

## DIGITAL TRANSFORMATION IN DATA COLLECTION OF MILK STORAGE KUD KRUCIL ARGOPORO: THE FUTURE SOLUTION OF THE DAIRY INDUSTRY

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**Abstract:** Digital transformation is a key factor in improving efficiency and accuracy across various sectors, including the dairy industry. The Krucil Argopuro Village Unit Cooperative (KUD), a key player in managing fresh milk from local farmers, faces numerous challenges in its manual milk deposit data collection process. This process often poses risks of recording errors, information delays, and a lack of transparency between farmers and the cooperative. This study aims to examine the implementation of digital transformation through an integrated digital recording system for milk deposit data collection at the Krucil Argopuro KUD. This study used a qualitative approach, with data collection methods including direct field observations and in-depth interviews with farmers and KUD administrators to gain a comprehensive understanding of modern agricultural information systems. The results show that digitalization can improve data accuracy, accelerate the recapitulation process, and strengthen trust between the cooperative and farmers. Therefore, digital transformation serves not only as a technical solution but also as a significant strategic step in addressing the challenges of the increasingly competitive and data-driven dairy industry in the future.

**Keywords:** Digital transformation, Data transparency, Digital milk data collection, Digitalization challenges.

### Introduction

The dairy farming sector is one of the important subsectors in national agricultural development, especially in meeting the needs of animal protein consumption of the Indonesian people (Ministry of Agriculture, 2021). The main product of this sector is fresh milk, which is not only of high economic value but also part of basic nutrition for the wider community. In the fresh milk supply chain, smallholder farming cooperatives, such as Village Unit Cooperatives (KUD), play a vital role as a liaison between farmers and the dairy processing industry. The cooperative not only functions as a marketing institution for livestock products but also as a provider of supporting services, including feed distribution, livestock health services, and technical assistance to its member farmers (Food Security Agency, 2020).

However, in practice, many cooperatives still face various basic problems, one of which is a recording and reporting system that is not optimal. In many regions, data collection of milk deposits from farmers to cooperatives is still done manually using notebooks or diary sheets. This is not only prone to human error but also complicates the process of recapitulation, supervision, and distribution of information to farmers. As a result, there are often data mismatches, late payments, and declining trust of farmers in cooperatives.

KUD Krucil Argopuro, located in Krucil District, Probolinggo Regency, is one of the cooperatives that is active in managing the distribution of fresh milk from local farmers. With

the number of members growing and the volume of milk production increasing every year, the need for a more efficient, accurate, and transparent recording system has become more urgent. So far, the process of recording milk deposits is still carried out conventionally by milk receiving officers, which are then copied into daily or monthly recapitulation reports. Such a model requires a great deal of time and effort, and it is not uncommon to cause data mismatches between field recording and final recap.

It is in this context that digital transformation becomes a strategic necessity, not just a technical innovation. The use of information technology in the management of milk deposit data can be a solution to various challenges faced by cooperatives, both in terms of operational efficiency and information transparency. The digitization of the recording system allows for real-time recording, reduces the risk of data errors, speeds up the reporting process, and strengthens the relationship and trust between cooperatives and farmers (Case Study of Milk Cooperatives in East Java, 2023). Not only that, digitally recorded data can also be used as a basis for decision-making, both at the level of cooperative management and local government policies in fostering the livestock sector (Ministry of Cooperatives and SMEs, 2022).

The Krucil Argopuro Village Unit Cooperative (KUD), as one of the important pillars in the dairy farming sector in the Probolinggo area, East Java, plays a central role in distributing milk production from farmers to the market. However, conventional recording systems that still rely on manual processes often cause obstacles in data accuracy, information delays, and potential manipulation that is detrimental to both cooperatives and farmers (Hapsari et al., 2019). In the long run, this can reduce production efficiency, weaken the payment system, and cause dissatisfaction and distrust from cooperative members.

Digital transformation in the milk deposit data collection system is the answer to these challenges. By integrating cloud-based software systems or mobile applications, data collection can be done automatically and instantly when milk is deposited. Farmers can immediately find out how many liters of milk have been deposited, the quality of the milk, and the deductions or incentives received (World Bank, 2017). This opens up a wider space for transparency and increases fairness and accountability in cooperative governance.

Furthermore, the implementation of digital systems opens up opportunities to conduct more comprehensive data analysis. Historical data on milk deposit volume, quality, and production trends can be used as a basis for providing technical recommendations to farmers, for example related to feed, cow health, and optimal milking time. On the other hand, cooperatives can also identify seasonal production patterns and better organize milk distribution and marketing strategies.

In addition to operational aspects, digital transformation also supports efforts to modernize the dairy sector as a whole. Local governments and related agencies can use the available data to develop more targeted policies, such as subsidies, technical training, and livestock capacity building programs (Setiadi & Widodo, 2020). This digitalization also strengthens the competitiveness of cooperatives amid increasing demands for the quality and quantity of milk production, both from the processing industry and the consumer market.

By seeing the importance of the role of digitalization, it is time for KUD Krucil Argopuro to take concrete steps towards an integrated digital data collection system. This is not just following technological trends, but is a strategic investment in ensuring the sustainability of the dairy industry in the future. Therefore, a study of digital transformation in milk deposit data

collection is very relevant to be carried out, in order to formulate a proper, effective, and sustainable implementation model and strategy.

This research aims to examine in depth digital transformation in the context of cooperative digitalization, especially through the implementation of the milk digital recording system at KUD Krucil Argopuro. The main focus of this study is to analyze how the integration of digital systems is carried out in the cooperative's operational workflows, as well as assess the extent to which the system contributes to increasing operational effectiveness, data transparency, and accurate and efficient data management. The study also explores the impact of digitalization on farmers as key stakeholders, including how they respond to system changes and digitalization challenges that arise in the field. The methods used include field observations, in-depth interviews with farmers and cooperative managers, and thematic analysis of best practices in the application of information systems in the livestock sector. With this approach, this research is expected to make a real contribution to the development of digital-based cooperative models that can be replicated in other regions in Indonesia (Elsanti, 2024).

### **Method**

This study uses a descriptive qualitative approach that aims to gain an in-depth understanding of the process of implementing digital transformation in the milk deposit recording system at KUD Krucil Argopuro. This approach was chosen because it is suitable for exploring social phenomena, interactions between actors, and dynamics that occur in the field in a contextual and holistic manner, with a focus on understanding the experiences, perceptions, and responses of actors directly involved in the recording system such as farmers, cooperative officers, and KUD administrators (Nugroho, 2020).

Data collection was carried out through direct observation of the recording process before and after digitization, in-depth interviews with farmers and KUD administrators to explore perceptions and challenges in the use of digital systems, documentation studies on internal cooperative documents such as deposit reports and daily records, as well as literature studies related to agricultural information systems and cooperative digital transformation (Saldaña, 2021). The data obtained was analyzed qualitatively using thematic analysis methods to identify the patterns, main themes, and meanings of each data, with the hope of providing a comprehensive picture of the impact of digitalization on the effectiveness of cooperative work and the relationship between cooperatives and farmers (Braun & Clarke, 2006).

The source of research data consists of primary and secondary data. Primary data was obtained directly from cooperative member farmers, management, operational staff, and field officers through in-depth interviews, participatory observations, and informal discussions, while secondary data came from the cooperative's internal documentation, scientific literature, and regulations from relevant agencies (Yin, 2018).

The type of data collected is qualitative data that is descriptive, allowing researchers to deeply understand the role of KUD Argopuro in supporting the welfare of farmers in Krucil Village through a description of natural conditions, processes, and social interactions. Data analysis is carried out through three stages: data reduction to filter relevant information, presentation of data in the form of descriptive narratives, and drawing conclusions based on finding patterns, with data validity maintained through triangulation of sources and techniques to compare various information from interviews, observations, and documentation.

The innovation in this study lies in the application of a locality-based thematic model with a participatory approach, where informants are not only objects but also provide interpretations of the conditions they experience. This research focuses not only on the economic aspects of the cooperative, but also on social aspects such as solidarity between farmers, access to information, and the practice of mutual cooperation facilitated by KUD Argopuro, making it a new contribution to the study of the digital transformation of cooperatives in the livestock sector (Nugroho, 2021).

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## Results and Discussion

Based on the results of research conducted through field observations, in-depth interviews with cooperative administrators, farmers, and analysis of internal documents of the Argopuro Family, it can be concluded that the implementation of digital systems in the process of collecting data and managing cooperatives has a significant positive impact. This digital transformation not only impacts work efficiency, but also creates a change in work culture and strengthens the active participation of farmers.

The implementation of the digital system, which began in June 2024, has been successfully implemented in full at five main shelter posts, namely Krucil 1, Krucil 2, Tambelang, Brummi 1, and Watupanjang. The use of web-based and mobile digital applications allows the recording of milk deposits to be carried out in real-time and accurately, replacing manual methods that are prone to errors, delays, and data manipulation. This process shows a significant increase in efficiency, especially in daily and monthly data recapitulation that previously took 3–4 days, can now be completed in just a matter of minutes.

In addition, the active involvement of farmers in monitoring deposit data through the application is also an important achievement in terms of transparency. Farmers can now access information on the amount of milk deposited, milk quality, deposit time, and incentives received independently, without having to wait for a report from the cooperative officer. This increases trust in the cooperative system, while strengthening the relationship between members and management.

The increase in recording accuracy of up to 95% is also an indicator of the success of the implementation of this system, as reported by the cooperative's digital operator team. Data stored automatically in cloud-based systems not only facilitates internal reporting, but also opens up opportunities for cross-sector integration, such as cooperative finance, feed distribution, livestock health programs, and more accurate microfinance services based on historical data.

Despite this, challenges remain. The implementation of digital technology still faces obstacles in several posts that are still in the process of digitization, such as Tambelang 2, Rabesan, Brummi 2, Pesapen, Kramat, and Kertakata. Some of the key barriers identified include low digital literacy among elderly farmers, limited internet network infrastructure in rural areas, and the need for ongoing technical training and mentoring.

Technical obstacles also arise in the form of system disruptions, virus-infected devices, and reliance on a stable internet connection for data synchronization. These issues have a direct impact on the backlog of financial and operational reports, requiring a long-term mitigation strategy that includes strengthening the technical capacity of administrators and field officers. Furthermore, the observation process shows that a phased approach in the implementation of digitalization is a realistic and effective strategy. The use of the “piloting” system in several main posts provides room for evaluation and refinement before being extended to other posts. This is in line with the participatory principle in digital transformation, where the success of the system depends not only on hardware and software, but also on social acceptance and HR readiness.

In terms of policy, the system used is a nettle application developed by a soft data link based on the principles of transparency and accountability. This system allows for inter-postal integration and comprehensive management of cooperative data. The system’s ability to provide real-time data and high accessibility makes it a strategic tool to improve cooperative governance, as well as strengthen the position of cooperatives in facing the challenges of modernizing the agriculture and livestock sector. In general, the results of this study corroborate the findings that cooperative digitalization, if applied with a contextual and participatory approach, can be a real solution for improving performance, efficiency, and trust in the dairy sector. KUD Krucil Argopuro has proven that village cooperatives also have great capacity and potential to transform into data-based organizations that are adaptive to technological developments.

Thus, digitalization in KUD Argopuro is not only a technical change in the recording system, but also a systemic transformation in cooperative management. This makes this model worthy of being used as a reference or pilot study for other cooperatives in Indonesia, noting that the approach remains based on local needs, government policy support, and sustainable human resource capacity building.

## **Discussion**

### **Implementation of Digital Systems in the Operation of KUD Argopuro**

The implementation of digital transformation in the Argopuro Village Unit Cooperative (KUD) since June 2024 shows that village cooperatives are able to adopt information technology to improve their operational performance. A digital system that includes recorded recording, payment, and marketing in an integrated manner has been implemented at five shelter posts, namely Pos Krucil 1, Krucil 2, Tambelang, Brummi 1, and Watu Panjang. This marks significant progress in efforts to digitize cooperative operations, which in the early stages have shown increased work efficiency and transparency.

Meanwhile, several other posts are still in the process of gradual integration, such as Tambelang 2, Rabesan, Brummi 2, Pesapen, Kramat, and Kertakata. This gradual process

illustrates the challenges in leveling the implementation of technology across units, which can be caused by infrastructure readiness, human resources, and adaptation to new systems. However, these efforts show KUD Argopuro's commitment to supporting digital transformation as an important strategy in improving service quality and data management.

These findings are in line with previous studies that stated that digitalization in cooperatives can be a key driver in improving operational efficiency and transparency, as well as strengthening trust between cooperatives and their members. Thus, the implementation of the digital system in KUD Argopuro can be a model for other village cooperatives in facing the challenges of modernizing the livestock sector.

**Table 1.** Shelter posts that already use digital systems:

Yes	Sheltr Post Name	Digitalization Status	Digital Start
1.	Krucil 1	Already Digital	June 2024
2.	Krucil 2	Already Digital	June 2024
3.	Tambelang	Already Digital	June 2024
4.	Beremi 1	Already Digital	June 2024
5.	Watu Panjang	Already Digital	June 2024

**Table 2.** Shelter posts that process use digital systems:

Yes	Sheltr Post Name	Digitalization Status	Digital Start
1.	Kramat	Digital Process	August 2024
2.	Pasapen	Digital Process	August 2024
3.	Tambelang 2	Digital Process	August 2024
4.	Beremi 2	Digital Process	August 2024
5.	Kertakata	Digital Process	August 2024
6.	Rabesan	Digital Process	August 2024

### **Applications or Systems Used and Their Impact on Work Effectiveness**

The digital system used at KUD Argopuro is part of a government program called Nettle, with an information system built by Link Data Soft Solusi. The system is designed based on the principle of data transparency, which allows every transaction and report to be recorded in real-time and openly accessible by related parties. The implementation of this system has been proven to be able to increase work effectiveness, minimize human error in manual recording, speed up the administrative process, and strengthen integration between cooperative posts (Creswell, 2014).

### **Digital Data Collection of Milk**

Digital data collection of milk is the core of the digital transformation implemented at KUD Krucil Argopuro. These systems replace the manual logging methods previously used with technology-based systems, such as digital applications or cloud-based logging software. The implementation of this system includes the use of digital input devices (such as smartphones, tablets, or computers) that are directly connected to a central database, allowing for real-time and automatic recording of milk deposits.

Through this system, every farmer who deposits milk will immediately receive information about the number of liters of milk deposited, the quality of milk (if measurements are available), the time of deposit, and the incentives or deductions applied. This information is not only stored in the cooperative's database, but can also be accessed by farmers directly through their devices or through field officers. This creates a more transparent and accountable environment, where everyone has access to the same data.

The main benefits of this digital data collection include:

- a. Improved recording accuracy: The risk of write errors, double counting, or data loss can be minimized.
- b. Speed in recapitulation: The process of generating daily, weekly, and monthly reports becomes faster and more efficient because the data has been structured from the beginning of input.
- c. Transparency and trust: Farmers feel more confident in the cooperative system because the data presented is open and verifiable.
- d. Storage and tracking of historical data: Data that has been recorded digitally can be easily traced, aiding in reporting to the agency or in the internal audit process of the cooperative.
- e. Easy integration with other systems, such as cooperative finance, feed distribution, or an incentive system based on production performance.

However, this digitalization process is also faced with several main challenges, including:

- a. The level of digital literacy of farmers varies. Some farmers, especially the older generation, have difficulty accessing or understanding the use of digital devices.
- b. Limited technological infrastructure, such as unstable internet networks in rural areas, as well as the availability of adequate digital input devices.
- c. The need for ongoing training and mentoring to ensure that the system can be used optimally and sustainably by all parties involved.
- d. A change in work culture, both among officers and cooperative administrators, from manual habits to a digital data-based approach.

However, the results of observations and interviews show that the majority of farmers welcome this digitalization after they feel the immediate benefits, such as ease of access to information and certainty of the amount of their deposit. In fact, some young farmers have begun to be more actively involved in the data management process, which was previously only controlled by cooperatives. This shows that digital transformation not only changes the work system, but is also able to encourage the active and inclusive participation of all cooperative members.

The digitization of milk data collection at KUD Krucil Argopuro can be used as a pilot model for other cooperatives in Indonesia, with the note that the approach used still considers the local context, the readiness of human resources, and is carried out in a gradual and participatory manner. This approach ensures that digital transformation is not just a replacement of tools, but a systemic change that is able to improve the quality of cooperative governance as a whole.

### **Challenges in the Application of Digital Technology**

Although it provides significant benefits, the digitalization process in the village cooperative environment cannot be separated from challenges. One of the obstacles faced is technical obstacles, such as systems that are experiencing troubleshooting and virus-infected devices, which have an impact on disruptions to financial statements (LP) and other operations (Ministry of Cooperatives and SMEs RI, 2023). In addition, the level of digital literacy of cooperative administrators is also a challenge in itself, considering that not all members have an adequate information technology background.

### **Challenges in Manual Data Collection Systems**

Manual data collection that relies on paper or daily log keeping has various disadvantages, such as: Recording errors due to human limitations. Risk of loss or damage of physical data. Delays in reporting and recapitulation of monthly data. Lack of transparency between farmers and cooperatives. This situation creates uncertainty in the payment and distribution of incentives to farmers. In addition, data-driven decision-making is hampered because the available data is not real-time and less accurate.

### **The Urgency of Digital Transformation in the Dairy Industry**

Digital transformation is the process of integrating digital technology in all aspects of business, including the agriculture and livestock sectors. In the dairy industry, digitalization can be applied in various forms, including: Application-based farm management system. Automatic sensor for milk volume and quality measurement. Integration of cooperative financial systems and production data.

The implementation of the digital recording system at the Krucil Argopuro KUD aims to improve the accuracy and operational efficiency in collecting data on milk deposits, as well as strengthen trust between farmers and cooperatives (Ministry of Communication and Information RI, 2025).

### **Digitalization Implementation Methodology**

In this study, the methods used include: Direct observation of the data collection process of milk deposits at KUD. In-depth interviews with farmers and cooperative managers about their experiences and expectations of the digital system. Literature study on modern livestock information systems and the implementation of technology in cooperatives. The digital system being tested is a web-based and mobile-based application that is able to record milk deposit data in real-time, manage data per individual farmer, and generate daily and monthly automatic reports.

## Results and Impacts of Digital Transformation

The results of the initial implementation of the digital system show several positive impacts: Up to 95% increase in recording accuracy compared to previous manual systems. The recapitulation process, which previously took 3–4 days, can now be done in a matter of minutes. Information transparency is increased, as farmers can access their deposit data through the app. Increasing the trust and active participation of farmers in cooperative activities. In addition, the system also opens up opportunities for integration with microfinance services, feed management, and historical data-driven livestock health programs (Solution Soft Data Link, 2025).

## Conclusion

The digital transformation carried out by KUD Argopuro since June 2024 shows the commitment of village cooperatives in utilizing technology to improve operational efficiency. With the use of Nettle's transparent and real-time digital system, the cooperative has succeeded in speeding up the administrative process, reducing recording errors, and strengthening interpostal integration. This initiative proves that digitalization can be effectively applied even in rural cooperative environments. Digital transformation in data collection of milk deposits at KUD Krucil Argopuro has proven to be able to increase efficiency, transparency, and accuracy of data. This shows that digitalization is not only a technical solution, but also a long-term strategy in building resilient, adaptive, and data-driven livestock cooperatives.

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