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Implementation Of Digital Technology For Management Optimization Production In The Palm Oil Industry (Case Study of Employees of PT. Perkebunan Nusantara IV PKS SEI Meranti)

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Abstract

This study aims to analyze the implementation of digital technology in optimizing production management in the palm oil industry with a case study of employees at PT. Perkebunan Nusantara IV PKS Sei Meranti. This research used a qualitative method with a descriptive approach. Data were collected through interviews, observations, and documentation involving five informants who were directly involved in production activities. The results show that digital technology implementation has been carried out through the digitalization of production systems, the use of Internet of Things (IoT), digital-based production monitoring, and production management information systems. The application of these technologies improves production efficiency, accelerates data processing and access, enhances quality control, and supports data-based decision making. However, several challenges were identified, including limited employee skills in operating digital systems, network disruptions, and high investment costs for technology development. Therefore, the company conducts various efforts such as employee training, regular system maintenance, and improvement of technological facilities to support the optimization of production management. This study indicates that digital technology plays an important role in improving efficiency, productivity, and effectiveness of production management in the palm oil industry.

Keywords : Digital Technology, IoT, Production Management, Palm Oil Industry, PTPN IV.

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INTRODUCTION

Coconut industry palm oil is sector strategic national which provides contribution big to the Indonesian economy , both from side exports , state revenue , and absorption power Work (Buluaro et al., 2025) . Agricultural sector hold role important in economy national , because besides provide food for all over population , sector this also contributes foreign exchange , providing chance work and support development other sectors especially in provision material standard for industry (Zulvatricia & Munte, 2025) . Rapidly growth technology as well as increasing internet use expanding has bring activity man the more integrated with the virtual world, both moment This and in the future (Asnawi & Kurniawan, 2025) . Plant identification within a plantation is crucial for plantation management, environmental management, biodiversity monitoring, and various other applications. Accurate inventory and monitoring of oil palm plantations often pose challenges in plantation management and land expansion (Rodi & Daliman, 2024) . Farmers meet the information they need to manage integration activities through communication interactions, discussions among farmers, and the use of information and communication technology (Hidayat et al., 2021) .

Development technology information and digitalization in plantations coconut palm oil , system information expected capable give various , so that Create something system intelligent data management (Samosir et al., 2025) . In context this , transformation technology information (IT) is one of the approach crucial strategy For increase Power competitiveness and productivity industry coconut palm oil (Solihin et al., 2024) . System information is combination between procedure work , information , people, and technology organized information For reach objective in A organization (Hutagalung, 2021) .

Technology This help increase efficiency logistics , reducing costs , and ensure compliance to standard sustainability (Nasution & Ningsih, 2025) . For sufficient monitoring area distance area , then need use connected technology through the Internet of Things (IoT). The Internet of Things is something concept that has ability For transfer data via network without need interaction man to man or man to computer . Application (IoT) on devices This For make things easier and save money time farmer in the scheduling process watering the nursery coconut palm oil (Ardiyanto et al., 2021) . This development also requires a shift from manual to digital administrative systems. New technologies can encourage PKS to operate efficiently and increase productivity (Jelita et al., 2020) .

Management production namely planning , implementation and also supervision in manufacturing something product start from material raw materials and materials addition other until produce something product (Umami & Solehudin, 2024) . Optimization done For optimize use source Power in produce something product with expected quality and

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quantity in accordance desired goals achieved (Anggraini & Multahadah, 2025) . Rapid growth in industry This cause continuous demand increased , but capacity production often not capable balance growth the (Wiguna et al., 2024) . Changes system production traditional going to based system technology tall demand mature and adaptive strategic planning (Buluaro et al., 2025) . Management chain supply coconut palm oil , ensuring sustainability and security in production (Iqbal & Ahmad, 2024) . The main objective is For increase efficiency operational , strengthening accountability , and provide visibility full from upstream to downstream , which ultimately empowering all actor in chain values , including farmer small (Ariprayugo et al., 2025) .

Coconut industry palm oil is one of the contributor main development economy in Indonesia, besides can reduce poverty Because industry This has change to life farmer scale small in a way positive (Falatehan et al., 2021) . Face revolution this is industry 4.0 sector palm oil industry need quick tidy up especially in aspect digital technology (Haryanti & Marsono, 2021) . The palm oil production system is integrated through programs such as the nucleus-plasma scheme. Managing supply chain dynamics, meeting market demand, and preventing consumer panic during production fluctuations depend heavily on accurate forecasts of palm oil output and trade flows (Fachdiana et al., 2023) . Oil palm is an industrial/plantation crop that is useful as a producer of cooking oil, industrial oil, and fuel (Pakpahan et al., 2023) . The palm oil industry palm oil produce various type waste solids and liquids in very large quantities (Almizri & Akhmad, 2025) . Oil industry coconut palm oil own a very strategic role in economy national and global Indonesia (Hamdani, 2025) . One of challenge management land palm oil is problem productivity land . The higher the demand for CPO (Crude Palm Oil) and predicted will continue to rise in the future , which will have implications for increasing need expansion land . This is naturally need prevented with method increase productivity land through improvement technology , utilization seeds superior and rejuvenated tree (Wahyuni et al., 2023) .

Previous research has shown that digitalizing production systems can improve data processing efficiency and simplify production monitoring (Hutagalung, 2021) . Furthermore, the implementation of **the Internet of Things (IoT)** in production monitoring systems can improve the accuracy and real-time monitoring of production activities, which supports data-driven decision-making by management (Gupta et al., 2023) . Digital-based monitoring systems have also been shown to help companies monitor production processes more effectively, particularly in terms of quality control and daily supervision (Wahyuni et al., 2023) . Furthermore, the use of **production management information systems** enables integrated production data management, supporting operational efficiency, quality control, and more accurate managerial decision-making (Fauziah et al., 2024) . The application of

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digital technology also has an impact on increasing productivity and automating work processes, so that production processes can run more optimally with minimal errors (Solihin et al., 2024) .

PT Perkebunan Nusantara IV as one of the company plantation state - owned role important in management industry coconut palm oil in Indonesia. One of the processing units is the Sei Meranti PKS which focuses on processing fresh fruit bunches into oil coconut palm oil . In effort increase efficiency and productivity work , company Keep going do various innovation , including utilization digital technology in activity operations and management production . Implementation this digital technology No let go from role employee as implementer main in the production process . Employees are human resources who play a crucial role in the successful implementation of digital technology in a company environment. Their level of understanding, skills, and readiness to use digital technology will significantly impact the effectiveness of that technology's implementation.

The palm oil industry is a strategic sector that plays a vital role in the Indonesian economy, particularly in increasing state revenue and providing jobs. Along with technological advancements, palm oil plantation companies have begun implementing digital technology to support production management. Emerging phenomena in the field indicate that the use of digitalized production systems, the Internet of Things (IoT), digital-based monitoring systems, and production management information systems have helped companies improve efficiency, productivity, quality control, and oversight of production activities. However, the implementation of digital technology does not always run smoothly. Several obstacles such as limited skilled human resources, technological infrastructure readiness, investment costs, and the level of employee adaptation to digital systems remain key challenges. At PT. Perkebunan Nusantara IV PKS SEI Meranti, for example, despite the implementation of digitalization and IoT-based monitoring, there are still differences in the effectiveness of implementation across departments, particularly in work automation processes and rapid data-driven decision-making. This phenomenon indicates that despite the implementation of digital technology, comprehensive optimization of production management has not been fully achieved.

Based on the above description, this study aims to analyze the implementation of digital technology in optimizing production management in the palm oil industry, using a case study of employees at PT Perkebunan Nusantara IV Sei Meranti Palm Oil Mill (PKS Sei Meranti). This study is expected to provide an overview of the use of digital technology in improving production process efficiency and contribute to the development of more effective production management strategies in the palm oil industry.

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Formulation of the problem

1. How implementation digital technology in management processes production in industry coconut palm oil at PT. Perkebunan Nusantara IV PKS Sei Meranti?
2. How role digital technology in increase efficiency and effectiveness management production in industry coconut palm oil at PT. Perkebunan Nusantara IV PKS Sei Meranti?
3. Anything obstacles faced employee in implementation digital technology for optimization management production at PT. Perkebunan Nusantara IV PKS Sei Meranti?
4. How efforts made company in overcome constraint implementation digital technology in management production at PT. Perkebunan Nusantara IV PKS Sei Meranti?

Research purposes

1. For know How implementation digital technology in management processes production in industry coconut Palm oil at PT. Perkebunan Nusantara IV PKS Sei Meranti.
2. For analyze role digital technology in increase efficiency and effectiveness management production in industry coconut Palm oil at PT. Perkebunan Nusantara IV PKS Sei Meranti.
3. For identify obstacles faced employee in implementation digital technology for optimization management production at PT. Perkebunan Nusantara IV PKS Sei Meranti.
4. For know efforts made company in overcome constraint implementation digital technology in management production at PT. Perkebunan Nusantara IV PKS Sei Meranti.

LITERATURE REVIEW

Implementation of Digital Technology

The development of information technology and digitalization in oil palm plantations, systems Information is expected to be able to provide various things, thus creating an intelligent data management system. The current media for disseminating information is by using websites. (Samosir et al., 2025) . Impact on improvement quality source Power man through development man intelligent , skilled and trained in use modern technology , so that increase efficiency work and data quality (Aulia & Nasution, 2023) . Continuous efforts and commitment , perhaps can achieved production coconut more palm oil sustainable and responsible answer with utilise Intelligence Artificial Intelligence (AI) and sensing Far level carry on (Akhtar et al., 2023) . Therefore that , is necessary application For support and track production coconut palm oil as well as understand importance coconut palm oil in various sectors in Indonesia to help economy national (Fachdiana et al., 2023) .

As for the indicators implementation digital technology is as following :

1. digitalization system production (Hutagalung, 2021)
2. utilization of the Internet of Things (IoT) (Indani et al., 2024)

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3. production ring monitor digital- based (Wahyuni et al., 2023)
4. system information management production (Fauziah et al., 2024)
5. work process automation (Ardiyanto et al., 2021)

Optimization of Production Management

One of system management implemented For get amount the optimal yield is pressing occurrence losses during the production process (Abdilah et al., 2025) Optimization utilization digital technology and big data For expected can become runway For support business and formulate decision in develop industry coconut palm oil (Lumbanraja & Lumbanraja, 2024) . Management agriculture must combine technology This For increase efficiency , reducing costs , and create opportunity For increase results harvest and profit (Puangsuwan et al., 2024) . Optimization production related analysis quality from CPO products and kernels produced with objective For optimize results production with notice source available power (Devani & Aiza, 2023) . Development industry based waste in the sector coconut palm oil , as well as support transition towards a circular economy (Suksmanantyo et al., 2025) .

As for the indicators optimization management production is as following :

1. production process efficiency (Asnawi & Kurniawan, 2025)
2. improvement productivity production (Solihin et al., 2024)
3. control quality production (Fauziah et al., 2024)
4. taking decision data- based (Asnawi & Kurniawan, 2025)

Palm Oil Industry

Coconut industry palm oil is one of the sector strategic in the Indonesian economy , both from aspect contribution to national GDP , creation field work , as well as producer State foreign exchange (Lubis, 2025) . Oil palm (Elaeis guineensis) is a plant cultivated annuals especially For produce fruit that is rich in oil (Mhh, 2023) . Coconut industry palm oil is one of the sector Indonesia's leading contributors significant to economy national , good through foreign exchange export and absorption power Work (Suksmanantyo et al., 2025) . Palm oil is monoecious plants , namely have male and female flowers on one plant the same tree . Every tree produce around 1000 – 3000 pieces in one bunch. Shape the fruit round or elongated with color purple blackish and changing become red-orange when ripe (Rodi & Daliman, 2024) . This industry provide field work all over chain supply , starting from worker plantation until employee factory processing and those involved in logistics and exports , which provide source income for millions worker (Zaki et al., 2024) .

Indicator coconut palm oil is as following :

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1. productivity processing coconut palm oil (Indani et al., 2024)
2. production process management palm oil (Hutagalung, 2021)
3. supervision activity production (Tyas et al., 2025)

RESEARCH METHODS

Study This use method qualitative with approach descriptive purposeful For understand in a way deep implementation digital technology in optimization management production in industry coconut palm oil (Buluaro et al., 2025) . Research carried out at PKS Sei Meranti with focus on experience and understanding employee to use digital technology in the production process . Data sources in study This consists of from primary data and secondary data (Nasari, 2022) . Primary data was obtained through interview direct with employees involved in activity production (Falatehan et al., 2021) , while secondary data obtained from literature scientific , journal research , as well as related documents with implementation digital technology and management production (Darmansyah et al., 2026) . Data collection techniques used in study This covering interviews , observations , and documentation (Fauziah et al., 2024) . Interview done semi - structured For dig information about implementation digital technology , production process monitoring , production data management , and obstacles faced in its use (Zulvatricia & Munte, 2025) . Observation done with observe in a way direct production process in the environment factory (Febrinova et al., 2025) , whereas documentation used For complete related research data with activity operational production . Informant study chosen use purposive sampling technique (Hidayat et al., 2021) , namely election informant in a way on purpose based on consideration that they own relevant knowledge and experience with topic research . Interviewed informants in study This consists of from a number of part operational production at the Sei Meranti PKS, as presented in the table following .

Table 1. Informants Study

No	Informant Name	Position	Role in Study
1	Supriyadi	Crane Production	Give information about data management and recording production
2	Zega's Sickness	Engineering Foreman	Explain implementation digital technology in activity technical production
3	Toni Siahaan	Quality and Logistics Analyst	Give information about control quality and management distribution production

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4	Jerianto Sinaga	Station Operator Stew	Explaining operational processes production and use technology in production monitoring
5	Miranda Syaputra	Crane Quality Assurance	Give information about supervision quality products and systems recording quality

Data obtained from interviews , observations , and documentation Then analyzed use analysis descriptive qualitative , namely with method grouping data based on theme research , interpreting information obtained from informants , as well as interesting conclusion about implementation digital technology in optimization management production in industry coconut palm oil .

RESULTS AND DISCUSSION

1. Implementation Digital Technology in Management Production

Based on results interview with a number of informant at PT. Perkebunan Nusantara IV PKS Sei Meranti, it is known that implementation digital technology in management production has implemented through use system computerization in production data recording , processing process monitoring coconut palm oil , as well as compilation report production digitally . System the make it easier employee in access information production in a way fast and improve accuracy data recording compared with previous manual method used . Findings study This in line with study (Hutagalung, 2021) which states that digitalization system production capable increase efficiency data processing and make things easier monitoring activity production . In addition , research (Fauziah et al., 2024) also explains that use system information management production allows production data management done in a way integrated so that can increase efficiency operational and support taking decision more managerial right . That is reinforced by the results interview with Supriyadi (Krani Production) which states that *" Now almost all production data Already noted use system computer so that the reporting process become more faster and more neat compared to previously which is still use manual recording . "* Statement Jerianto Sinaga (Station Operator) also said something similar . Boiled) which explains that *" use digital systems help us monitor the processing process coconut palm oil start from reception fruit until the boiling process at the station stew so that production data more easy controlled . "* In addition , Miranda Syaputra (Krani Quality Assurance) also stated *that " with existence digital system , recording results production and quality data become more structured so that make it easier in compilation report production and report quality . "*

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2. The Role of Digital Technology in Optimization Management Production

Based on results interview with a number of informant part operationally , digital technology has role important in support optimization management production Because capable speed up data processing , improve efficiency work , and make things easier coordination between part in activity operational factory coconut palm oil . With existence digital systems , information about amount production , processing , and condition operational factory can known in a way more fast so that make things easier supervision and collection decision by the parties management . Findings This in line with study (Gupta et al., 2023) which explains that implementation digital technologies such as the Internet of Things (IoT) in production monitoring system can increase accuracy as well as allows monitoring activity production in real time so that support taking decision data- based by management . In addition , research (Wahyuni et al., 2023) also stated that digital- based monitoring system helps company in supervise the production process in a way more effective , especially in control quality and supervision operational daily . This is reinforced by the results interview with Zega (Technical Foreman) stating that *" digital technology is very helpful in the work process Because condition machines and processing processes can monitored with more fast so that If happen problem can quick handled . "* In addition , Toni Siahaan (Quality and Logistics Analyst) also conveyed that *" with existence digital systems , production and quality data can known with fast so that make it easier in control quality as well as arrangement distribution results production . "* Another statement was also made by Supriyadi (Krani Production) which explains that *" information available production in digital systems help part production in monitor activity operational so that the work process become more controlled . "*

3. Internal constraints Implementation Digital Technology

Based on results interview with a number of informant at PT. Perkebunan Nusantara IV PKS Sei Meranti, it is known that in implementation digital technology is still there is a number of obstacles faced by the company and employees . These constraints including limitations ability part employee in operate digital systems as well disturbance network or a system that sometimes happen so that can influence smooth operational processes . Conditions the show that implementation digital technology does not only need availability technology , but also readiness source Power man as well as support adequate infrastructure . This in line with study (Fauziah et al., 2024) which states that success use system information management production is greatly influenced by readiness source Power man as well as ability organization in manage digital systems in

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effective . In addition , research (Solihin et al., 2024) also explains that the implementation process digital technology in activity operational often face challenge in the form of limitations ability power Work in adapt with technology new so that need adjustment and training process in a way sustainable . This is reinforced by the results interview with Jerianto Sinaga (Station Operator) Boiled) which states that *" No all employee direct understand method use digital system because part Still used to with method manual work . "* In addition , Sakit Zega (Technical Foreman) also said that *" sometimes system experience disturbance or network No stable so that work must wait until system back to normal. "* A similar thing was also expressed by Toni Siahaan (Quality and Logistics Analyst) who stated that *" at the beginning implementation several digital systems employee Still experience difficulty in operate system Because Not yet used to use technology the . "*

4. Efforts to Overcome Implementation Obstacles Digital Technology

Based on results interview with a number of informant , company has do various effort For overcome constraint in implementation digital technology in management production . These efforts among other things, providing training to employee related use digital system , perform maintenance and repair system in a way periodically , and increase facility technology used in activity operational factory . The steps carried out so that implementation digital technology can walk optimally and provide maximum benefits for company . Findings This in line with study (Solihin et al., 2024) which states that implementation accompanying digital technology with improvement competence source Power man capable increase productivity as well as support work process automation so that activity production can walk more optimal with level minimal errors . This is reinforced by the results interview with Supriyadi (Krani Production) which states that *" company usually give direction or training to employees to be more understand use digital systems in work everyday . "* In addition , Sakit Zega (Technical Foreman) also explained that *" If happen system problem or digital equipment , usually quick done checking and repairing so that the production process can return walk normally . "* Another statement was also made by Miranda Syaputra (Krani Quality Assurance) who stated that *" company Keep going make an effort increase facility technology as well as give mentoring to employees so that the use of digital systems can walk with more effective . "*

CONCLUSION

Based on results study can concluded that implementation digital technology in

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management production at PT. Perkebunan Nusantara IV PKS Sei Meranti has implemented through use system computerization in production data recording , processing process monitoring coconut palm oil , as well as compilation report production digitally . Implementation technology the give benefit in increase efficiency work , speed up processing information , as well as make things easier coordination and supervision of the production process . Although thus , in implementation Still there is a number of constraint like limitations ability part employee in operate digital systems , interference network or system , as well as need sufficient cost big in development technology . Therefore that , the company do various effort For overcome constraint the through giving training to employees , maintenance system in a way periodically , and improvement facility technology to support optimization management production in industry coconut palm oil .

Research

Implications Research results This show that implementation digital technology has role important in increase effectiveness and efficiency management production in industry coconut palm oil . Therefore that , the company need Keep going develop utilization digital technology in activity operational production as well as increase competence source Power man through training and mentoring so that employees capable operate digital systems optimally . In addition , support management in provision infrastructure adequate technology as well as evaluation system in a way periodic also becomes factor important in ensure success implementation digital technology . In academic , research This can become reference for study next to study digital transformation in sector industry plantations and their impact to improvement efficiency as well as productivity production .

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