

OPERATIONAL ANALYSIS OF FOOD INVENTORY IN WARTEG (WARUNG TEGAL) BUSINESSES AROUND TANGERANG

Angelyn Meirvyrist^{1*}, Cherrie Michelle Lie², Emily Charmaine³, Fidelia Senaputra⁴,
Ivan Darrio⁵, Sorensen Sukarta⁶, Akeno Athallah Yahya⁷, & Nurhayati⁸

^{*1-7}Program Studi Business Department Universitas Prasetya Mulya

⁸Program Studi Food Business Technology Universitas Prasetya Mulya

*e-Mail: angelyn.mrvy@gmail.com

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Abstract: *This study examines inventory management and production capacity in warung tegal (warteg) businesses in Tangerang and surrounding areas, with a focus on the mismatch between production capacity and customer demand during peak hours. Warteg businesses typically prepare food in advance based on daily demand estimates, which often leads to operational risks such as food shortages or overproduction due to fluctuating demand, especially during lunchtime. Using a descriptive qualitative approach, data were collected through in-depth interviews and direct observations of 30 warteg businesses selected through convenience sampling. The analysis focuses on inventory-related indicators, including stock availability, frequency of stockouts, and replenishment practices during peak periods. The findings show that shortages frequently occur when popular menu items such as chicken and eggs run out before peak hours end. This is mainly caused by production decisions that rely on experience rather than structured inventory planning. This condition reduces service levels, resulting in longer waiting times and increased queues. The study suggests that implementing simple inventory management practices, such as recording daily sales patterns and determining buffer stock for high-demand menu items, can help optimize production planning, improve service efficiency, and reduce the risk of both shortages and food waste in small-scale food businesses.*

Keywords: *Inventory Management; Food Stockouts; Peak Hour Demand; Production Capacity; Food Stall; Warteg Business*

Abstrak: Penelitian ini mengkaji manajemen persediaan dan kapasitas produksi pada usaha warung tegal (warteg) di Tangerang dan sekitarnya, dengan fokus pada ketidaksesuaian antara kapasitas produksi dan permintaan pelanggan pada jam-jam sibuk. Usaha warteg umumnya menyiapkan makanan terlebih dahulu berdasarkan perkiraan permintaan harian, yang seringkali menimbulkan risiko operasional seperti kekurangan stok atau produksi berlebih akibat fluktuasi permintaan, terutama pada jam makan siang. Dengan menggunakan pendekatan kualitatif deskriptif, data dikumpulkan melalui wawancara mendalam dan pengamatan langsung terhadap 30 usaha warteg yang dipilih melalui sampling kenyamanan. Analisis berfokus pada indikator terkait persediaan, termasuk ketersediaan stok, frekuensi kehabisan stok, dan praktik pengisian ulang selama periode puncak. Temuan menunjukkan bahwa kekurangan stok sering terjadi ketika menu populer seperti ayam dan telur habis sebelum jam sibuk berakhir. Hal ini terutama disebabkan oleh keputusan produksi yang bergantung pada pengalaman daripada

perencanaan persediaan yang terstruktur. Kondisi ini menurunkan tingkat layanan, yang mengakibatkan waktu tunggu yang lebih lama dan antrean yang semakin panjang. Studi ini menyarankan bahwa penerapan praktik manajemen persediaan sederhana, seperti mencatat pola penjualan harian dan menentukan persediaan cadangan untuk menu yang banyak diminati, dapat membantu mengoptimalkan perencanaan produksi, meningkatkan efisiensi layanan, serta mengurangi risiko kekurangan stok dan limbah makanan di usaha makanan skala kecil.

Kata kunci: Manajemen Persediaan; Kekosongan Stok Makanan; Permintaan pada Jam Sibuk; Kapasitas Produksi; Kios Makanan; Usaha Warteg

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PENDAHULUAN

A food stall is a small-scale, informal business that sells ready-to-eat food in public spaces with simple facilities and low capital, providing affordable meals to urban communities (Iskandar et al., 2025; Shahren, 2024; Verma & Mishra, 2023). In Indonesia, warteg (Warung Tegal) can be categorized as this type of food stall, operating as a micro-enterprise within the informal sector and serves low-cost daily meals to middle and low income consumers (Andriyanty, 2021).

This type of business relies heavily on operational efficiency to sustain profitability. Warteg owners must manage daily food production while ensuring that raw materials are available in the right quantity and quality. Since most ingredients are perishable, poor handling of inventory can quickly lead to waste, increased costs, and reduced food quality (Fallah, 2021; Ruqeshi & Ullah, 2024).

Within the scope of operations management, inventory management becomes a critical function that directly affects business performance. It involves planning, controlling, and monitoring the flow of raw materials to support continuous food production (Chopra & Meindl, 2016; Russell & Taylor, 2020). Effective inventory management helps businesses balance the supply and demand, reduce unnecessary costs, and maintain service consistency.

However, many small food businesses, including warteg, still rely on simple and informal inventory practices. Decisions are often based on experience rather than structured data, which increases the risk of overstocking or stock shortages (Alvina et al., 2025; Putri et al., 2025). This condition indicates a gap between theoretical approaches and actual practices in the field.

To address this issue, several inventory management methods such as Economic Order Quantity (EOQ), Reorder Point (ROP), and demand forecasting can be applied to improve decision-making progress and operational efficiency (NG et al., 2025; Rifai et al., 2021). These methods provide a more systematic approach to managing raw materials, especially in businesses with high demand variability.

Therefore, this study focuses on analyzing inventory management practices in warteg as one of the most common forms of food stalls in Indonesia. The study aims to evaluate current practices and identify practical improvements that can enhance operational efficiency and reduce waste.

LITERATURE REVIEW

Inventory Management and Perishable Goods

Inventory management is a system that aims to determine the optimal quantity and timing of ordering or production to minimize total inventory costs while maintaining the desired service level. It focuses on balancing holding costs, ordering or production costs, and stockout costs (Russell & Taylor, 2020). Decisions regarding how much to produce or order and when to do so are central to effective inventory in operational systems.

In the context of food business such as warteg, inventory is classified as perishable goods, which have a limited shelf life. This characteristic increases the complexity of inventory management. Overstocking does not only increase holding costs but also leads to food waste, while shortages during peak hours reduce service level and potential revenue (Fallah, 2021; Ruqeshi & Ullah, 2024). In addition, environmental and sanitation factors can affect food quality and safety which further emphasizes the importance of proper inventory handling in small food businesses (Marlinae et al., 2019)

Previous studies on small food enterprises show that operational challenges often arise from limited planning and lack of structured inventory systems, especially in informal businesses such as warteg (Ardiansyah Bagus, 2023; Santoso, 2019). These limitations make inventory management a critical area for improving both efficiency and business performance.

Economic Order Quantity (EOQ)

Economic Order Quantity (EOQ) is a deterministic inventory model used to determine the optimal order or production quantity by minimizing total inventory costs. The model balances ordering costs and holding costs using key variables such as demand rate, ordering cost, and holding cost per unit (Russell & Taylor, 2020). EOQ provides a structured approach to deciding how much to produce or order in each cycle (Alnahhal et al., 2024; Fallah, 2021).

Although EOQ is widely applied in manufacturing and retail sectors, its principles can be adapted to small food businesses such as warteg. In this context, EOQ can support decision-making in determining daily production quantities. Setting production quantities requires careful consideration of the trade-off between holding costs and the risk of stockouts (Chopra & Meindl, 2016). Producing too much increases the risk of waste, while producing too little may result in lost sales during high-demand periods.

Furthermore, inventory optimization approaches have been developed to improve efficiency across various industries, including small-scale operations, by integrating cost considerations with demand patterns (Hemant & Shafighi, 2023). These approaches strengthen the relevance of EOQ-based models in improving operational decision-making.

Reorder Point (ROP)

Reorder Point (ROP) refers to the inventory level at which a new order or production must be initiated to prevent stockouts. It is typically calculated based on demand during lead time and may include a safety stock component under uncertain demand conditions (Russell & Taylor, 2020). Inaccurate ROP calculations can lead to either stock shortages or excessive inventory, both of which reduce operational efficiency (Lukmana & Yulianti, 2015).

In warteg operation, although production is conducted daily, the concept of ROP remains relevant, especially during peak hours. It helps determine when additional production should be initiated to meet sudden increases in demand. Without proper ROP negatively affects service levels and customer satisfaction.

In addition, recent developments in inventory management emphasize the importance of integrating sustainability and efficiency, particularly in managing perishable goods and reducing waste (Carpitella & Izquierdo, 2025). This perspective supports the need for more structured inventory practices in small food businesses such as warteg.

METHODS

This research uses an inventory management theory approach as the main guide along with capacity and facilities design as supplementary material. The main research topics include the objectives of inventory management, service level, safety stock, and reorder point. The group also uses capacity planning, facilities, and basic layouts theories to support a more detailed and thorough data study process. Operationally, the main variable of this research is food inventory management, measured by determining the quantity of food stock, the frequency of stockouts during peak hours, and stock replenishment strategies when demand increases. Furthermore, the second variables are capacity and service flow, seen from the number of workers, tables, and chairs, the layout of the kitchen and dining area, as well as factors that hinder consumer service.

The research analysis uses a descriptive qualitative method using two techniques for each variable studied. The group uses in-depth interviews to obtain data regarding the food inventory management of each warteg. During the interview process, the group prepared 12 open-ended questions for the warteg owners. This was done with the aim of providing them with an opportunity to elaborate on their views in more depth, thereby providing the group with more accurate and sharp insights.

On the other hand, the observation method is used at the same time as the interview process to directly determine the warteg layout. Through observation, the group obtains a clear picture of the service space, the position of the production and dining areas, and the workflow of the staff when serving consumers. Additionally, observation helps identify service obstacles, such as a lack of workforce or limited space for movement. With this combination of methods, the analysis results are not only based on the respondents' answers but are also supported by observations of real conditions in the field.

To ensure research accuracy, the group established warteg located in the Tangerang City, South Tangerang, and Tangerang Regency areas as the research population. Then, the group determined the samples using the convenience sampling technique after considering time constraints and the availability of warteg owners to be interviewed. Based on this

technique, the group has obtained a fixed sample of 30 warteg that represent all wartegs operating in the Tangerang City, South Tangerang, and Tangerang Regency areas.

RESULTS AND DISCUSSION

This section presents the analysis of inventory management practices in warteg based on three main aspects: the mismatch between production capacity and demand during peak hours, the existing inventory management practices, and the impact on service levels.

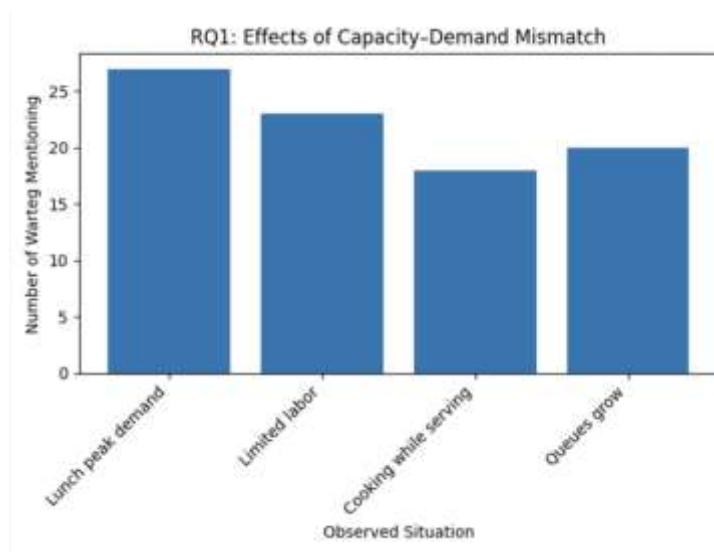


Figure 1 Graph of the discrepancy between production capacity and demand levels

Figure 1 shows that the most common form of shortage occurs during lunch hours, particularly in high-demand menu items. This shortage forces staff to re-cook during peak periods, which increases waiting time and leads to longer queues. This finding directly explains how the mismatch between production capacity and demand contributes to operational inefficiency.

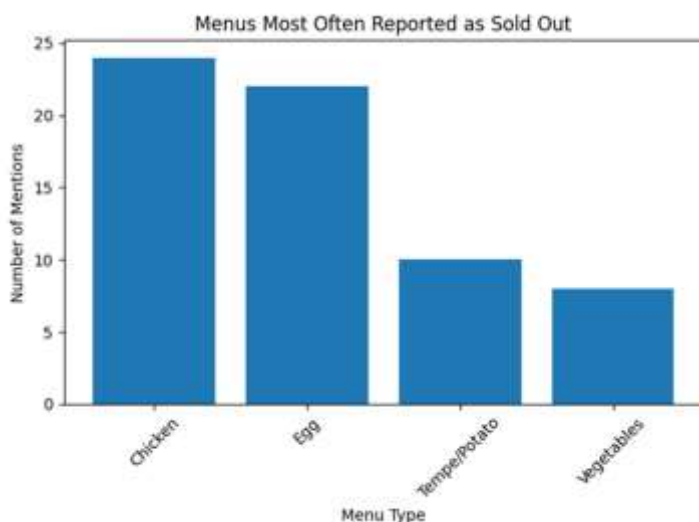


Figure 2 Graph of Most Frequently Depleted Menu Items

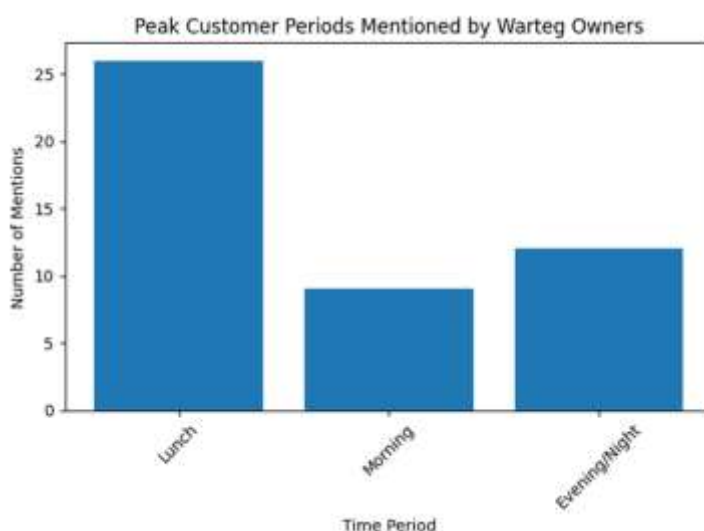


Figure 3 Graph of Warteg Peak Hours

Figure 2 and 3 further support this result. Lunch time is identified as the main peak period, where customer arrivals significantly increase within a short time frame. However, production capacity remains constant due to limited labor and pre-determined cooking quantities. As a result, popular menu items such as chicken and eggs are frequently depleted. This indicates that production decisions are not aligned with actual demand patterns.



Figure 4 Trend graph of warteg inventory systems

Figure 4 indicates that inventory practices in warteg businesses are still dominated by experience-based decision-making. Most owners rely on past habits and visual estimation of remaining stock rather than structured planning. Replenishment is conducted only after stock levels are visibility low, indicating a reactive inventory system.

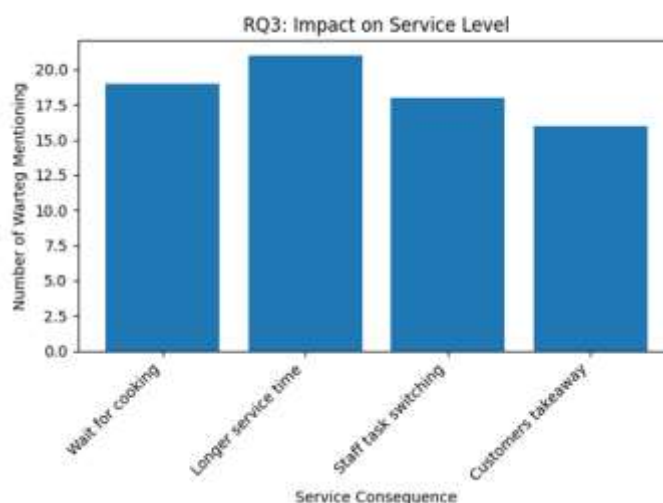


Figure 5 Trend graph of impacts on warteg

Figure 5 highlights the impact of these practices on service levels. The most common consequences include increased waiting time, longer service duration, and longer queues during peak hours. In some cases, staff must shift roles from production to service, which further delays the cooking process. This creates a cycle where shortages continue to affect service performance.

Table 1 Comparison of Interview Results with Previous Journals

Research Questions	Warteg Interview Data Results	Quezon Province Journal (Baylen, 2020)	Batagor Juanda Journal (Alvina et al., 2025)
How does the mismatch between production capacity and demand levels during peak hours cause food inventory shortages?	Production is based on daily estimates. During peak hours (11:30–13:00), demand surges while production volume and labor remain constant, causing main side dishes to sell out quickly. However, re-cooking slows down service and increases queues.	Small restaurants experience stockouts of favorite menus during busy hours due to a lack of data-driven planning. Demand is higher than the prepared inventory capacity, leading to a decline in service quality.	Irregular raw material planning leads to stock shortages that hamper the production process. Production capacity is not always aligned with actual needs, resulting in raw material shortages.
How can an appropriate inventory management model be implemented to maintain the availability of several main menus during peak hours without increasing the risk of overproduction?	There is currently no formal method. Owners increase production gradually when stock is nearly depleted (reactive). There is no clear safety stock or ROP, so the risk of shortage remains high.	The use of a more organized inventory system and consistent recording is suggested so that the restaurant can estimate needs and prevent stock outs without over-purchasing.	The implementation of simple methods such as EOQ and ROP, along with more systematic stock recording, is recommended to balance availability and costs while reducing waste of perishable ingredients.
How can determining the optimal production quantity improve the service level in a warteg business?	If the production quantity matches peak hour demand patterns, main menus remain available and waiting times are reduced. Currently, service levels often drop because menus run out before the peak period ends.	Better inventory control increases menu availability when needed, thereby maintaining customer satisfaction and service quality.	More measurable raw material planning can maintain production flow and increase the consistency of product availability.

Based on the comparison table, the mismatch between production capacity and demand during peak hours is identified as the primary cause of inventory shortages in small-scale food businesses. In warteg operations, the surge in customer arrivals during lunch hours is not supported by an increase in production volume or workforce capacity. As a result, several menu items are depleted quickly, which disrupts service flow and reduces operational efficiency.

This finding is consistent with previous studies, which highlight that inventory systems based on estimation without structured recording increase the risk of stock outs and

negatively affect service quality. The lack of data-driven planning limits the ability of businesses to anticipate demand fluctuations, especially during peak periods.

Furthermore, all three sources emphasize the importance of more structured and planned inventory management. Aligning production quantities with actual demand patterns can help maintain menu availability while minimizing waste. In the context of warteg, this approach can improve service levels by reducing waiting times and ensuring that customers can access their preferred menu without delays caused by re-cooking.

Therefore, improving production quantity planning does not only enhance inventory stability but also plays a significant role in maintaining service quality and overall operational performance.

Discussion

The findings indicate that inventory shortages in warted businesses are primarily driven by the inability to align production capacity with fluctuating demand during peak hours. Demand increases sharply within a short period, while production decisions remain based on fixed estimates. This condition reflects the absence of demand-based planning and highlights the reliance on intuition rather than structured inventory control.

From an inventory management perspective, this pattern represents a reactive system, where actions are taken only after stock levels decline rather than being anticipated in advance (Ruqeshi & Ullah, 2024). As a result, warteg operations are unable to respond effectively on demand surges, leading to frequent stockouts during peak periods. This condition is particularly critical in the context of perishable goods, where both overproduction and underproduction carry significant risks (Fallah, 2021).

The issue becomes more evident in high-demand menu items such as chicken and eggs. The frequent depletion of these items suggests that no safety stock or prioritisation strategy is applied for fast-moving products. In inventory management theory, safety stock is used to buffer demand uncertainty and prevent stockouts, especially for high-turnover items (Russell & Taylor, 2020). However, the absence of such mechanisms leads to repeated shortages and inconsistent service delivery.

These findings are consistent with previous studies, which emphasize that inventory management practices based on experience without systematic recording increase the likelihood of stockouts and reduce service quality (Alvina et al., 2025; Putri et al., 2025). Without accurate demand data, businesses cannot establish appropriate production levels or anticipate peak-hour consumption patterns.

Therefore, improving inventory management in warteg business requires a shift from experience-based decision-making to a more structured approach. The application of simple inventory models, such as demand-based production planning, safety stock, and reorder point, can help align production with actual demand patterns (Rifai et al., 2021). This improvement not only reduces the risk of shortages but also enhances service efficiency by minimizing waiting time and maintaining menu availability during peak hours.

CONCLUSION

This study concludes that the mismatch between production capacity and demand during peak hours is the primary cause of food shortages in warteg businesses. Production decisions that rely on experience without systematic historical data result in insufficient initial stock, particularly for high-demand menu items such as chicken and eggs. Consequently, menus are often depleted before the peak period ends.

This condition directly reduces service levels, as indicated by increased waiting times, longer queue, and disrupted workflows due to re-cooking during peak hours. The presence of a reactive inventory management system, in which additional production is only initiated after stock labels decline, shows that fundamental inventory control practices such as safety stock and reorder point have not been applied.

From a managerial perspective, warteg owners need to implement simple daily sales recording to identify demand patterns, especially during peak hours. This can support more accurate production planning and the establishment of buffer stock for high-demand items. By aligning production with demand, warteg businesses can improve service levels, maintain operational stability, and reduce waste caused by overproduction or stock shortages.

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