

Techniques for Determining the Location and Layout of Tempe Production Businesses

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ABSTRACT

The tempe industry is one of the micro, small, and medium enterprise (MSME) sectors that plays an important role in supporting national food security by providing affordable plant-based protein for the community. However, this industry faces several challenges, including fluctuations in soybean prices, increasing market competition, and the need to improve production efficiency. Therefore, optimizing production processes through proper location selection and effective business layout planning becomes an important aspect to ensure business sustainability. This study aims to analyze the importance of location selection techniques and business layout planning in improving production performance in the tempe industry. The research uses a qualitative approach through a literature review method by examining location theory, facility layout theory, and findings from relevant previous studies. The results indicate that selecting a strategic business location, particularly one that is close to raw material sources and target markets, can reduce transportation costs and improve distribution efficiency. In addition, a production layout designed based on workflow processes can minimize production bottlenecks, reduce operational waste, and create a safer and more organized working environment. The integration of strategic location selection and effective layout planning can significantly improve operational efficiency and strengthen the competitiveness of tempe MSMEs. Therefore, implementing appropriate location and layout strategies is essential to support the sustainability of tempe production businesses and enhance their contribution to local economic development and national food security.

Introduction

The tempe industry is one of the micro, small, and medium enterprises (MSMEs) that contributes significantly to national food security (Zulmi et al., 2026). Tempe is known as a traditional Indonesian fermented food that is rich in vegetable protein and relatively affordable for the community. In addition to being an alternative source of protein, tempe also has high economic value because it is widely produced by MSMEs in various regions in Indonesia (Wulansari et al., 2024). Data from the Central Statistics Agency shows that soybean consumption for the tempeh industry continues to increase every year, reflecting high market demand for this product and its role in meeting the nutritional needs of the community (Badan Pusat Statistik, 2022). In addition, the tempe industry also contributes to creating jobs and boosting the local economy, making the sustainability of this industry an important consideration (Rozita et al., 2025).

Despite its strategic role, the tempeh industry faces a range of increasingly complex challenges. One of the main challenges is the fluctuation in the price of imported soybeans, which are the primary raw material in tempeh production. Dependence on imported soybeans leads to unstable production costs, which can affect the selling price of the product (Ismiyati et al., 2025). In addition, increasing market competition, both among tempeh producers and with alternative food products—requires MSMEs to improve production efficiency and product quality. At the same time, consumer demands regarding food safety standards, production facility hygiene, and product quality are also rising, making it necessary for tempeh businesses to implement more effective and efficient production management (Satriawati et al., 2025; Sugiharto et al., 2025).

In the context of operations management, two key aspects that significantly influence production efficiency are the selection of a business location and the design of the production facility layout. The selection of a business location is a strategic decision that affects transportation costs, access to raw materials, proximity to markets, and product distribution efficiency. According to the classical industrial location theory proposed by Weber, the optimal location is one that minimizes transportation costs for raw materials and finished products, thereby enhancing the company's operational efficiency. In the context of the tempeh business, a location near sources of soybean raw materials and consumer markets offers advantages in reducing distribution costs and maintaining product quality (Abdullah et al., 2023; Jatmiko et al., 2021).

In addition to selecting a business location, designing the production layout also plays a key role in improving operational efficiency. A well-designed layout enables a more effective workflow, reduces unnecessary movement of materials, and minimizes the risk of contamination and workplace accidents. According to Heizer and Render (2021) in operations management theory, a facility layout designed based on the production process flow can improve operational efficiency because each production activity is systematically arranged according to the sequence of operations (Latifah et al., 2021). In the tempeh industry, the production process, which includes soaking, boiling, peeling, inoculation, fermentation, and packaging requires a systematic layout to ensure that production runs more efficiently and meets food safety standards.

Several previous studies have shown that the application of appropriate layout planning techniques can improve production efficiency in small-scale food industries. The study Safitri (2022) who used the Systematic Layout Planning (SLP) method found that improving the layout of production facilities can reduce material handling distances by up to 35% and increase production process efficiency. Another study by Fauzi and Rahmawati (2023) shows that the application of a lean layout approach in small-scale food industries can minimize various forms of waste, such as waiting time, excessive material movement, and the accumulation of work-in-progress. Furthermore, the study Afifah and Setyawan (2021) indicates that strategic business location selection can improve distribution efficiency and accelerate market access for food-based MSMEs. On the other hand, various government

programs also continue to promote improvements in the quality of food MSME production through the provision of production facilities, food hygiene training, and assistance with the upgrading of production facilities for business operators ([Kementerian Koperasi and UMKM, 2021](#)).

Although various studies have discussed the importance of business location selection and production layout design, most of these studies still focus on the manufacturing or food industries in general. Research specifically examining the application of location and layout strategies in the tempeh industry as one sector of the food SME sector remains relatively limited. Furthermore, some previous studies have emphasized only one aspect either business location or production layout without comprehensively examining the integration of these two aspects. Therefore, this study is important to analyze how business location selection techniques and production layout design can improve operational efficiency in the tempe industry. Thus, this study aims to examine the role of business location selection in improving production efficiency, analyze the impact of production layout design on the smoothness of the production process, and understand how the integration of a strategic business location and an effective production layout can improve operational efficiency and the sustainability of the tempe business amidst the dynamics of the modern food industry.

Methods

This study employs a qualitative approach using the library research method. This method was chosen because the study focuses on analyzing concepts, theories, and the findings of previous research related to business location selection and production layout design in the tempeh industry. Library research allows the researcher to gain a comprehensive theoretical understanding and identify relevant scientific developments related to the research topic without conducting direct field data collection ([Snyder, 2019](#)).

The data used in this study is secondary data, which is data obtained from various written sources such as scientific journal articles, operations management textbooks, official government reports, and statistical publications related to the food industry and SMEs. The literature used was selected based on several criteria, namely relevance to the research topic, source credibility, and relatively recent publication dates. The literature search was conducted through various academic databases such as Google Scholar, ScienceDirect, and national journal repositories to ensure that the sources used were from reputable scientific publications ([Xiao & Watson, 2019](#)).

Data collection was conducted through the identification, selection, and compilation of literature related to industrial location theory, production facility layout, and operational efficiency in small-scale food industries. After the relevant literature was obtained, the researcher classified and grouped the information based on the research themes, namely business location selection, production layout design, and their implications for operational efficiency.

Data analysis was conducted using qualitative descriptive analysis, which involves systematically describing and interpreting findings from various sources of literature. This analysis aims to explain how the concepts of business location selection and production layout can be applied to improve production process efficiency in the tempeh industry. During the analysis process, the researcher conducted a literature synthesis, which involves combining various previous research findings to identify patterns, relationships, and conclusions relevant to the research objectives.

Based on this process of analysis and synthesis, the researchers then drew conclusions regarding the role of business location selection strategies and production layout design in improving operational efficiency in the tempe industry. With this approach, the study is expected to provide a systematic conceptual understanding and relevant recommendations for the development of food-related SMEs, particularly in the tempe industry.

Results and Discussion

This study aims to analyze how business location selection and production layout design can improve operational efficiency in the tempeh industry as part of the food micro, small, and medium-sized enterprise (MSME) sector. Based on a literature review of various studies on production facility layouts and business location management in the food industry, it was found that both aspects play a strategic role in improving production efficiency, reducing operational costs, and strengthening business competitiveness. In small-scale food industries such as tempe production, operational efficiency is significantly influenced by how business operators manage production flows, organize workspaces, and ensure the proximity of business locations to raw materials and markets.

The Impact of Business Location on Production Efficiency

A review of the literature indicates that the selection of a business location is one of the key factors determining a business's operational success. A strategic business location can facilitate access to raw materials, reduce transportation costs, and expedite product distribution to consumers. In the tempeh industry, the primary raw material soybeans must be available on a regular basis, making proximity to suppliers a critical factor in ensuring smooth production.

Research on the management of production facilities in the food industry indicates that locating a business near raw material sources can improve distribution efficiency and reduce logistics costs for businesses (Febriani & Wurjaningrum, 2024). This is particularly important for food-related SMEs, which typically have limited capital and relatively small profit margins. With a strategic business location, business owners can reduce operational costs and improve production efficiency.

In addition to proximity to raw materials, business location must also take into account access to consumer markets. Tempeh falls into the category of fresh food products with a relatively short shelf life, requiring fast and efficient distribution. Research on production layout optimization in small-scale food industries indicates that business locations near distribution centers or markets can enhance sales stability and accelerate product distribution to consumers. Thus, the selection of a business location is not only related to production efficiency but also plays a role in maintaining product quality and enhancing consumer satisfaction.

Another factor to consider when selecting a business location is the availability of production infrastructure. The tempeh industry requires adequate production facilities, such as access to clean water, energy sources, and hygienic production spaces. Research on the optimization of production facility layouts indicates that the presence of adequate production infrastructure can improve operational efficiency and support the long-term sustainability of the business (Zhou, Liu, & Liu, 2024). Therefore, selecting the right business location must take into account various factors, such as proximity to raw materials, market access, and production infrastructure support, so that production activities can run optimally.

The Role of Production Layout in Improving Operational Efficiency

In addition to selecting a business location, the design of the production layout also has a significant impact on operational efficiency in the tempeh industry. A production layout refers to the arrangement of equipment, workspaces, and supporting facilities within a production system to ensure that the workflow proceeds effectively and efficiently. A systematically designed facility layout can reduce unnecessary material movement, increase labor productivity, and streamline the production process.

In the tempeh industry, the production process consists of several stages that must be carried out sequentially: soaking the soybeans, boiling, removing the soybean skins, washing, mixing the starter culture, fermentation, and packaging. Each of these stages requires a different workspace, so the layout of the production facility must be designed in accordance with the production process flow. Research on facility layout design in the food industry indicates that the application of the Systematic Layout Planning (SLP) method can significantly improve workflow efficiency and reduce material handling distances (Khofiyah et al., 2023).

Other studies have also shown that redesigning the layout of production facilities can improve operational efficiency and streamline the production flow. Redesigning the layout of production facilities in small-scale industries can improve work efficiency because each workstation is positioned according to the sequence of the production process. This allows

workers to perform production activities more systematically, thereby shortening production time.

In addition to improving work efficiency, production layouts also affect workplace safety and worker comfort. The tempeh industry generally still relies on manual production processes, which means workers often perform repetitive physical tasks. Research on production facility layouts in the food industry shows that ergonomic workspace design can reduce worker fatigue and increase productivity (Yusuf, 2019). With a well-designed facility layout, workers can carry out production activities more efficiently without having to move around unnecessarily.

Optimizing Production Layout Using the SLP Method and Simulation

Several studies have shown that the Systematic Layout Planning (SLP) method is an effective approach for improving the efficiency of production facility layouts. This method is used to design facility layouts based on the relationships between production activities so that workflows can operate optimally. Research conducted by Meiliati et al. (2024) shows that the application of the SLP method in small-scale food industries can improve the efficiency of production space utilization and streamline the production flow.

In addition to the SLP method, production simulation approaches are also frequently used to evaluate the effectiveness of production facility layouts. Research Noval et al. (2024) shows that the use of production simulations in facility layout redesign can help identify bottlenecks in the production flow and provide more efficient layout design alternatives. With this approach, businesses can design more optimal production facility layouts without having to make major changes to the existing production system.

Other studies have also shown that optimizing production layouts can help reduce material handling costs and improve operational efficiency in the production process. Taufik, Umrah, and Djayadinigrat (2024) found that optimizing production layouts using the SLP method can reduce material handling costs and improve overall production efficiency. This indicates that good facility layout design not only improves operational efficiency but also helps businesses reduce operational costs.

In addition, research on facility layout simulation in the food industry shows that the use of simulation technology can help improve the efficiency of production space utilization and optimize the overall production flow (Suriensah et al., 2022). With this approach, businesses can design more efficient facility layouts and boost production productivity.

Integration of Business Locations and Production Layouts

The results of the literature review indicate that business location selection and production layout design are two interrelated aspects in improving operational efficiency in the tempeh industry. A strategic business location enables entrepreneurs to gain easier access to raw materials and markets, while an efficient production layout helps streamline the production flow and increase labor productivity.

Integrating these two aspects can improve operational efficiency and strengthen business competitiveness in the long term. Research on production facility management in the food industry indicates that companies capable of optimizing business location and production facility layout achieve higher levels of operational efficiency compared to those that neglect these aspects.

To clarify the results of the literature review, a summary of research findings regarding the influence of business location and production layout on operational efficiency can be seen in the following table.

Factor	Research Findings	Impact on the Tempe Industry	References
Business location	Proximity to raw materials improves distribution efficiency	Reduced transportation costs for raw materials	Febriani & Wurjaningrum (2024)
Production layout	SLP improves workflow efficiency	Reduced material handling distances	Khofiyah et al. (2023)
Layout redesign	Layout improvements enhance operational efficiency	Smoother production processes	Abdullah et al. (2023)
Layout simulation	Layout evaluation improves production space efficiency	Increased productivity	Noval et al. (2024)
Layout optimization	Reduction in material handling costs	Lower operating costs	Taufik et al. (2024)

Implications for the Competitiveness of Tempe SMEs

The findings of this study indicate that the management of business locations and the layout of production facilities have significant implications for the competitiveness of tempe SMEs. A strategic business location enables entrepreneurs to reduce logistics costs and expedite product distribution to consumers. Meanwhile, an efficient production facility layout helps improve labor productivity and ensure consistent product quality.

In the long term, implementing the right operational management strategies can help tempe SMEs improve cost efficiency, product quality, and customer satisfaction. This is

particularly important in the face of increasingly competitive market conditions and rising consumer demands for food product quality. Consequently, optimizing business locations and production facility layouts are strategic steps that tempe SMEs can take to enhance operational efficiency and strengthen their competitive edge in an increasingly dynamic market.

Conclusion

Based on the results of the literature review conducted, it can be concluded that business location selection and production layout design are two key factors that play a role in improving the operational efficiency of the tempeh industry as part of the food MSMEs sector. A strategic business location, particularly one near raw material sources and markets, can reduce transportation costs, expedite product distribution, and maintain the quality of tempeh, which has a relatively short shelf life. Additionally, the availability of supporting infrastructure such as access to clean water, energy, and sanitation facilities is also a critical factor in ensuring the continuity of production. These findings indicate that business location decisions are not only related to economic aspects but also to operational efficiency and the quality of the products produced.

In addition to business location, an effective production layout design also plays a significant role in improving productivity and work efficiency in the tempe industry. A facility layout designed based on the sequence of production processes can streamline the flow of raw materials, reduce the distance materials need to be moved, and minimize waiting time between production processes. Various studies show that the application of methods such as Systematic Layout Planning (SLP), facility layout redesign, and production simulation approaches can improve operational efficiency and reduce waste in the production process. Thus, the integration between the selection.

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