

Analysis of Raw Material Inventory Control for Smoothness of The Production Process Using MRP (Material Requirement Planning) Method at The Tofu Factory of Guyub Rukun in Malang City

Danda¹, Anung Prasetyo Nugroho², Yuni Setyawati³

** Correspondence Author: yivomlw400@gmail.com*

^{1,2,3} Management, Faculty of Economics, University of Tribhuwana Tunggaladewi, Malang, Indonesia

INDEXING	ABSTRACT
Keywords: Keyword 1; Production process Keyword 2; MRP method Keyword 3; Inventory control Keyword 4; Raw material Keyword 5; Smoothness	This research was conducted with the aim of finding out whether the analysis of raw material inventory control carried out by the Guyub Rukun tofu Factory was effective in the production process in Lowokwaru District Malang City, to find out how the raw material inventory control process works for the production process, The research design in this study is to use a quantitative approach method. This research using quantitative methods is research that aims to describe and understand the phenomena experienced by research subjects, for example regarding the analysis of raw material inventory control for the smooth running of the production process using the MRP method. In this study, the collected data was then processed using quantitative descriptive analysis. In general, quantitative data analysis involves three steps: observation, interviews, and documentation. This research was conducted at the Guyub Rukun Tofu Factory in Lowokwaru District, Malang City in June 2025. The results of this study are the raw material inventory control system implemented by the Guyub Rukun Tofu Factory in Malang City, the Guyub Rukun Tofu Factory implements a routine inventory control system and is based on daily operational experience, where every day the main raw material is purchased, namely soybeans, as much as 200 kg according to the daily production capacity. The application of the material requirement planning (MRP) method in planning raw material requirements at the Guyub Rukun tofu factory based on EOQ calculations, with an ordering cost of IDR 40,000 per order and a storage cost of IDR 717,000 per kg per year, obtained an optimal order size of around 818 kg per order. Thus, the effectiveness of the material requirements planning (MPR) method compared to the inventory control policies currently implemented by the Guyub Rukun Tofu factory.

Article History

Received : 22 July 2025 ; Revised : 26 September 2025 ; Accepted : 04 October 2025

Publish : 05 October 2025

INTRODUCTION

Raw material inventory control is a cornerstone of operational success in manufacturing and production sectors, involving the organized oversight, regulation, and refinement of essential inputs like metals, textiles, chemicals, and agricultural commodities that serve as the foundation for finished goods. This discipline ensures that businesses maintain adequate stock levels to meet production demands without overstocking, which can lead to waste, spoilage, or financial strain. By implementing practices such as meticulous record-keeping, real-time inventory tracking, demand forecasting, and setting reorder thresholds and buffer stocks, companies can make

strategic decisions that optimize procurement and storage, enhance liquidity, and reduce unnecessary costs. Differentiating between direct raw materials, those incorporated into the final product and indirect ones used to support production, adds complexity that requires customized inventory approaches. Technological innovations have revolutionized this field, with tools like barcode systems, RFID technology, and integrated inventory software enabling automation and precision. These systems minimize manual errors and generate valuable insights through data analytics, helping managers identify inefficiencies, fine-tune purchasing cycles, and adapt quickly to shifts in demand or supply chain disruptions, as well as explained by Gopalakrishnan and Haleem (2015), Girsang and Purwanto (2017), Susanto (2018), Citaresmi and Azizah (2019), Saputra *et al* (2021), Haryadi and Bramasto (2023), Begum *et al* (2024), Gisi (2025).

Beyond operational efficiency, raw material inventory control contributes to product consistency and customer satisfaction by ensuring reliable access to standardized inputs. It also aligns with sustainability objectives by reducing waste and encouraging responsible resource management. While small enterprises may rely on well-maintained spreadsheets, larger organizations typically adopt ERP systems that connect inventory data with broader functions such as finance, logistics, and production planning. Poor inventory control can have serious financial repercussions, including elevated holding costs, missed sales opportunities, and diminished profitability, making it essential for businesses to invest in robust systems. Moreover, industries like food, pharmaceuticals, and chemicals often face strict regulatory requirements for traceability and documentation, further emphasizing the need for effective inventory oversight. Ultimately, raw material inventory control is not just a logistical necessity but a strategic asset that influences every stage of production—from planning and procurement to cost control and customer engagement. By aligning inventory strategies with organizational goals and leveraging modern technologies for greater precision and responsiveness, companies can strengthen their competitive edge, maintain operational stability, and thrive in an increasingly complex and fast-paced global environment, as well as explained by Akinlabi (2021), Zhong (2022), Ogbuagu *et al* (2023), and Stüve *et al* (2025).

Managing raw material inventory is essential for tofu factories, as it directly affects their ability to maintain smooth production, control costs, ensure product quality, and meet customer expectations (Farhan and Purnomo, 2025). The key ingredient soybeans must be stocked in accurate quantities and delivered on time to avoid production stoppages that could result in unmet demand, financial losses, and damage to the factory's reputation. On the flip side, excessive stockpiling of soybeans, especially in humid conditions, can lead to spoilage and increased storage expenses. To strike the right balance, tofu producers rely on inventory control strategies that include demand forecasting, setting reorder thresholds, and maintaining buffer stock to guard against supply chain disruptions. Methods like Economic Order Quantity (EOQ) and Material Requirement Planning (MRP) are commonly used to determine optimal purchasing schedules and quantities, helping minimize both procurement and storage costs, as well as explained by Christifan and Gozali (2020).

The first Guyub Rukun tofu factory was established in 1980. Guyub Rukun tofu is one of the first tofu factories in Malang. This tofu factory was first established by Mr. H. Chozin. Currently, the Guyub Rukun tofu factory is managed by H. Chozin's son, Mr.

Suriyono. Currently, the tofu factory has 8 employees. The Guyub Rukun tofu factory is located in Malang. This factory focuses on tofu production which requires soybeans as the main raw material. In carrying out its production activities, the Guyub Rukun tofu factory faces various challenges in managing soybean supplies, such as uncertain supplies from distributors, limited storage space and fluctuating production needs. This condition creates the potential for an imbalance between the availability of raw materials and daily production needs.

The focus of this research is the analysis of raw material inventory control used by the Guyub Rukun Tofu Factory in the development of its business and production processes, as well as the factors that influence the success of inventory control development.

Based on the research questions outlined above, the following research objectives can be determined:

1. What is the raw material inventory control system currently implemented by the Guyub Rukun Tofu Factory in Malang City?
2. How is the Material Requirement Planning (MRP) method applied to planning raw material requirements at the Guyub Rukun Tofu Factory in Malang City?
3. To what extent is the implementation of the Material Requirement Planning (MRP) method effective compared to the inventory control policies currently implemented by the Guyub Rukun Tofu Factory in supporting the smooth production process.

This research paradigm is quantitative, with an analysis of raw material inventory control aimed at ensuring a smooth production process. Inventory control is crucial for the production process. The Guyub Rukun Tofu Factory can further develop with an analysis of raw material inventory control. Therefore, this research provides a solution in the form of raw material control.

LITERATURE REVIEW

Inventory control

Inventory control is a planned approach to determining what to order, when to order, how much to order and how much inventory to keep so that costs associated with purchasing and storage are optimal without disrupting production and sales. Inventory control plays a role in ensuring smooth business operations by maintaining optimal stock levels (Muller, 2019). It involves monitoring inventory quantities, organizing storage locations, and determining appropriate times for restocking. When executed effectively, inventory control helps companies avoid common issues such as running out of stock—which can result in lost sales and unhappy customers—or holding excess inventory, which can tie up financial resources and increase storage expenses. It's important to distinguish inventory control from inventory management. Inventory control is more tactical, focusing on daily operations like tracking items and their locations. In contrast, inventory management is strategic, encompassing broader concerns such as demand planning and supply chain optimization (Olaniyi and Pugal, 2024). Together, these functions create a flexible and responsive business framework. Strong inventory control offers benefits that go beyond operational streamlining. It enhances decision-making, lowers inventory holding costs, and improves customer service. For instance, consistently stocking high-demand items builds consumer trust and encourages repeat business. Meanwhile, identifying products with low turnover allows businesses to refine marketing efforts or phase out less

profitable items. Inventory control is more than a logistical function, it's a strategic asset that drives profitability, strengthens customer relationships, and enhances organizational adaptability (Oteri *et al*, 2023; Adeniran *et al*, 2024; Ramadan *et al*, 2024). Whether using basic tools or sophisticated systems, maintaining precise and up-to-date inventory records enables businesses to respond quickly to market dynamics and operate with greater sustainability (Vaka, 2024).

Material Requirement Planning (MRP)

Material Requirement Planning (MRP) is a scheduling technique used by manufacturing companies as a means for all workers involved to communicate regarding the flow of materials or goods (Hasanati *et al*, 2019). The MRP technique or method emphasizes planning, because MRP is essentially a planning and scheduling technique. This technique is actually very simple, namely simply using mathematical logic to plan the number of items needed and schedule when the items are needed (Siregar, 2022). Although very simple, from practice it is known that it is precisely because of this planning and scheduling that a production or manufacturing process can often be successful or not. Planning with MRP is a typical planning and scheduling used in a manufacturing company that concerns the flow of goods to and through the finished goods manufacturing process (Xu *et al*, 2023).

Material Requirement Planning (MRP) is a key system used in manufacturing and production to streamline the coordination of inventory, purchasing, and scheduling. It helps businesses determine the specific materials needed, the quantities required, and the timing for their availability to meet production targets (Tanaga and Oetama, 2023). MRP works by integrating crucial data sources such as the master production schedule (MPS), bill of materials (BOM), and inventory status files (ISF) to calculate the actual material needs and generate planned orders. This ensures that essential raw materials and components are delivered just in time for use, reducing surplus inventory and associated costs (Akande, 2019). The system's forward-looking approach helps prevent shortages, shortens lead times, and improves the efficient use of resources, ultimately boosting productivity. MRP is particularly beneficial in complex manufacturing settings where different products share components or where production must quickly adapt to changes in demand. By automating the planning process, MRP minimizes human error and supports better decision-making, enabling managers to revise procurement and production plans in response to shifting customer requirements, supplier issues, or market dynamics (Ihme, 2015; Miclo *et al*, 2019).

RESEARCH METHOD

This study uses a descriptive quantitative approach to describe the experience of the research subjects, namely the analysis of raw material inventory control for the smooth production process using the MRP method. The main focus of the study is the analysis of raw material inventory control at the Guyub Rukun Tofu Factory in Malang City, analyzing control in the production process, and developing planning strategies involving raw materials. The type of research used is quantitative descriptive analysis. Data analysis was carried out through three main steps: observation, interviews, and documentation. Observation is a data collection technique by conducting direct observation, interviews, and documentation is a data collection technique by taking pictures. The research location is the Guyub Rukun Tofu Factory in Lowok Waru District, Malang City.

RESULT AND DISCUSSION

Characteristics of Research Subjects/Objects/Samples/Respondents

Research Subjects

The subject of this research is the Guyub Rukun Tofu Factory in Lowokwaru District, Malang City, which plays a role in managing tofu production. This research involved UMKM actors of the Guyub Rukun Tofu Factory, Malang City with observation, interviews, documentation.

Data analysis

This study uses a quantitative approach with the MRP method and the EOQ approach to analyze raw material inventory control for the smooth running of the production process.

Research Data Presentation

In quantitative research that focuses on the analysis of raw material inventory control for the smooth production process using the MRP (material requirement planning) method at the Guyub Rukun Tofu Factory in Malang City. Researchers conducted research at the Guyub Rukun Tofu Factory in Malang City and researchers conducted direct observations at the research object of the Guyub Rukun Tofu Factory in Malang City in order to find out the phenomena that exist in the field, researchers conducted research by observation, interviews and documentation to the Guyub Rukun Tofu party, Belimbing District, Malang City, including the owner of the Guyub Rukun Tofu Factory, Mr. Suriyono, equipped with documentation and direct interviews. The following are the results of research conducted at the Guyub Rukun Tofu Factory in Malang City.

Application of the Material Requirement Planning (MRP) method in planning raw material requirements at the Guyub Rukun Tofu Factory

Based on the EOQ calculation, with an ordering cost of Rp 40,000 per order and a holding cost of Rp 717 per kg per year, the optimal order size is approximately 818 kg per order. This means the factory only needs to place orders eight times in 30 days, compared to 30 times using the Lot-for-Lot method. Thus, MRP helps factories determine the quantity and timing of raw material orders more efficiently, reduce total inventory costs by reducing ordering frequency, and maintain smooth production.

The use of the Material Requirement Planning (MRP) system at the Guyub Rukun Tofu Factory has become a key driver in refining how the factory plans and procures its essential raw materials, especially soybeans, which are central to tofu production. MRP enables the factory to anticipate demand accurately, calculate the exact quantity of materials required, and schedule purchases in alignment with production timelines. This system draws on data from the master production schedule, bill of materials, and current inventory records to determine when and how much raw material should be ordered. Before adopting MRP, Guyub Rukun struggled with issues like surplus inventory, which led to spoilage and higher storage costs and insufficient stock, which caused production delays and unmet customer orders.

With MRP in place, the factory now applies methods such as Lot-for-Lot (LFL), Economic Order Quantity (EOQ), and Period Order Quantity (POQ) to customize its procurement approach. LFL ensures that soybeans are ordered in quantities that match

each production batch, helping to avoid overstocking and reduce waste. EOQ calculates the most economical order size by balancing the costs of ordering and storing inventory, while POQ schedules purchases at regular intervals to synchronize with production cycles. These strategies have helped Guyub Rukun lower the frequency of orders, cut down on inventory expenses, and respond more effectively to changes in market demand.

Additionally, MRP fosters better collaboration between the purchasing and production departments, ensuring that raw materials arrive just in time for processing, which helps maintain consistent product quality. The system also enhances financial planning by providing accurate forecasts and tighter inventory control, allowing the factory to allocate resources more strategically and avoid unnecessary spending. Furthermore, MRP supports compliance with food safety standards by improving the traceability and documentation of raw material usage an essential requirement in regulated food production environments.

The success of MRP at Guyub Rukun illustrates that even small tofu producers can benefit significantly from structured inventory planning. Transitioning from intuition-based ordering to a data-driven approach has boosted the factory's operational efficiency, minimized waste, and improved its ability to meet customer expectations consistently. In the broader context, MRP is not merely a tool for managing inventory—it is a strategic resource that empowers tofu producers to grow sustainably, remain competitive, and adapt to the evolving demands of the food industry.

Analysis of raw material inventory control for smooth production processes using the MRP (Material Requirement Planning) method at the Guyub Rukun Tofu Factory in Malang City.

The research results state that by considering all aspects: cost efficiency, reduced order frequency, more structured demand planning, and increased operational resilience, it can be concluded that the MRP method is more effective than the LFL policy currently implemented by the Guyub Rukun Tofu Factory. The implementation of MRP is expected to support the factory in increasing productivity, efficiency, and overall business sustainability.

CONCLUSION

From the results of the research that has been carried out, it can be concluded that:

1. The raw material inventory control system implemented by the Guyub Rukun Tofu Factory in Malang City involves purchasing 200 kg of soybeans, the main raw material, daily, in accordance with daily production capacity. The advantage of this policy is minimal storage costs, as the raw materials are used on the same day as purchased. This also avoids the risk of soybeans spoiling, molding, or losing quality due to prolonged storage. On the other hand, a disadvantage of this strategy is the high frequency of orders, which results in high ordering costs in the long term.
2. Implementation of the Material Requirement Planning (MRP) method in planning raw material requirements at the Guyub Rukun Tofu Factory
3. The implementation of the Material Requirement Planning (MRP) method at the Guyub Rukun Tofu Factory is an effort to increase efficiency in planning and controlling raw material requirements, particularly soybeans, the primary ingredient in the tofu production process. Through MRP, the Guyub Rukun Tofu Factory not

only maintains smooth production but also manages resources more economically, systematically, and responsively to operational dynamics.

4. The effectiveness of the Material Requirement Planning (MRP) method compared to the inventory control policy currently implemented by the Guyub Rukun Tofu Factory. The implementation of the Material Requirement Planning (MRP) method provides a more systematic and efficient approach to planning raw material requirements compared to the inventory control policy currently used by the Guyub Rukun Tofu Factory, namely the Lot-for-Lot (LFL) method.

Therefore, it can be concluded that the MRP method is more effective than the LFL policy currently implemented by the Guyub Rukun Tofu Factory.

REFERENCES

Authored Book

- Akande, O. (2019). *An Integrated Approach To Production Planning and Control Systems In Small Scale Industry*. Southern Illinois University at Edwardsville.
- Begum, S., Akash, M. A. S., Khan, M. S., & Bhuiyan, M. R. (2024). A framework for lean manufacturing implementation in the textile industry: A research study. *International Journal of Science and Engineering*, 1(04), 17-31.
- Gisi, P. J. (2025). *Effective Manufacturing Consulting: Strategies for Success in a Dynamic Industry*. Florida, USA : CRC Press.
- Gopalakrishnan, P., & Haleem, A. (2015). *Handbook of materials management*. India : PHI Learning Pvt. Ltd.
- Muller, M. (2019). *Essentials of inventory management*. Tennessee, USA : HarperCollins Leadership.

Dissertation from a Database

- Ihme, M. (2015). *Interpreting and applying demand driven MRP: a case study* (Doctoral dissertation, Nottingham Trent University).
- Zhong, L. (2022). *Competing on digitalization transformation: The relationship between enterprise resource planning, management control systems, and dynamic capabilities* (Doctoral dissertation, Cardiff University).

Journal Articles

- Adeniran, I. A., Efunniyi, C. P., Osundare, O. S., & Abhulimen, A. O. (2024). Optimizing logistics and supply chain management through advanced analytics: Insights from industries. *Engineering Science & Technology Journal*, 5(8).
- Akinlabi, B. H. (2021). Effect of inventory management practices on operational performance of flour milling companies in Nigeria. *International Academy Journal of Management, Marketing and Entrepreneurial Studies*, 8(2), 137-174.
- Farhan, T., & Purnomo, A. (2025). Analysis of Soybean Raw Material Inventory Control for Production Sustainability at a Tofu Factory in Padang Cermin District, Pesawaran Regency. *Journal of Business and Halal Industry*, 2(3), 7-7.
- Haryadi, D., & Bramasto, A. (2023). Study of Inventory Control and Quality Control of Raw Materials. *Almana: Jurnal Manajemen dan Bisnis*, 7(3), 613-621.

- Miclo, R., Lauras, M., Fontanili, F., Lamothe, J., & Melnyk, S. A. (2019). Demand Driven MRP: assessment of a new approach to materials management. *International Journal of Production Research*, 57(1), 166-181.
- Ogbuagu, O. O., Mbata, A. O., Balogun, O. D., Oladapo, O., Ojo, O. O., & Muonde, M. (2023). Quality assurance in pharmaceutical manufacturing: Bridging the gap between regulations, supply chain, and innovations. *International Journal of Multidisciplinary Research and Growth Evaluation*, 4(1), 823-831.
- Olaniyi, O. A., & Pugal, P. S. (2024). Optimising inventory management strategies for cost reduction in supply chains: A systematic review. *Jurnal Akuntansi dan Bisnis: Jurnal Program Studi Akuntansi*, 10(1), 48-55.
- Oteri, O. J., Onukwulu, E. C., Igwe, A. N., Ewim, C. P. M., Ibeh, A. I., & Sobowale, A. (2023). Cost optimization in logistics product management: strategies for operational efficiency and profitability. *International Journal of Business and Management. Forthcoming*.
- Ramadan, A., Alkhodary, D., Alnawaiseh, M., Jebreen, K., Morshed, A., & Ahmad, A. B. (2024). Managerial competence and inventory management in SME financial performance: A Hungarian perspective. *Journal of Statistics Applications & Probability*, 13(3), 859-870.
- Saputra, W. S., Ernawati, R., & Wulansari, W. A. (2021). Analysis of Raw Material Inventory Control Using Economic Order Quantity (EOQ) Method at CV. XYZ. *International Journal of Computer and Information System*, 2(3), 118-124.
- Siregar, A. (2022). Analysis Of Inventory Planning For Brick Raw Materials Using The Material Requirement Planning (Mrp) Method. *JOEL: Journal of Educational and Language Research*, 1(7), 965-972.
- Stüve, D., Van Der Meer, R., Ali Agha, M. S., & Lütke Entrup, M. (2025). Supply chain planning in the food industry: mixed methods research on the adoption of advanced planning systems. *Production Planning & Control*, 1-30.
- Tanaga, M. B., & Oetama, R. S. (2023). Material requirement planning information system: Prototype and lead time analysis. *Journal of information systems and informatics*, 5(3), 848-859.
- Vaka, D. K. (2024). Integrating inventory management and distribution: A holistic supply chain strategy. *the International Journal of Managing Value and Supply Chains*, 15(2), 13-23.
- Xu, G., Guan, Z., Yue, L., & Mumtaz, J. (2023). An efficient production planning approach based demand driven MRP under resource constraints. *International Journal of Industrial Engineering Computations*, 14(3), 451-466.

Proceedings

- Christifan, A. J., & Gozali, L. (2020, December). Application of MRP system for control of raw material inventory with EOQ lot sizing. In *IOP Conference Series: Materials Science and Engineering* (Vol. 1007, No. 1, p. 012029). IOP Publishing.
- Citraresmi, A. D. P., & Azizah, F. (2019, February). Inventory control of raw material on sweet bread production. In *IOP Conference Series: Earth and Environmental Science* (Vol. 230, No. 1, p. 012056). IOP Publishing.

- Girsang, A. S., & Purwanto, A. (2017). Controlling system for stock raw material for production planning and inventory control in a pharmacy company. *Int. Rev. Mech. Eng.*, 11(11), 855-861.
- Hasanati, N., Permatasari, E., Nurhasanah, N., & Hidayat, S. (2019, May). Implementation of material requirement planning (MRP) on raw material order planning system for garment industry. In *IOP Conference Series: Materials Science and Engineering* (Vol. 528, No. 1, p. 012064). IOP Publishing.
- Susanto, R. (2018, August). Raw material inventory control analysis with economic order quantity method. In *IOP Conference Series: Materials Science and Engineering* (Vol. 407, No. 1, p. 012070). IOP Publishing.