : https://orcid.org/0009-0000-2010-987X
Elzas : https://orcid.org/0009-0000-4895-6990
*Corresponding Author : lailynfuad@gmail.com

ABSTRACT

Cloud Technology is increasingly becoming a prime choice among technology enthusiasts. This is due to its wide reach, security system, and relatively affordable maintenance costs. PT Sentosa Group, a long-established company that is aware of technological advancements, operates in the plantation sector and aims to develop a website capable of accommodating extensive data integration needs. A mobile application is one of the expected outcomes that can provide convenience to the company. By applying the right research methods, this initiative is expected to be completed within a short period with optimal efficiency. The use of cloud technology in this company is not new; previously, a system was already in place to manage inventory and logistics. However, with its implementation, this application can now be fully utilized by all plantation stakeholders.

Keywords: Cloud Technology, Plantation, Mobile Computing, Web App.

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INTRODUCTION

With the advancement of information technology, the use of technology in various sectors of life has become increasingly inevitable. One of the industries beginning to adopt modern technology is the plantation sector. According to Wahyudi et al. (2021), digitalization in the agriculture and plantation industries has become a trend that supports efficiency and transparency in resource management. PT Sentosa Group, a company engaged in the plantation sector, is currently focused on managing toxic cassava crops. However, the existing system still relies on conventional methods, such as manual paper-based recording, which poses challenges in integrating data with field teams.

To improve operational efficiency, PT Sentosa Group plans to develop an integrated web and mobile-based system powered by cloud technology. The use of cloud computing in the plantation industry has been proven to enhance flexibility and data management effectiveness. As stated by Kusuma and Prasetyo (2020), cloud-based systems allow companies to access and manage data in real-time, enabling more accurate data-driven decision-making. With this system, the company can seamlessly integrate planting schedules, harvest data, and financial reports.

Additionally, this system also serves as a communication tool between field teams and office teams. Research by Hidayat et al. (2019) indicates that integrating mobile technology into agribusiness enhances reporting effectiveness and work process monitoring in the field. With a mobile application connected to the cloud, field teams can instantly report their work progress, allowing office teams to promptly address any issues that arise in the field.

Data security is also a key factor in the development of this system. According to Rachman and Fajar (2022), utilizing cloud technology in agriculture not only facilitates data access but also ensures information security through encryption features and multi-factor authentication. Therefore, the system designed for PT Sentosa Group will adopt high data security standards to protect company information from cyber threats.

By implementing a web and mobile-based system integrated with the cloud, PT Sentosa Group is expected to enhance its operational efficiency and accelerate the decision-making process. This digital transformation can also serve as an example for other plantation companies in optimizing the use of information technology. As stated by Sari and Nugroho (2023), digital adaptation in the plantation sector is the key to increasing business competitiveness in the Industry 4.0 era. With this initiative, PT Sentosa Group will be better prepared to face the increasingly competitive plantation industry.

RESEARCH METHOD

Research Design

This study employs a qualitative approach using a case study method. According to Creswell and Poth (2018), the case study method is used to gain an in-depth understanding of phenomena in real-world contexts, especially when the boundaries between the phenomenon and context are not entirely clear.

The case study approach in this research is designed to explore how the implementation of technology in scheduling and reporting systems can enhance operational efficiency at PT Sentosa Group. The case study method was chosen because it allows for an in-depth exploration of subjects' experiences in complex situations (Merriam & Tisdell, 2016; Baxter & Jack, 2008). Furthermore, this study employs thematic analysis to identify patterns in interview and questionnaire data, as described by Nowell et al. (2017), and applies data triangulation to enhance the validity of research findings (Denzin & Lincoln, 2018). This analytical technique aims to ensure that the collected data reflects the actual conditions faced by workers (Guest, MacQueen, & Namey, 2012).

This study focuses on the integration of technology into the scheduling and reporting system at PT Sentosa Group, South Sumatra, particularly in managing the work schedules of field workers and office teams. The research was conducted from February to April 2024 at the company's location. The selection of the site was based on its relevance to the study and accessibility to data and participants (Yin, 2018).

Research Subjects

The research subjects are field workers and office teams at PT Sentosa Group involved in the scheduling and reporting processes. The subject selection technique is purposive sampling, which aims to choose individuals with in-depth insights into the issues being studied (Patton, 2015). Previous research by Lestari et al. (2020) showed that field workers and administrative staff often face difficulties in managing work schedules manually. Therefore, selecting subjects from these groups is crucial to understanding the effectiveness of the implemented system.

Research Procedure

This research was conducted in the following stages:

1. **Field Observation** – Observing the recording and scheduling system used before application implementation. According to Hidayat et al. (2019), direct observation is essential for understanding existing work patterns before introducing technological interventions.
2. **In-depth Interviews** – Conducting interviews with field workers and office teams to understand their challenges and needs in the scheduling system. Yin (2018) states that interviews are one of the primary methods in case studies, allowing for in-depth exploration.
3. **Survey Questionnaire** – Distributing questionnaires to workers regarding the challenges of using a manual scheduling system and their expectations of a digital application. According to Sugiyono (2020), questionnaires help systematically gather data from many respondents.
4. **Application Testing** – Testing the developed application and evaluating user responses regarding its ease of use and benefits. A study by Sari and Nugroho (2023) highlights that user-based evaluation is crucial in implementing technology in the industrial sector.

Instruments and Data Collection Techniques

Data were collected using the following methods:

1. **Semi-structured Interviews**, with questions aimed at assessing the effectiveness of the current recording system and the need for a new application. Yin (2018) emphasizes that semi-structured interviews provide flexibility in data exploration.
2. **Questionnaires**, to measure the ease and challenges of using a manual recording system and expectations for a digital application. Sekaran and Bougie (2020) state that well-designed questionnaires can provide a quantitative overview of user perceptions.
3. **Documentation**, consisting of field notes related to the scheduling and reporting system implemented in the company. This documentation will be analyzed using the methods described by Creswell and Poth (2018) in their qualitative research.

Data Analysis Techniques

The collected data will be analyzed using thematic analysis, which identifies patterns and themes from interviews and questionnaires. Braun and Clarke (2019) state that thematic analysis is a suitable technique for understanding subjects' experiences in real-world contexts. Additionally, a data triangulation approach will be applied to enhance the validity of the research. Patton (2015) explains that triangulation compares the results of observations, interviews, and documentation to ensure consistency in findings.

RESULTS AND DISCUSSION [SIZE 11 UPPERCASE]

System Analysis and Design

This research aims to develop an application that can address various field challenges, including job scheduling, task distribution, reporting, financial management, logistics, and monitoring work progress cycles in each area. According to Laudon & Laudon (2021), a well-designed information system can enhance operational efficiency by providing real-time data that supports decision-making. Additionally, Hevner et al. (2004) explain that a research-based design approach must consider user needs and the work environment to produce an optimal system.
The design and implementation of the application can be outlined as follows:

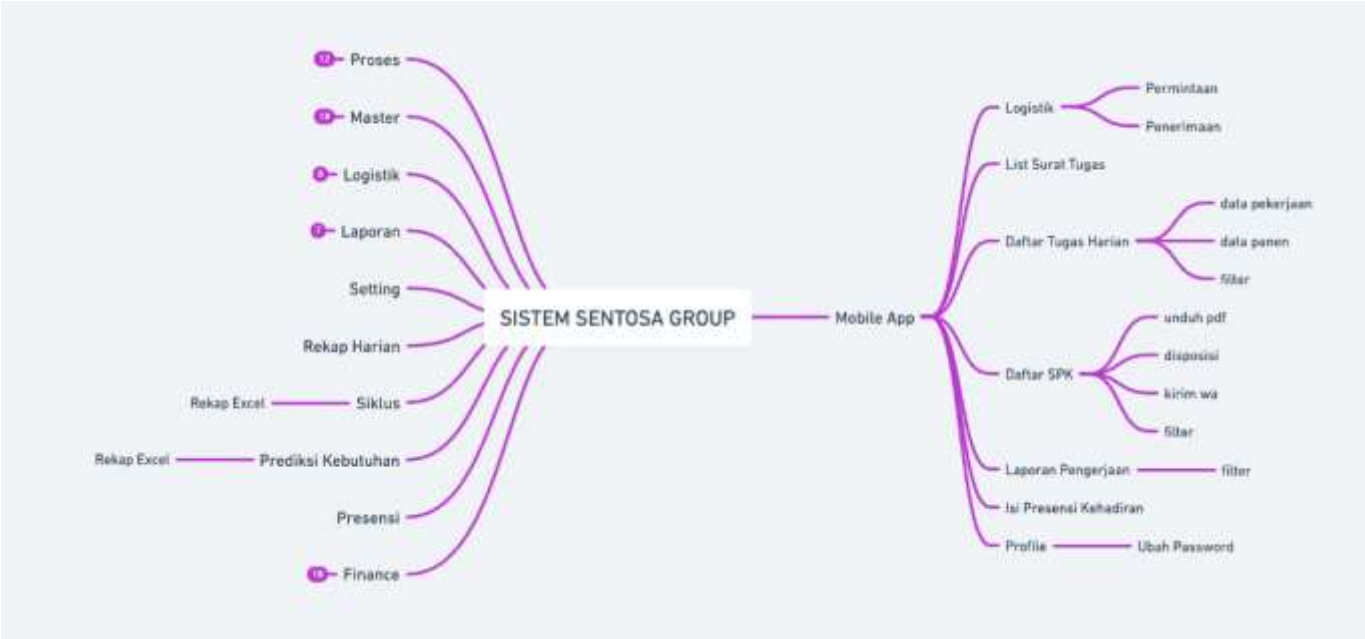

Figure1. Mindmap Diagram

One of the most crucial business processes in this design is how the system can facilitate procurement and stock deduction. As explained by Monczka et al. (2020), an integrated supply chain management system can improve accuracy and reduce inefficiencies in inventory management. The diagram below illustrates the complete workflow of this process:

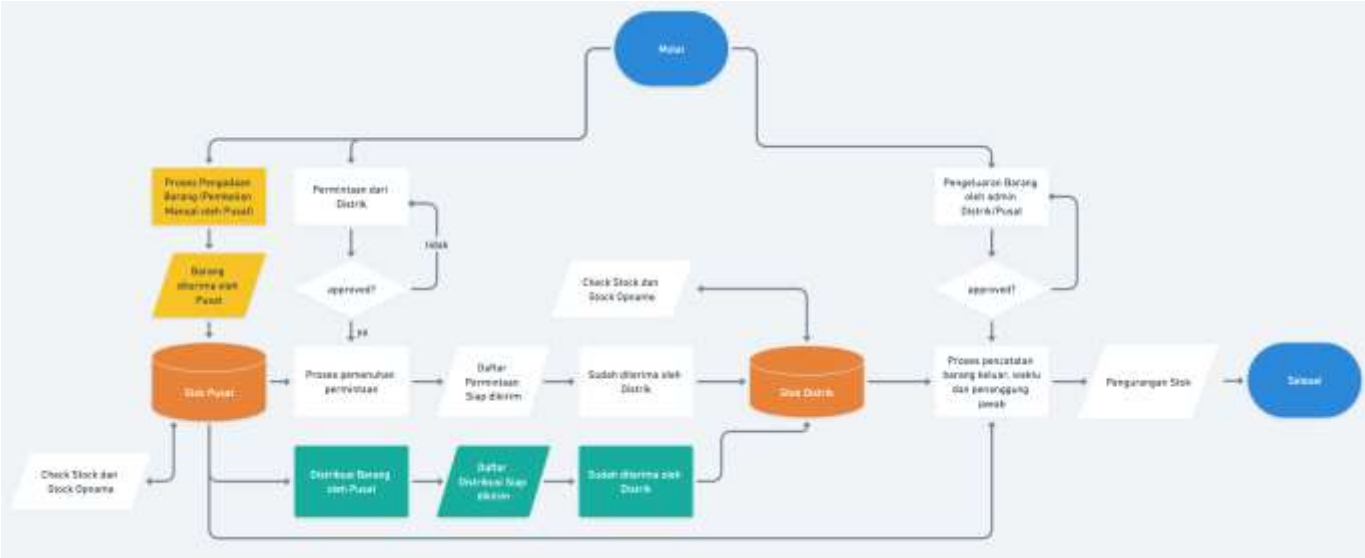

Figure 2. Logistics Request and Deduction Flow

During the implementation process, the dashboard becomes one of the most essential features to provide a comprehensive overview of the company's business processes. Each area can be monitored for work progress, making it easier for management to make strategic decisions. According to Few (2013), an effective dashboard should be able to present relevant data, be easy to understand, and be quickly accessible to support better decision-making processes.

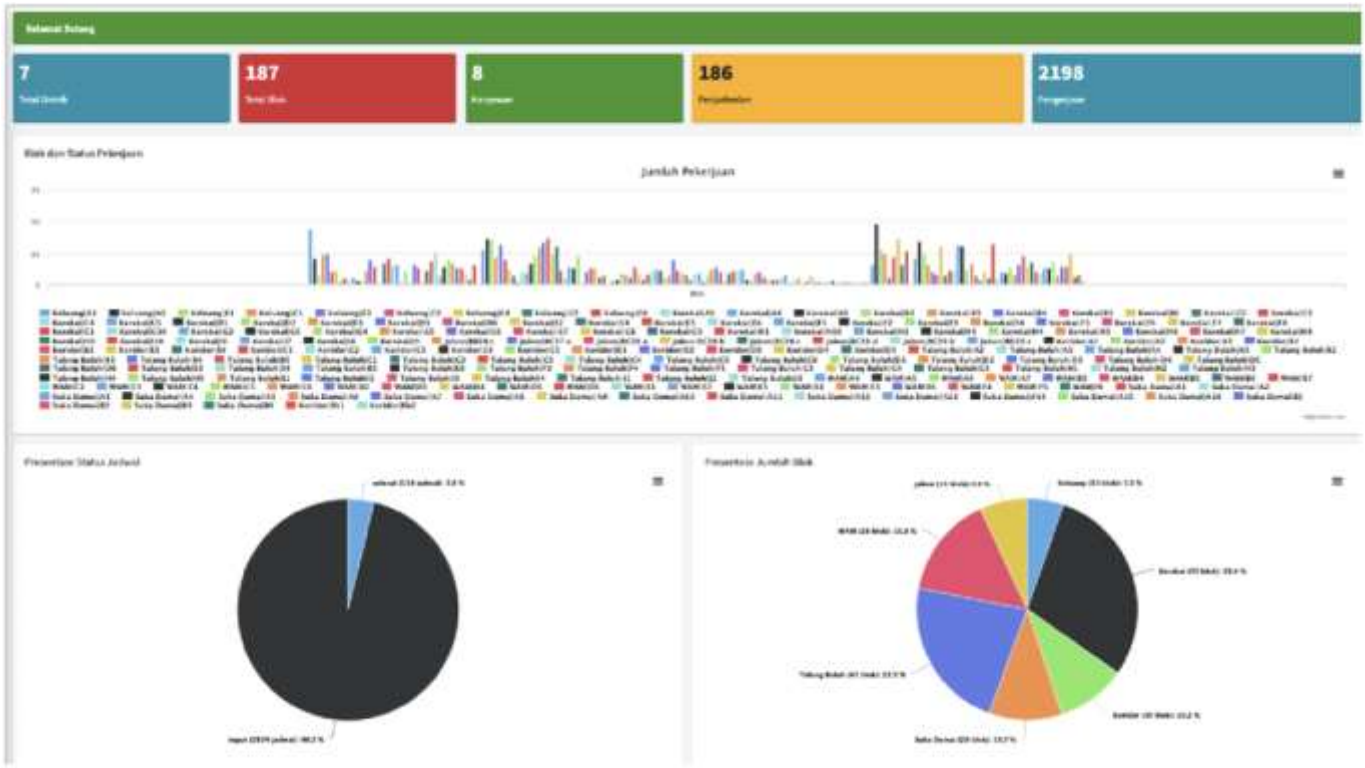

Figure 3. Dashboard System

Another key feature in this research is the daily recap process and work cycle for each type of work and area listed in the Assignment Letter given by the leadership. This data was collected from reports from field employees who carried out work as instructed.

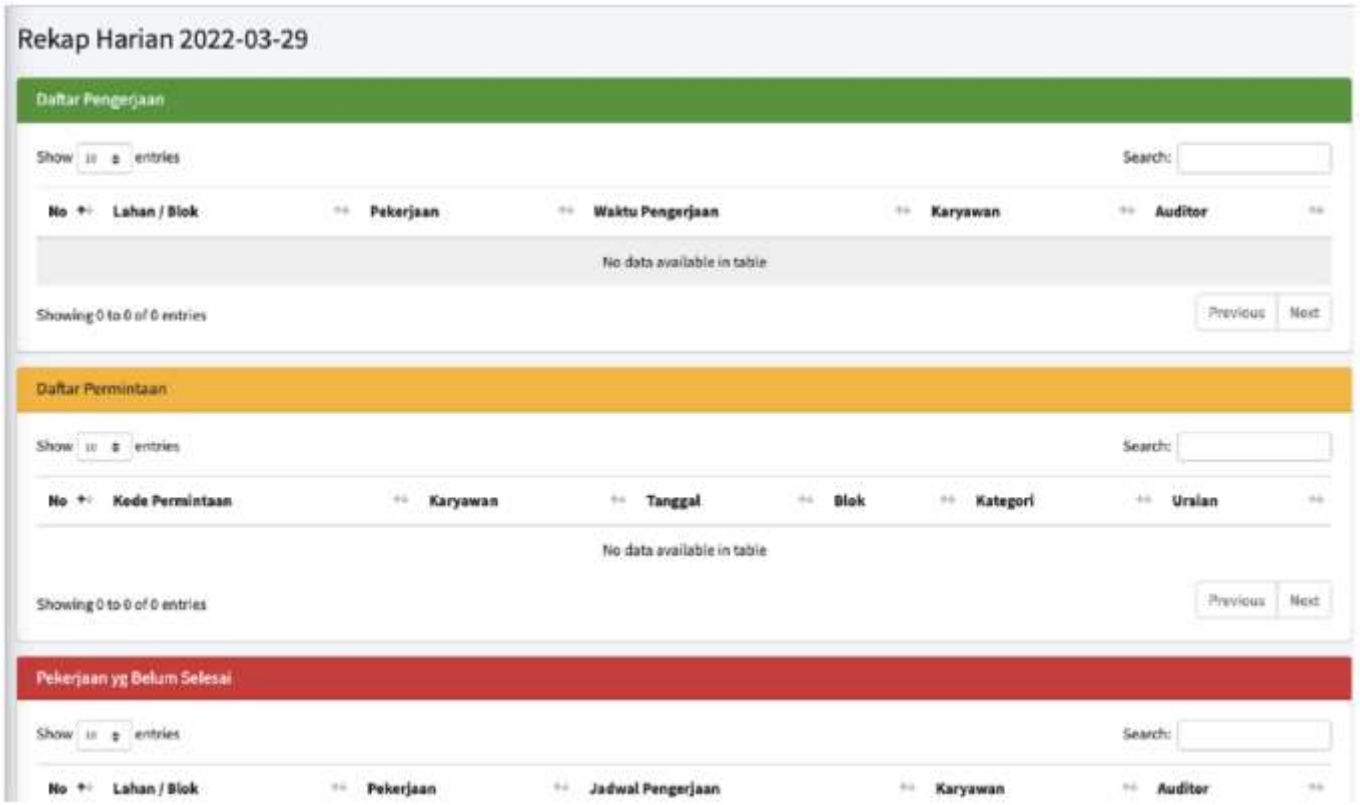

Figure 4. Daily Job Recap

The Cycle feature is one of the most reliable in this research because it can provide information regarding work status in each different timeline in each area. Apart from that, information is also displayed regarding the person in charge, status and time of work so that it can be used to assess the Key Performance Index (KPI) of each employee. According to Marr (2012), effective KPI monitoring in a work system allows companies to identify individual and team performance in real-time, so they can take necessary actions quickly. Furthermore, Parmenter (2015) stated that KPIs presented in digital systems are able to increase transparency and accuracy in the performance evaluation process.

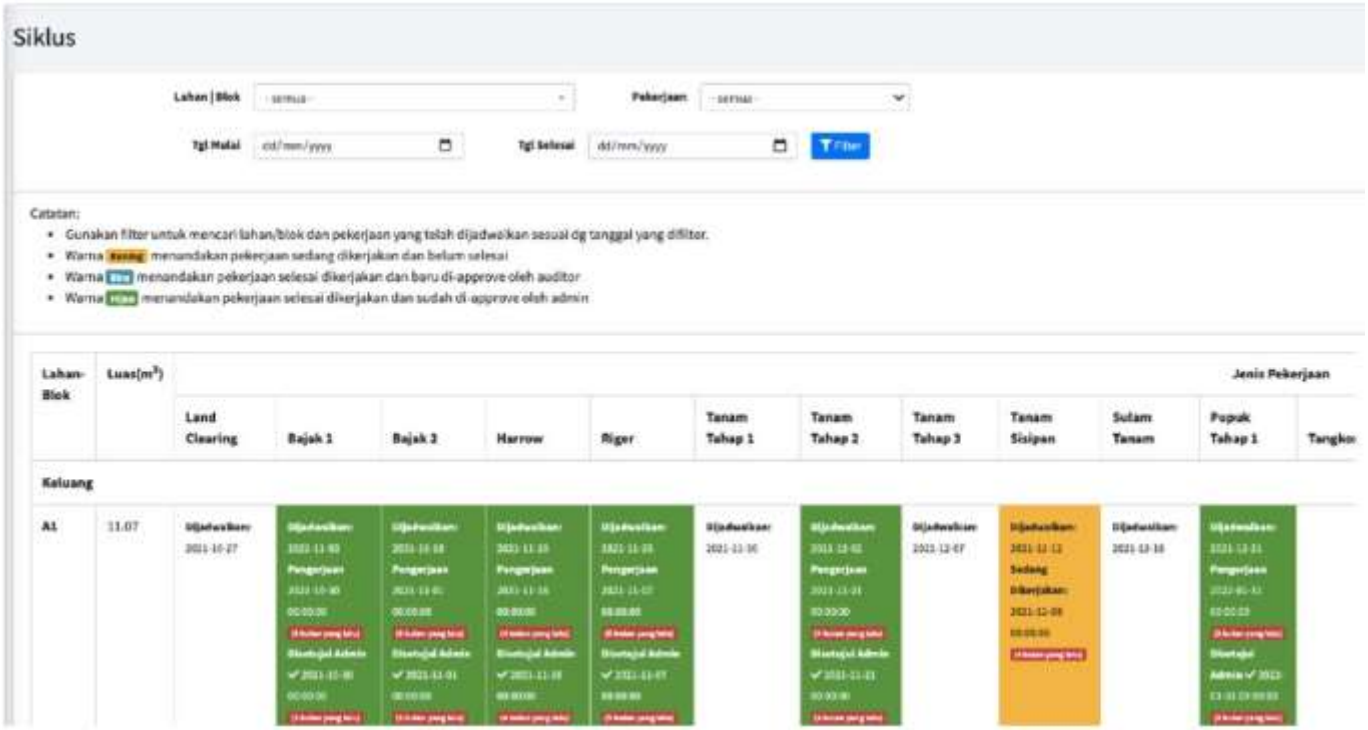

Figure 5. Work Cycle Per Area

One of the outputs of this system is the automatic generation and distribution of Assignment Letters. This process is carried out based on the characteristics, competencies, and responsibilities of each employee, ensuring more efficient and targeted task assignments.


Cetak 1 / 1 100%

SURAT PERINTAH KERJA BORONGAN
No : 10/SG/SPK/II-Feb/2022

Dari	**: Pimpinan Perkebunan SENTOSA GROUP**
Untuk	**: Lailyn Puad**
Alamat	**: Kerekai**
Blok	**: B4, A5 (Luas Lahan: 4.54 ha)**
Jenis Pekerjaan	**: Pukan**
Keterangan	**: Pekerjaan dilaporkan harus sesuai SOP**

Dengan spesifikasi pekerjaan sebagai berikut:

1. Borongan di areal ancak yang ditentukan oleh Askep
2. Sarana dan prasarana kerja yang disedikana yaitu, Traktor, Implemen Bajak 1
3. Pemborong wajib menyelesaikan pekerjaannya yang ada di ancak, baru bisa pindah ancak lain atas persetujuan Askep
4. Apabila terjadi Kecelakaan Kerja kepada Para Pekerja Borongan maka menjadi Tanggung Jawab Pihak Pemborong
5. Jika Pihak Pemborong melakukan Kesalahan/Penyimpangan dari Spesifikasi Pekerjaan, maka Pihak Perusahaan akan memberikan Teguran, Peringatan atau Sanksi kepada Pihak Pemborong
6. Pembayaran akan dilakukan berdasarkan Hasil Pemeriksaan Tim Lapangan dan Hasil Audit Internal serta Sensus oleh Tim Pemetaan

Figure 6. Output of Assignment Letter

In addition to the web-based system described earlier, there is also a mobile application that employees use interactively to report their work. According to Almarabeh et al. (2016), the use of mobile applications in the workplace enhances employee flexibility and productivity by enabling access to the system anytime and anywhere. This is further supported by Saravanan et al. (2019), who found that mobile applications can accelerate business processes by reducing the time required for manual reporting and documentation. Meanwhile, Kumar & Aldrich (2021) state that integrating mobile systems into work management can improve operational efficiency by up to 30% by minimizing delays in communication and decision-making.

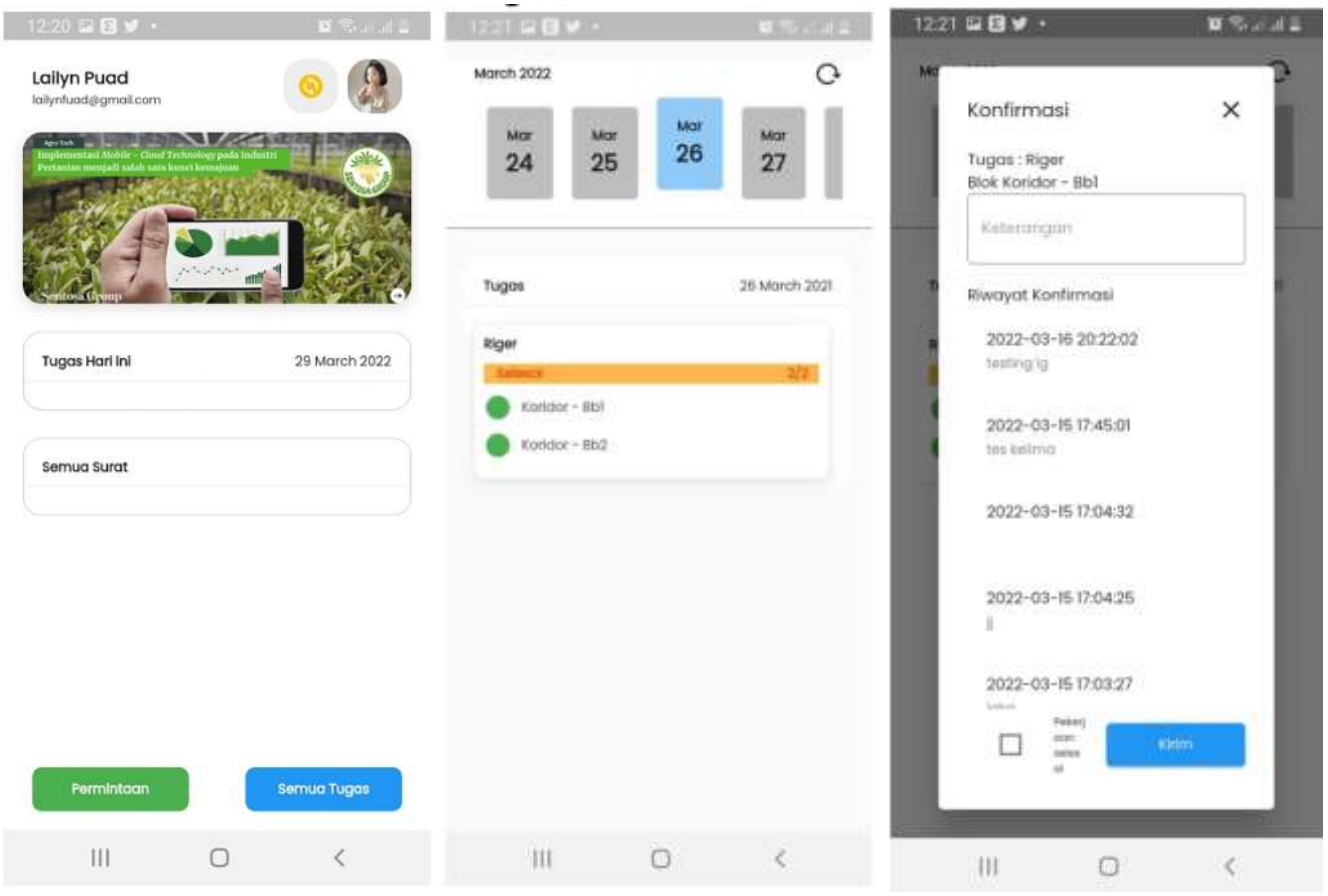

Figure 7. Mobile Application Interface

CONCLUSION [SIZE 11 UPPERCASE]

Based on the research conducted, the following conclusions can be drawn:

1. PT Sentosa Group owns an extensive *singkong racun* plantation, which requires complex workforce management due to the varying maintenance needs across different planting periods.
2. This study provides an overview of the complexity involved in monitoring each type of maintenance to ensure an efficient planting-to-harvesting cycle.
3. The research resulted in the development of a system based on both a web application and a mobile application, which facilitates business processes at every stage of work.
4. Several key features are available to generate strategic information regarding field workers' performance, including a general dashboard, daily reports, and job cycle tracking.

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DISCLOSURE

The author reports no conflicts of interest in this work.

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